DESIGNING FOR UNCERTAINTY: THREE APPROACHES

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Introduction

Throughout the millennia, human beings depended on the spoken work to communicate with one another and to build communities. Given the limited reach of the spoken word, our communities were typically small and our languages abundantly different. This has changed in only the historical blink of the last millennium. This change was powerfully advanced by four revolutionary changes in communication. The first of these was movable type, introduced to Western Europe in 1450. The second was the introduction of mass-production paper, which began to roll off the Fourdrinier machine in 1807. The third change, involving images and sound, was heralded by William Dickson's camera for capturing moving images invented in the Edison laboratory in 1888. The reach of this third change was immensely amplified by broadcasting technology, which began with radio signals sent from atop a Westinghouse factory in 1920.

Each of these three revolutionary changes in communication technology produced huge quantities of physical artifacts. The artifacts of the first two—printed material of all kinds—were themselves the essential instruments of change. By the 1960s, the third revolution had produced vast accumulations of recorded sound on media ranging from metal wire to plastic disks and magnetic tape. It had also produced mountains of film and videotape. Those responsible for the last generation of library buildings, in the 1960s, had to find places to put all of this physical material and could reasonably expect it to grow exponentionally in the future.

This expectation was wrong. For the fourth revolution in communication technologies, the digital revolution, has changed all of our calculations about space. We have even talked about getting all of the Library of Congress onto one small storage device.[1] With the marvelous march of Moore's law, that brave new world no longer seems quite the pipe dream it once did.

[1] See, for instance, Kevin Kelly, "Scan This Book!" *New York Times*, 14 May 2006, p. xx-xx

This fourth revolution in communication technology began changing everything for libraries in the 1960s, and the rate of change become simply breathtaking with the introduction of the World Wide Web in 1993. Who in 1991 would have predicted where we are now, a mere fifteen years later? And who will be so foolhardy as to predict where we will be in another fifteen years, in 2021?

Well, I will. I do this not because of the clarity of my crystal ball but out of simple necessity. If one's topic is investments made in renovating and building new academic library space, one has no choice but to predict. Colleges and universities reasonably wish to secure fifty, seventy-five, or more years of value from any investment in academic space.[2] This expectation makes fifteen years a very short prospect for space design, even while it appears to be a beyond-the-horizon prospect for information technology. This intractable problem of perspective has so far yielded no clear solution except our injunction to architects to design space that is flexible. We use the word flexibility to clothe our naked uncertainty about what is coming.

Can we do better? In this essay, I want to explore three approaches to doing better, to resolving the conundrum of investing simultaneously in both the highly dynamic virtual space of information technology and the comparatively static physical space of bricks and mortar. There are many common elements in these three approaches, especially as regards their focus on student learning; but for purposes of schematizing I will emphasize the different motivations for each. I call them the service and instructional approach, the marketing approach, and the mission-based approach.

Service and instructional approach

Starting in the early 1990s with the Information Arcade at the University of Iowa and the Leavey Library at the University of Southern California,[3] librarians and information technologists have joined in designing a new set of services meant to respond to the revolution—

[2] See Phillip D. Long and Stephen C. Ehrmann, "Future of the Learning Space: Breaking Out of the Box," *EDUCAUSE review*, 40 (July/August 2005), 56; available at http://www.educause.edu/apps/er/erm05/erm054.asp (May 2006).

[3] For the University of Iowa Information Arcade, see Carol Ann Hughes, "'Facework': A New Role for the Next Generation of Library-Based Information Technology Centers," *Library Hi Tech*, 16, no. 3-4 (1998), 27-35; and, for the Leavey Library, Deborah Holmes-Wong, Marianne Afifi, Shahla Bahavar, and Xioyang Liu, "If You Build It, They Will Come: Spaces, Values, and Services in the Digital Era," *Library Administration & Management*, 11 (1997), 74-85.

our revolution!—in information technology. This approach, often embodied in electronic classrooms and what is called the Information Commons, sees rapid and fundamental change in information technology as primarily a service and pedagogical problem. Students and faculty need well-equipped facilities and instructional help in mastering information technology. The Information Commons offers both and represents a new element in the panoply of library service spaces: reference, circulation, technical services, and departmental libraries. The Information Commons requires a fundamentally new degree of collaboration between librarians and information technologists, who bring different professional training and cultures together in newly designed spaces that support student and faculty learning. The Information Commons is now a well-established feature of library space design and has spawned its own professional literature and Web sites.[4]

More recently—say, within the last six years—the partnership of librarians and information technologists has in some places expanded to include student tutoring staff and sometimes the staffs charged with media and audio-visual materials and with faculty development.[5] This expansion appeared in the applications for the workshops on information literacy offered by the Council of Independent Colleges, starting in 2001. And when in 2004 I first visited the University of Guelph Library and its Learning Commons, I knew something of unquestioned importance was afoot.

To strengthen my understanding of the Information and Learning Commons, I surveyed as many four-year institutions as I could identify that have consciously created spaces designed to bring together some combination of librarians, information technologists, student services staff, and possibly other academic support staff—all in support of student learning.[6] These staffs represent, after the faculty, a college or university's most substantial investment in the academic success of students. The survey inquires about how these staff have been brought into the same service space and how success is being defined.

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[4] A good entry point to this literature is the Web site, "Information Commons: a directory of innovative services and resources in academic libraries," available at: http://www.brookdale.cc.nj.us/library/infocommons/ic_home.html (May 2006).

[5] For instance, there is no mention of student support staff as offering an opportunity for "strategic alignment" in Donald Beagle, "Conceptualizing an Information Commons.," *Journal of Academic Librarianship*, 25 (March 1999), 82-89.

[6] The survey instrument appears in Appendix 1.

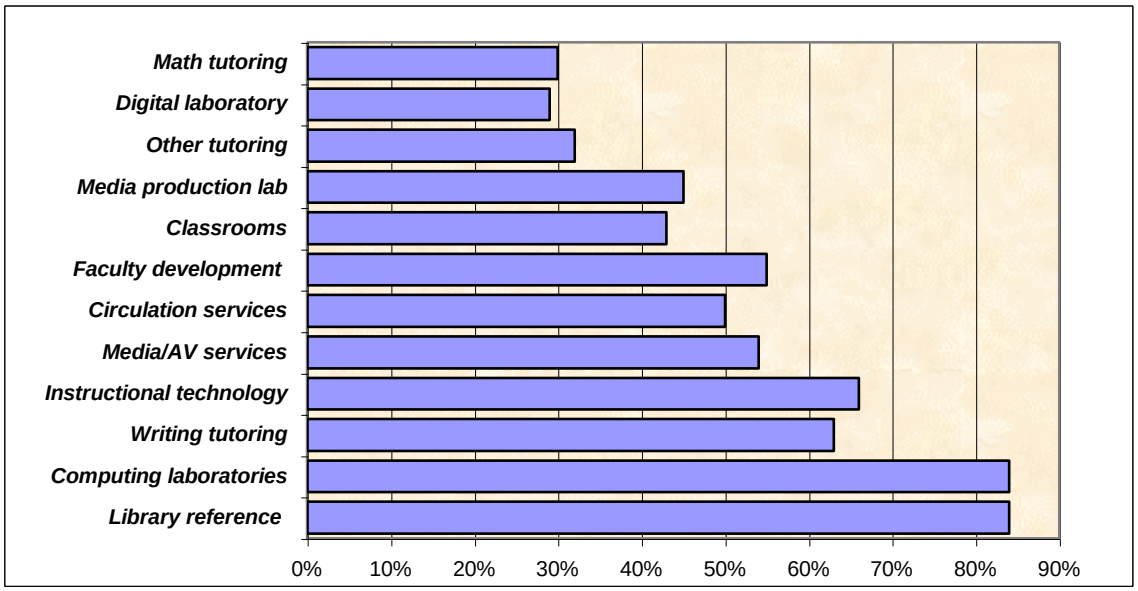
Among some 300 applicants to the CIC information literacy workshops, 67of these small to medium sized colleges and universities appeared to have created spaces for collaboration among academic support staff. As independent institutions, they have little support from state or the Federal government; they typically have small endowments, are dependent financially on tuition income, and see instruction as their primary mission. Next, drawing on the work of Joanne Henning at the University of Victoria, Joan Lippincott at the Coalition for Networked Information, and the Collaborative Facilities Web site jointly maintained by CNI and Dartmouth College, I identified an additional 24 institutions.[7] Most of these are larger and wealthier, often public institutions; many are strongly oriented toward research. These 91 institutions do not include every college or university to have created spaces for academic support staff collaboration, nor can these institutions be seen as a random sample. I do, however, believe this is a critical mass of institutions that vary from one another in ways typical of higher education in the United States.

I got survey responses from 66 colleges and universities, for a 73% rate of return. Of these, 56 institutions (90%) said they had indeed created collaborative facilities. A number of those completing the survey emphasized their projects are "works-in-progress" and do not yet fully represent their aspirations. One respondent captured the sense of adventure that instills these projects, saying: "the reference librarians and faculty instructional technology consultants, those most closely involved with the collaboration, have felt that it has been a very exciting and useful adventure not only in providing better service to our clients, but also in our own development."

Here are the most interesting things I learned from these 56 responses. The services offered collaboratively are:

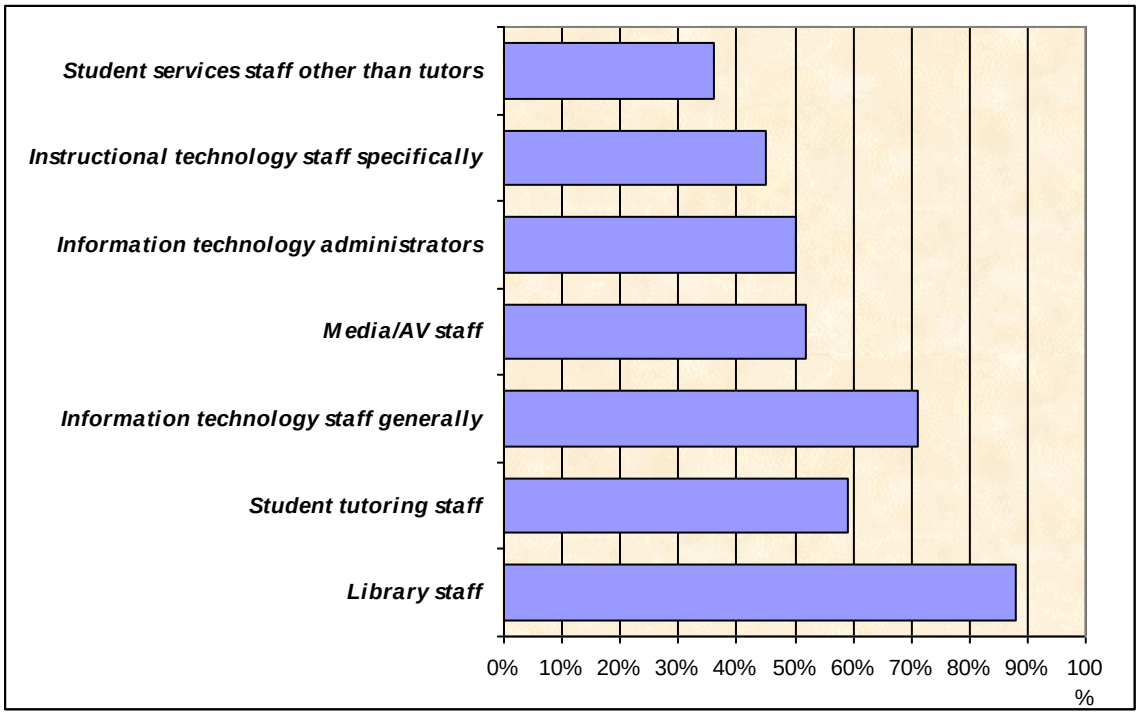
[7] See http://jhenning.law.uvic.ca (May 2006); for the CNI/Dartmouth Web site, see http://www.dartmouth.edu/~collab/ (May 2006).

FIGURE 1: Services Offered in Collaborative Facilities



These services are provided by staff described as follows:

FIGURE 2: Staff Employed in Collaborative Facilities

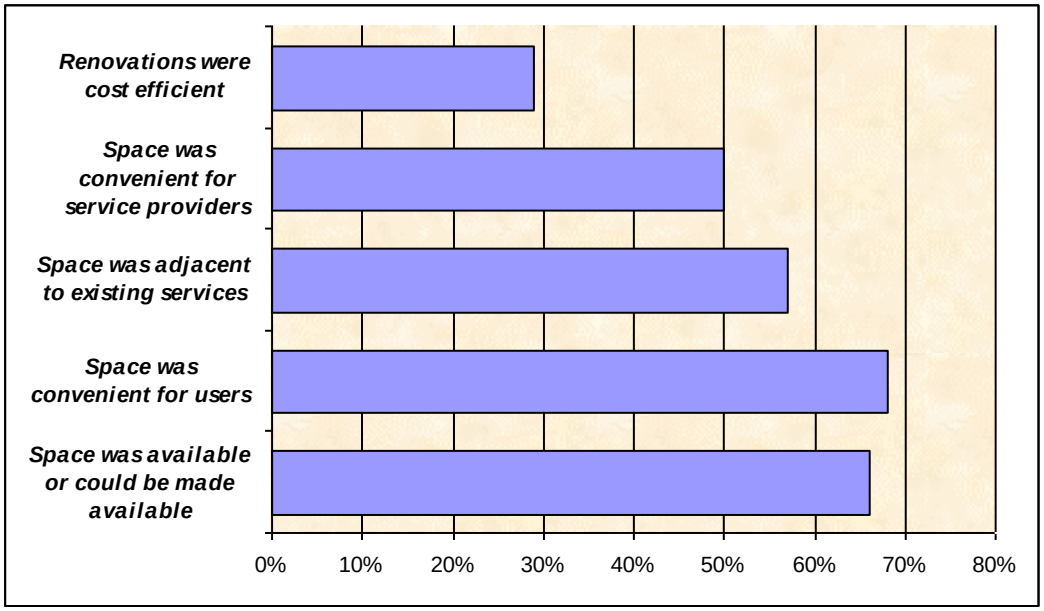


NOTE: The survey distinguishes among information technology staff generally, instructional technology staff, and information technology administrators. These are meaningful distinctions in many large institutions but meaningless in most small institutions, where a handful of technology staff must be generalists.

Given the high visibility of the Information Commons in the professional literature and the attention paid to collaboration with information technologists, I was surprised to find that student tutoring staff are involved in these collaborative facilities with a frequency approaching that of information technology staff generally.

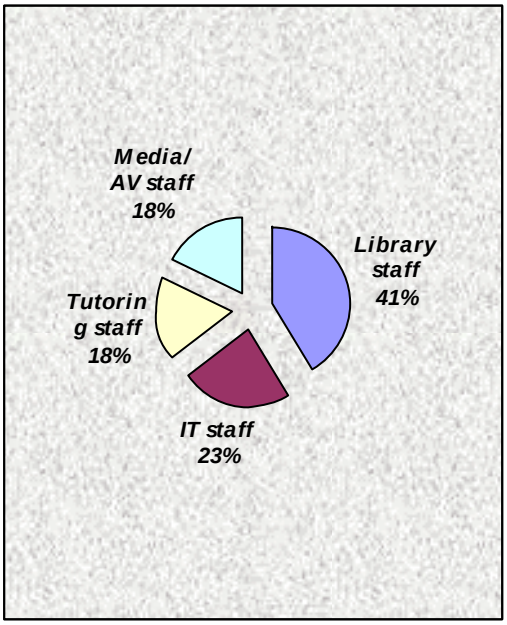
Where are these collaborative facilities being located? Some 88% of them are in library buildings; another 9% are housed in classroom and/or laboratory buildings, while the remaining 5% are housed in specially built buildings. These locations were chosen for the following reasons:

FIGURE 3: Reasons for the Location of the Collaborative Facility



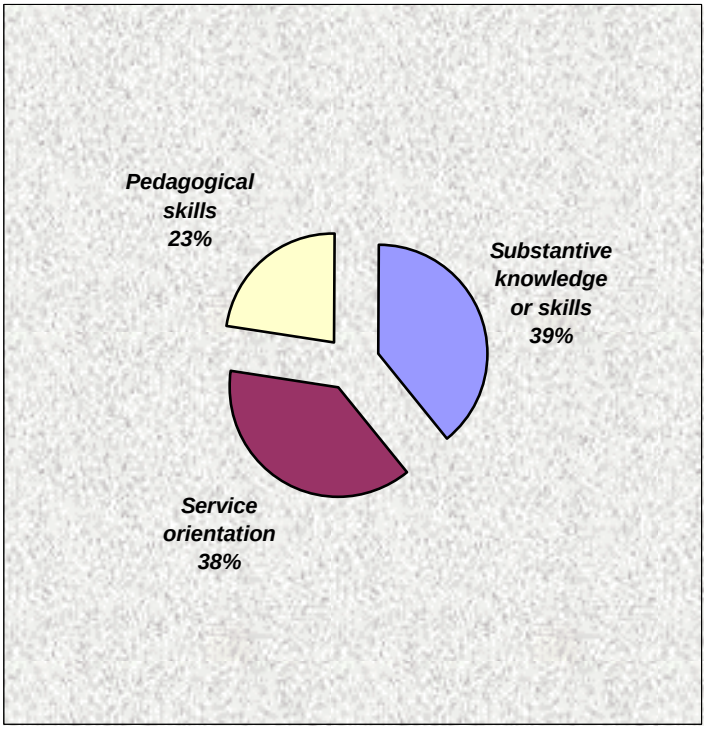
The survey inquired about three different success factors: staff cross training, increased spending, and changes in administrative structure. The first of these, cross training, was required in 82% of the cases. Asked what staff were cross trained, survey respondents reported:

FIGURE 4: Cross Training of Academic Support Staff



Asked about the kinds of the cross training needed, survey respondents reported:

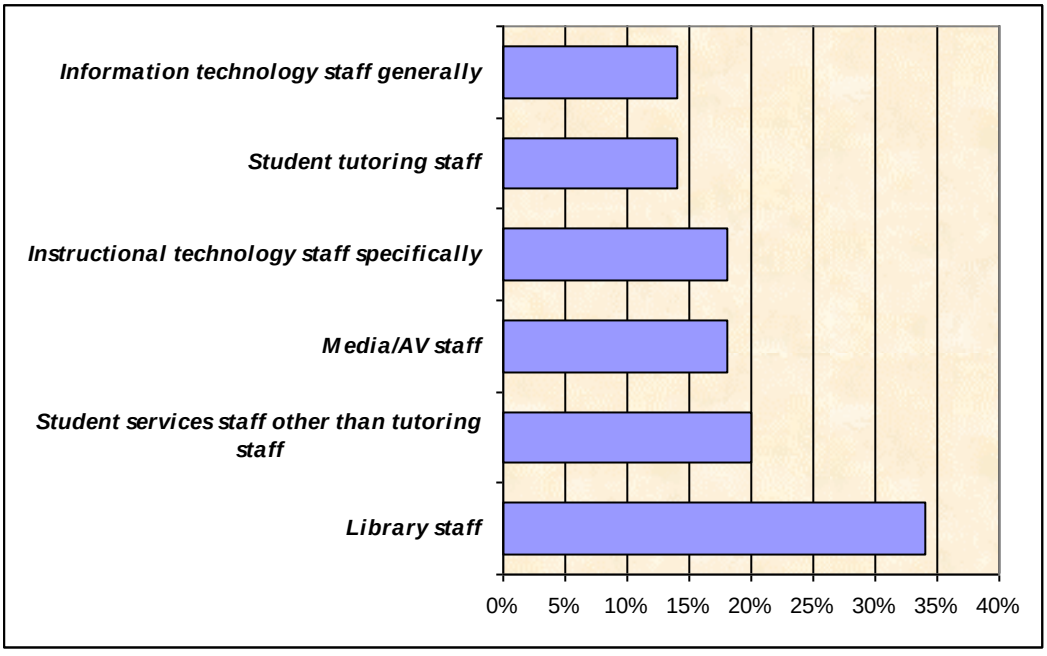
FIGURE 5: Kinds of Cross Training Required



These responses suggest that librarians are much more often asked to learn new substantive skills than are information technologists, student tutoring staff, or media/AV staff. Cross training in substantive skills and in service outlook are comparable in frequency. These figures may correlate with the observation often made that librarians must learn more about technology to function successfully in a collaborative work space, while information technologists must learn more about a service outlook. That the cross training so infrequently involved pedagogical skills is disappointing, given the absence of pedagogical training in the professional preparation of most librarians and information technologists. The relatively modest attention to pedagogy is the more to be regretted if these collaborative facilities do indeed spring from seeing rapid and fundamental changes in information technology as a pedagogical problem.

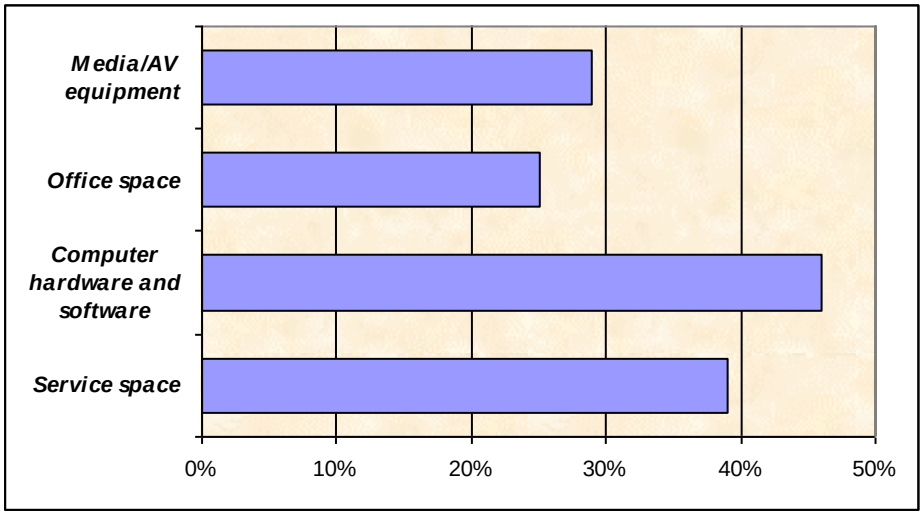
In just over half of the cases (55%), collaborative facilities required new spending to be successful. In these institutions, survey respondents reported new spending on staff in the following areas:

FIGURE 6: Increased Spending On Academic Support Staff



Additional spending was also required for the following:

FIGURE 7: Increased Non-Staff Spending



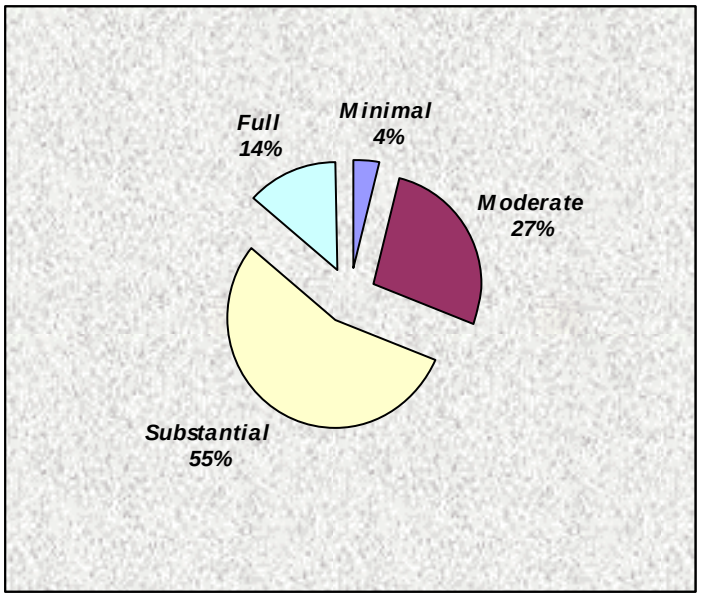
Many colleges and universities have considered so-called "merged" organizations, which bring library and information technology operations into one administrative unit. Many reasons motivate such thinking, including interest in an Information or Learning commons, and there are several ways of effecting a merger. Respondents to this survey reported that the success of their collaborative facilities required a change in formal reporting lines in only 32% of the cases. Among the 16 institutions reporting such changes, only 4 have chosen a "merged" library and information technology organization. Six institutions left their academic support staff in professionally distinctive operating units; in 5 of these cases, however, the various operating units all report to the head of one of them. Six institutions have chosen some "other" configuration for their reporting lines. New responses to revolutionary change in information technology and library services seem not to be strong motivators for change in administrative structures. Possible reasons for this (i.e., resistance to change within well established professional cultures) are not evident in the survey data.

Perhaps more telling than formal changes in administrative structure is how survey respondents described the collaboration among academic support staff. One respondent particularly emphasized this topic, saying:

> Genuine collaborations among historically distinct and physically separated student support services require immense attention, support and nurturance. There is excellent potential for success, improvement to services, and epiphanies that lead to better outcomes for student academic success and productivity.

Asked to characterize the degree of the collaboration among academic support staff required for success, respondents reported:

FIGURE 8: Degree of Collaboration, Interaction, and Integration



These data indicate how infrequently revolutionary change in information technology drives academic support staff toward "full" collaboration and—perhaps more striking—how frequently only moderate collaboration among the academic support staff is seen as compatible with success. The survey did not inquire about the terms or measures used in judging success. Some comparison of institutions reporting different degrees of collaboration would be useful, especially as regards their measures for success and their performance against those measures. It would for instance be instructive to know which measures of success are such as not to require "full" collaboration, and whether "full" collaboration, in the 12% of cases where it is achieved, yields a more powerful definition of success.

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Librarians and information technologists typically conceive of themselves as members of a service profession. To collaborate in media/AV services and to bring computing, digital product and media production laboratories into the library is to act within the service ethos of their professions. To collaborate in tutoring and faculty development services and in building classroom space in the library gives these academic support staff the opportunity to expand the instructional role that is often inherent in their service activities. How far-reaching this expansion

may be cannot be determined from the survey data reported here, except that the modest attention to additional pedagogical training may suggest a partial embrace of instructional roles.

One survey respondent commented that

> the Information Commons ought to be seen, not as a unit of the library, or something separate from the library, but as the future of the academic library, and something which encompasses and transcends the traditional library, bringing together traditional print resources and the best of the electronic information resources that we are purchasing, and in an environment which includes high quality information services from librarians and instructional support professionals.

I think this claim overstates the transformative character of the Information or Learning Commons. Without doubting the importance of the Commons as a service innovation, I argue that it is exactly that—a *service* innovation—and fundamentally reflects the traditional concern with library space as service space. Such thinking and the space it produces spring from our convictions about how best to serve students and other readers. The strong motivation in this approach is to act on behalf of students in helpful, serviceable, and hopefully instructive ways. What is distinctive in the Information and Learning Commons is a recognition of the value of a widely collaborative approach to shaping services that help students and faculty face the uncertainties arising from rapid changes in information technology.

So motivated, it is not surprising that this first approach to designing for uncertainty often leads to, or indeed grows out of an effort to assess the need for services and instruction. Such marketing is in fact a second approach to designing for uncertainty and is, in its motivation, a reverse image of the first. As the first approach turns primarily on ideas of information *services*, so the second approach turns primarily on the concept of readers as information *consumers*.

Marketing approach

This second approach seeks to understand the behaviors and preferences of students and to design spaces in response to their preferences. This approach is inspired by the practices of marketing and market research, and it typically regards information users as consumers.

The close interaction of the services and marketing approaches to space design is evident in the fact that the marketing approach so often starts not with students but rather with library staff as service providers. When the library directors who managed academic library renovation

and construction projects completed between 1992 and 2001 were asked about their planning methods, they reported doing systematic assessments of library operations 85% of the time, compared to systematic assessments of reader or user wishes, done 64% of the time. Systematic assessments of the modes of student learning and faculty teaching were done still less frequently, 41% and 31% of the time respectively.[8] The wide range of marketing inquires is reflected in a substantial professional literature that has used survey data to understand the use of digital libraries.[9] Other work investigates learning behavior more generally and learning in a digital environment specifically, while other investigators measure learning outcomes and comment on library responses to the learning behaviors that readers favor.[10]

I illustrate the marketing approach to designing for uncertainty by describing parts of a recent online survey of student behavior and preferences at a liberal arts college.[11] About 46% of the college's students completed the survey. Asked why they go to the main campus library, these students identified the following reasons:

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[8] Scott Bennett, *Libraries Designed for Learning* (Washington, DC: Council on Library and Information Resources, 2003), pp. 20-22; available at http://www.clir.org/pubs/abstract/pub122abst.html (May 2006).

[9] Studies by Amy Friedlander, Carol Tenopir, and Cathy De Rosa are particularly useful exemplars of this work. See Friedlander, *Dimensions and Use of the Scholarly Information Environment: Introduction to a Data Set Assembled by the Digital Library Federation and Outsell, Inc.* (Washington, DC: Council on Library and Information Resources, 2002), available at http://www.clir.org/pubs/abstract/pub110abst.html (May 2006); Tenopir, *Use and Users of Electronic Library Resources: An Overview and Analysis of Recent Research Studies* (Washington, DC: Council on Library and Information Resources, 2003), available at http://www.clir.org/pubs/abstract/pub120abst.html (May 2006); and De Rosa, *The 2003 OCLC Environmental Scan: Pattern Recognition. A Report to the OCLC Membership* (Dublin, OH: OCLC, 2004).

[10] See, for instance, *How People Learn: Brain, Mind, Experience, and School*, ed. John D. Bransford, Ann L. Brown, and Rodney R. Cocking (Washington, D.C.: National Academy Press, 1999); Kenneth A. Bruffee, *Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge*, 2nd ed. (Baltimore: Johns Hopkins University Press, 1999); John Seely Brown, "Learning in the Digital Age," in *The Internet and the University: 2001 Forum*, edited by Maureen Devlin, Richard Larson and Joel Meyerson (Boulder, CO: EDUCAUSE. 2002) pp. 65–91; Diana Oblinger, "Boomers, Gen-Exers, & Millennials: Understanding the New Students," *EDUCAUSEreview*, 38 (July/August, 2003), available at http://www.educause.edu/ir/library/pdf/erm0342.pdf (May 2006), 36-43; Joan K. Lippincott, "Net Generation Students and Libraries," *EDUCAUSEreview*, 40 (March/April 2005), 56-66; available at http://www.educause.edu/er/erm05/erm0523.asp (May 2006); Steve Jones, "The Internet Goes to College: How students are living in the future with today's technology," a publication of the Pew Internet & American Life Project, September 2002, available at http://www.pewinternet.org/PPF/r/71/report_display.asp (May 2006); and the National Survey of Student Engagement and the Faculty Survey of Student Engagement, available at http://nsse.iub.edu/index.cfm (May 2006).

[11] The library that conducted this survey granted me permission to use its data on the condition that they be presented anonymously. The view taken here of this survey data is my own and does not necessarily reflect the views of the institution where the data were collected. The data on library usage relate to the main campus library only and does not reflect the use of discipline-specific branch libraries. The library's survey addressed issues beyond those discussed in this essay.

FIGURE 9: Reasons for Going to the Library

	Modal Response	***Never & Rarely***	***Sometimes***	***Frequently***
Get technology assistance	**Rarely** (n=41%)	79%	18%	4%
To study with a group	**Rarely** (n=44%)	73%	24%	3%
Get research assistance	**Rarely** (n=38%)	71%	25%	4%
Socialize	**Never** (n=41%)	71%	21%	8%
Use print journals	**Rarely** (n=38%)	67%	23%	11%
View DVDs or videos	**Rarely** (n=35%)	64%	26%	11%
Use computer for courses	**Sometimes** (n=34%)	35%	34%	32%
To study alone	**Frequently** (n=35%)	30%	35%	35%
Check out a book	**Sometimes** (n=45%)	23%	45%	32%

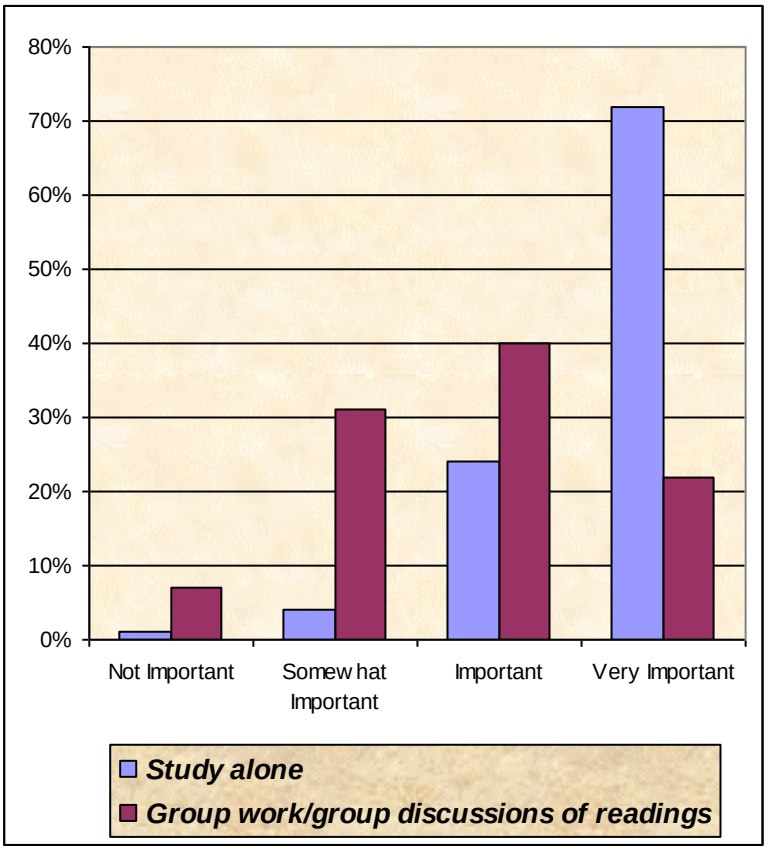
Notable in these responses is the number of reasons that **rarely or never** prompt two-thirds or more of this college's students to go to the main library. These include the reasons that most often motivate the design of information and learning commons: getting research and technology assistance and engaging in group study. Equally striking is that only a third of these students report having *any* reason to go to the main library **frequently**, and that two-thirds of these students have only three reasons for going to the main library **sometimes** or **frequently**. Two of these reasons—the use of computers and studying alone—do not intrinsically require the use of library space.

There is nothing unusual about these sobering data that indicate an underutilization of the college's main library. They conform to widely reported patterns of use, as for instance in the Pew report "The Internet Goes to College":

> Nearly three-quarters (73%) of college students said they use the Internet more than the library, while only 9% said they use the library more than the Internet for information searching. In response to a general question about overall library use, 80% of college students reported using the library less than three hours each week (p. 12).

These data suggest that new investment in library space needs to be understood primarily not as a means of improving services but as a strategy for changing learning behaviors and the culture of learning. To get at these issues, this survey asked students about the importance to them of two specific learning behaviors: individual study and group study paired with discussions among students of course readings outside of class. Students responded:

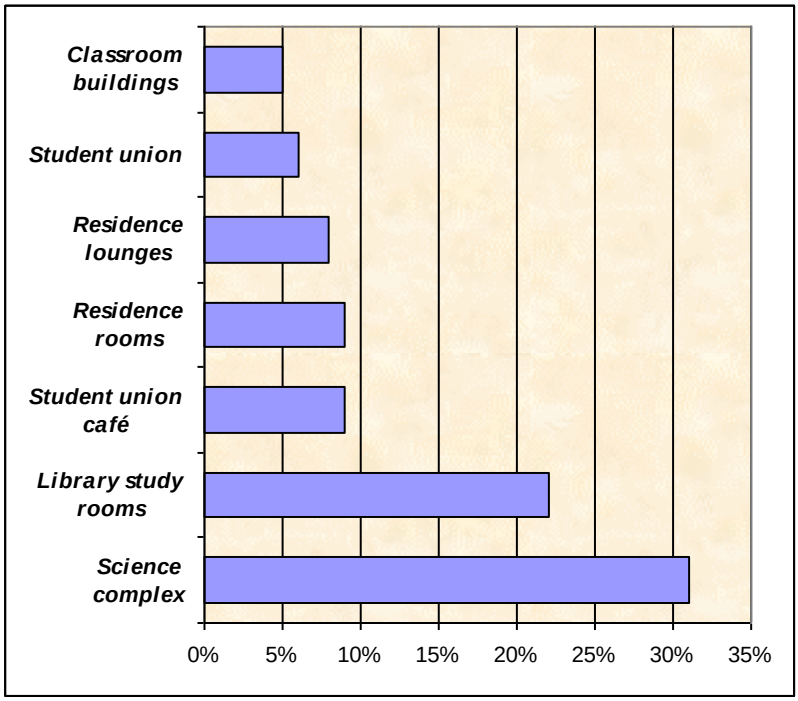
FIGURE 10: Importance of Learning Behaviors



Clearly, these students regard individual study as important or very important much more frequently (95% of the responses) than they do group study (62%).[12] The survey inquired further about spaces used for group study. Only two locations—the campus science complex and the main library—were mentioned with some frequency:

[12] NSSE data for this college would confirm or contradict this observation. FSSE data for the college would reveal any disparities between the importance that students and faculty attach to group study. It is often the case that faculty regard group study as less important than do students and no doubt shape their assignments accordingly. One student services officer observed in informal conversation that she was not surprised by the high importance students attach to individual study. Such views reflect how they have been taught to be learners and what they are most frequently asked to do as learners.

FIGURE 11: Spaces Used for Group Study



Asked what made the science complex so effective a space for group study, students described it as being in a convenient, central location and as offering excellent natural light, ample space, comfortable furniture, wireless connectivity, and access to food. They often described the space as tolerant of heightened levels of noise in a way library space is not. Different students preferred different levels of "noise" and "distraction." For instance, one student preferred the science complex to the library because "it's not THAT loud, but there's sort of general ambient noise, which helps me." A number of students also commented they could expect "lots of people in similar classes [in the science complex], so you can ask questions." One student offered a useful summary, expressing a preference for the science complex "because it's a central location that generally has seating and traffic—you can run into people and have a little break. . . . My key things: natural lighting, easy access to outside, food, foot traffic, steady availability [for study]. I haven't found . . . the library that useful because it's just too quite and I fall asleep (the . . . couches are really comfortable)."

When asked about what should be included in a possible commons space in the main library, these students responded:

FIGURE 12: Possible Features of a Library Commons Space

	"Gotta have"	*"OK"*	*"Nah"*
Extended hours	80%	17%	3%
Comfortable lounge seating	75%	22%	3%
Café	54%	29%	16%
More group study	37%	51%	12%
Tables for collaborative work	35%	53%	12%
Student academic services (writing, etc.)	31%	58%	11%
Many additional workstations	29%	53%	18%
Peer advising	20%	56%	24%
Combined technology/research help desk	19%	61%	19%

What these students most frequently "gotta have" is study space available late at night and early morning, comfortable seating, and access to food. These can surely be provided in the library, but they are not intrinsically related to library services or to services offered by information technologists and students services staff. While approximately half of these students view such academic support services as possibly useful ("OK"), they are clearly not a priority for more than about a third of these students. In the context of this talk, what strikes one most is that the learning behaviors and preferences these students describe correspond very little with the service and instructional aspirations that typically motivate the information commons and learning commons. Students at this college express very little need for co-located assistance from library staff, information technologists, or tutors.

Indeed, there is little in these responses to indicate that most students at this college make any but occasional use of the main library as a physical place. Yet when one stands near the front door of this library, one sees substantial traffic. The contradiction is more apparent than real. About a third of the students at this college report they *do* frequently study in the main campus library, check out its books, and use its computers for course work. The activities of this third of the college's students create a considerable stir and the appearance and feel of a busy library. Such a view nonetheless leaves the majority of students out of the picture. This is surely unacceptable from an educational point of view, the view—it should be remembered—that prompts librarians, information technologists, and tutoring staff to come together in collaborative facilities.

The logic of a marketing approach forces attention both to those who make frequent use of the library and to those who use it only sometimes or rarely. This logic poses fateful choices about how we will focus planning and space design. In what measure will library space and services be designed either in response to those we already serve reasonably well or in response to those we only sometimes see in the library?

Just how untenable it is for libraries regularly to reach only one-third of those they are meant to serve is evident in *The 2003 OCLC Environment Scan: Pattern Recognition*. This is a report to the OCLC membership, an organization built on the belief that its services to libraries are the best means for OCLC to satisfy readers' information needs. This belief becomes unsustainable if libraries regularly reach a relatively modest percentage of the population they were created to serve at the same time that information has become an abundant rather than a scare commodity and its users express strong preferences for self-service and self-sufficiency. In an environment where students see self-directed trial and error as the preferred approach to problem solving and regard "doing" as more important than "knowing" (Oblinger, p. 40), the OCLC report insists that we must ask anew, "How does the library appear today through the information consumer's lens?" The answer to this question is posed as yet another question:

> Can OCLC disaggregate itself and its services in order to meet the needs of self-service consumers interested in microcontent? And how can OCLC and others link the worlds of order [i.e., the library] and chaos [i.e., the Internet], and empower the information consumer to be well-guided? OCLC members . . . [i.e., libraries] value structure and mediated content. Evidence suggests that libraries' constituents do not value these elements to the same degree. Who then—which constituents—should OCLC research when building a product and service strategy?" (p.102).

Explicitly, the 2003 OCLC report is a call for "libraries and allied organizations [to move] . . . closer to information consumers at the level of *their* needs" (p. 105). Implicitly, the report foresees that OCLC will have to abandon libraries that fail to do this and join Google and others committed to remaining relevant to information consumer preferences.

For the individual college library reported on here (and I do not doubt for many others as well), the pressing question is "who then—which constituents—should it respond to in building a product and service strategy?" Should this main campus library continue to serve only about a third of the institution's students with any frequency? Or should it adopt a strategy that moves the library closer to the needs of the remaining two-thirds of the college's students? And is this

an either/or choice for the library, or a both/and choice? Is there still another approach to designing for the uncertainties of our increasingly digital environment?

Mission based approach

In driving to its conclusion, the 2003 OCLC report is explicit in regarding information users as consumers, even in the chapter on "The Research & Learning Landscape." This view is at least implicit in many of the survey questions we commonly ask—such as that about what students "gotta have" in a library commons space. Indeed, it is a view that students often take of themselves, as evident in one student's comment on study space: "My key things: natural lighting, easy access to outside, food, foot traffic, steady availability [for study]." But in this last phrase, and in much else in our surveys and the professional literature, there remains some instinct to identify students as learners more than as information consumers. One might seize on this in shaping an approach to design that insists, as its point of departure, that students are before all else learners and that library space design should be primarily concerned not with services but with learning.

Such a design practice would have us focus first upon ends, not means—on institutional mission rather than academic services. Such a design practice would constitute a third approach to designing for uncertainty, motivated not by the professional intentions of academic support staff or by the behaviors and preferences of information consumers, but by the institutional mission that brings students, faculty, and academic staff together in the first place. This approach could identify specific learning behaviors that students and faculty say are important and design spaces that foster such of these behaviors as advance the educational mission of the college or university. The emphasis here is on institutional mission. In this context, it is important to document learning behaviors important to students and faculty only as a step toward enabling the institution to determine whether it also identifies these behaviors as crucial to fulfilling its mission. Where that is the case, the institution will presumably feel strong motivation to invest in space designed to foster the learning behavior in question.

To help focus design on institutional mission, I have developed a pair of surveys asking about ten specific learning behaviors that figure in educational practices known to be effective

drawn from the National Survey of Student Engagement.[13] These are behaviors of active, engaged learning; they are primarily initiated by students; and they occur principally outside of the classroom.[14] Focusing on these behaviors has a three-fold rationale:

- It is commonly observed that much of collegiate learning happens outside of the classroom and that learning is most effective when students are actively engaged in it.
- Colleges and universities make sizeable capital investments in campus spaces other than classrooms; these spaces should be significant assets supporting the teaching and learning mission of each institution.
- Learning outside of the classroom sometimes involves librarians, information technologists, and student support staff. After the faculty, these staff represent an institution's most significant investment in people committed to the academic success of students.

The ten learning behaviors about which my surveys ask are elements of two NSSE benchmarks of effective educational practice. Each of the ten is here followed by the abbreviation used by NSSE to identify the individual learning behavior.

ACTIVE AND COLLABORATIVE LEARNING BENCHMARK:

1. Students work with classmates outside of class to prepare class assignments [OCCGRP]
2. Students discuss ideas from readings or classes with others outside of class (students, family members, co-workers, etc.) [OCCIDEAS]
3. Students discuss ideas from readings or classes with faculty members outside of class [FACIDEAS]
4. Students work with faculty members on activities other than coursework (committees, orientation, student life activities, etc.) [FACOTHER]
5. Students work on a research project with a faculty member outside of course or program requirements [RESRCH04]

ENRICHING EDUCATIONAL EXPERIENCES BENCHMARK

6. Students have serious conversations with students who are very different from themselves in terms of their religious beliefs, political opinions, or personal values [DIFFSTU2]

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[14] The surveys are available at http://express.perseus.com/perseus/surveys/1734848031/14f92090.htm (the student survey; May 2006)) and at http://express.perseus.com/perseus/surveys/1734848031/4ad72d78.htm (the faculty survey; May 2006)).

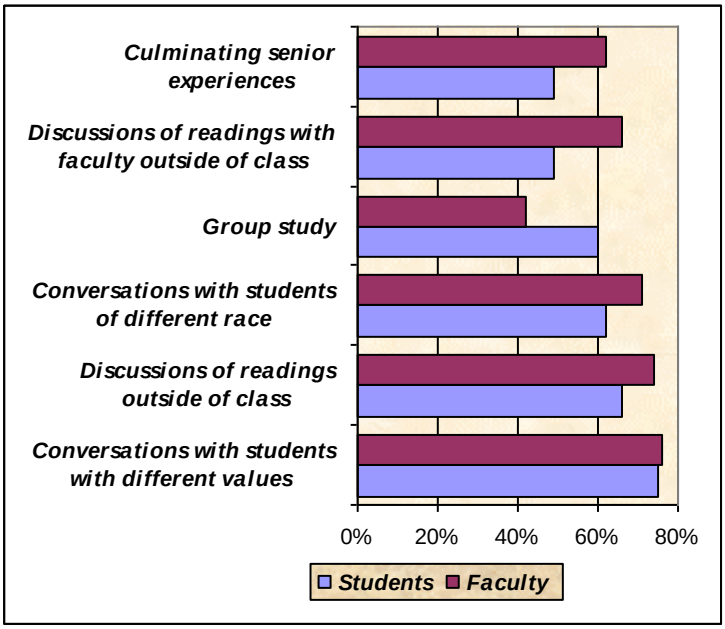
7. Students have serious conversations with students of a race or ethnicity different from their own [DIVRSTUD]
8. Students pursue independent study or a self-designed major [INDSTD04]
9. Students have a culminating senior experience (comprehensive exam, capstone course, thesis, project, etc.) [SNRX04]
10. Students participate in a learning community or some other formal program where groups of students take two or more classes together [LRNCOM04]

My surveys ask students and faculty respondents to say which of these learning behaviors are important or very important to them; to indicate (if a given learning behavior is important to them) whether their campus provides space that fosters the behavior; and to identify that space. I report here on what can be learned at one liberal arts college (not the same one as considered in the previous section of this paper) from such an inquiry.[15] At this college, both student and faculty respondents to the surveys were self-selecting, rather than randomly selected. About 11% of the college's students and 61% of the faculty responded to the survey.

Learning behaviors identified as important. About half or more of the students and faculty at this college identified six of the ten learning behaviors listed above as important or very important to them:

[15] The college that conducted these surveys granted me permission to use the data on the condition that they be presented anonymously. The view taken here of this survey data is my own and does not necessarily reflect the views of the institution where the data were collected.

FIGURE 13: Learning Behaviors Identified as Important/Very Important



Students and faculty agreed on the importance of discussions of readings outside of class [OCCIDEAS], conversations with students who have very different personal values [DIFFSTU2], and conversations with students who differ in race [DIVSTUD]. A higher percentage of faculty than student respondents rate the first [OCCIDEAS] and third [DIVSTUD] of these behaviors as important or very important.[16] If this college, as an institution, sees these behaviors as highly relevant to its educational mission, it might well ask whether the experience and exploration of diversity is something that benefits from distinctive space design and whether space of this character is readily available on campus. This is really a question about whether the college joins its faculty and students in valuing these specific learning behaviors and wishes to foster them as a matter of institutional mission.

Students and faculty disagree on the remaining three learning behaviors. Here again, the college might well determine how these behaviors bear on its educational mission and decide whether space designed to fosters any of these behaviors would strengthen the institution. In

[16] Because the learning behaviors used in this inquiry come from the National Survey of Student Engagement, it is possible consider responses to this survey about learning space in the context of national surveys of both student (NSSE) and faculty (FSSE) views. This college does not consistently lead or lag behind on any of the learning behaviors asked about in this survey, except for conversations with students who are very different in personal values [DIFFSTU2] and conversations with students of different race [DIVRSTUD].

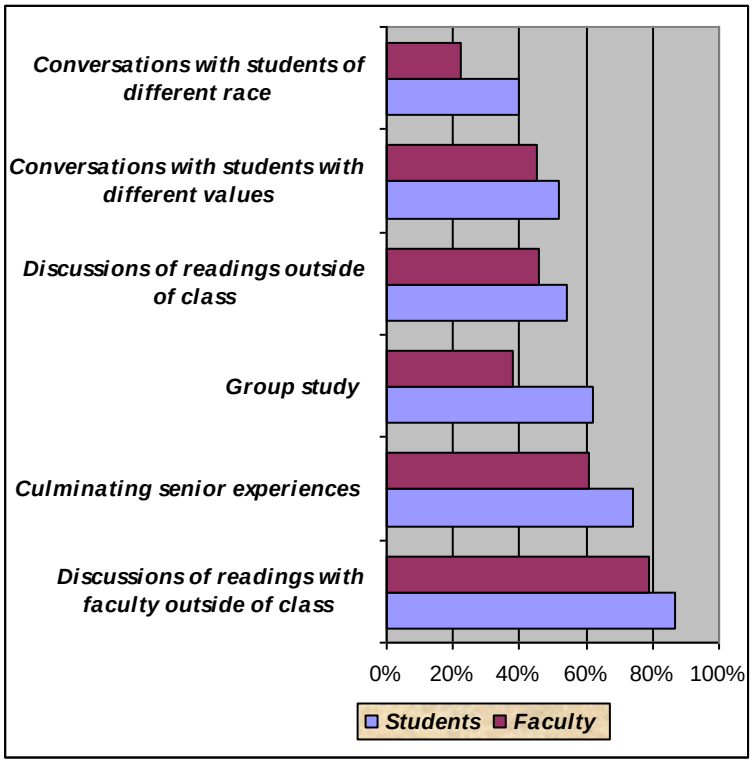
effect, the college would consider whether it could improve its education practice by acting to reduce student/faculty disagreements about learning behaviors that are important to the mission of the college. In the present case:

- Students regard group study [OCCGRP] as *much more important* than do faculty. This is a common disparity but one that a college might wish to reduce, given the critical importance of study time. Most undergraduates fall far short of the view advanced by faculty nation-wide that students need to study at least 25 hours a week to do well in college.[17] Surely many factors contribute to students' general failure to meet faculty expectations regarding time-on-task, but decisions about encouraging group study and providing congenial group study space are likely to be among them. Colleges and universities invest heavily in creating campus environments, and arguably these investments are underperforming if they do not demonstrably foster learning behaviors that students themselves value and that might lead students to spend more time studying.
- Faculty respondents, *much more often* than students, regard faculty-student discussions of class material outside of the classroom [FACIDEAS] as important or very important. It appears from the survey that these discussions occur most frequently in the dinning hall and the student union (probably encouraged by the availability of food), common spaces in academic buildings, outdoors, and in faculty offices. If a college wanted to make these conversations more important *to students*, it might consider a more intentional use of food and of space providing food as a means of encouraging them.
- Faculty respondents, *much more often* than students, regard culminating senior experiences [SNRX04] as important or very important. Survey data suggest this learning behavior occurs in many different campus spaces. If a college wanted to make capstone experiences more important *to students*, it might consider giving these activities more distinctive spatial identity and celebrating them more often and more intentionally (e.g., a gathering place for honors students, and spaces for the frequent exhibit, presentation, and performance of capstone work).

Campus spaces supporting important learning behaviors. When asked whether the college provides space that actually fosters the six learning behaviors identified as important, students and faculty responded as follows:

[17] *Student Engagement: Pathways to Collegiate Success*. NSSE 2004 Annual Report of Survey Results, p. 13; available at http://nsse.iub.edu/html/report-2004.cfm (May 2006).

FIGURE 14: Frequency with which Students and Faculty Think Campus Space Fosters Learning Behaviors Adequately/Very Well



In only two cases (discussions of readings with faculty outside of class [FACIDEAS] and culminating senior experiences [SNRX04]) did more than two-thirds of students and faculty respondents feel the college provides space that adequately fosters learning behaviors important to them. Notably, these two learning behaviors are important to only half of students. For the remaining learning behaviors, campus spaces are arguably under-performing for approximately 40% to 60% of students and approximately 40% to 80% of faculty.

The surveys sometime yield ambiguous results. In the case of this college, for instance, among the 60% of student respondents who identify group study [OCCGRP] as important or very important to them, 62% believe the campus provides space that supports this behavior adequately or very well. Against this positive picture stand 8 of the 18 general comments made by students on the survey, including:

- Group study is important and vital to my success in a few particular classes. . . . It would be nice if there were places available 24 hours a day for students to meet and study together.

- We need somewhere to study with groups of people besides in the lobbies of the dorms. It becomes very noisy and distracting to see people come and go while trying to study. The current library does not appeal to group studying.
- I think to have more space to have big study sessions is important and a way to incorporate more diversity among students.
- At the present moment I feel like I have to go off campus to find a nice environment to study.

These comments presumably reflect the views of the 40% of student respondents who value group study but do not feel that campus space supports such study adequately. These comments find an echo among faculty respondents to the survey. Only 42% of faculty respondents regard group study as important or very important, but among these faculty, only 38% (compared to 62% of student respondents) believe the campus provides spaces that support group study adequately or very well. One faculty respondent commented that

- Commons areas such as a student complex with spaces to interact, drink coffee, study, or meet with other students are quite limited. Library common space is very limited as well.

Identification of supportive learning spaces. Only those students and faculty who believe campus spaces foster well the learning behaviors important to them were asked to identify, from a list, the specific spaces they feel support learning. Figure 15 identifies these spaces and employs the χ^2, or chi-square, statistical test to understand the significance of the results. The survey identified seven different kinds of campus space. The number of times students or faculty identified each of these spaces was totaled, producing a distribution of observed values (f). This distribution was compared to a random distribution of values (F) to determine whether (at a 95% level of confidence) the observed distribution is significantly different from a random one. The observed distributions for both students and faculty are in fact significantly different, as evident in the fact that the value of χ^2 for both student and faculty responses (orange) exceeds the value of the critical region noted for each (blue) The figure displays the individual $(f-F)^2/F$ calculations, from which the value of χ^2 is determined, for each of the seven spaces. This display helps to identify which of the seven spaces contribute most significantly to the value of χ^2, through either positive or negative variance from a random distribution. In this analysis, the positive (green) or negative (yellow) direction of the variance from a random distribution is noted for any value of $(f-F)^2/F$ exceeding 2.0.

FIGURE 15: Non-Classroom Campus Spaces
Identified as Fostering Effective Learning Behaviors

			$(f-F)^2/F$							
	χ^2	*Critical region χ^2; df = 7*	Residence halls	Dinning halls	Student union	Commons spaces in academic buildings	Recreational & intramural sports facilities	Outdoor spaces	Libraries	Computing laboratories
Students	73.762	14.067	**2.227**	0.068	1.354	**10.526**	**42.284**	1.621	**6.694**	**8.988**
Faculty	24.344	14.067	0.002	**2.944**	1.951	1.530	**14.982**	1.530	0.702	0.702

As one might predict, neither students nor faculty see recreational and intramural sports facilities as fostering learning behaviors. This finding functions as a reality check for the analysis. Other statistically significant findings are that:

- Student scores differ quite markedly from a random distribution. Students identify the residence halls as fostering effective learning behaviors *slightly more often* than would be expected in a random distribution of scores, while they identify commons spaces in academic buildings *much more often*—even more frequently than the library. Notably, students identify campus computing laboratories as fostering effective learning behaviors *much less often* than would be expected in a random distribution of scores.
- Faculty scores differ much less markedly from a random distribution. Faculty identify only the dinning halls as fostering effective learning behaviors *slightly more often* than would be expected in a random distribution of scores.
- There is *no overlap* in the spaces that either students or faculty identify as effective learning spaces more often than would be expected in a random distribution of scores. Students and faculty see campus learning spaces quite differently.

Figure 15 tells us a good deal about *student* views of their learning spaces.

- Students identify commons spaces in academic buildings and the library as effective learning spaces much more frequently than their own residences. This corresponds with the well-recognized problematic nature of residence halls as learning spaces.
- Students most frequently identify commons spaces in academic buildings as effective learning space. This is notable because of the relative paucity of such spaces on this campus (and on many other others). One might hypothesize that these "non-proprietary" spaces are particularly attractive to students because of the ease with which they can be temporarily appropriated by students.[18]
- It is to be regretted that the library scores so much lower than commons spaces in academic buildings, especially given the relative paucity of the latter. It is still more to be regretted that students do not frequently identify the student union as an effective learning space, given the amount of space in the student union that could function in this way. Understanding the design differences between poorly performing library and student union space and the strongly performing commons spaces in academic buildings might be important for effecting change.
- It is to be regretted that campus computer laboratories are so infrequently identified as effective learning spaces. This result is contrary to the usual preference of students that computers be part of their study environment.

Designing with confidence

Let us now return to our point of departure and see where we are. The problem with which this essay began is the need for higher education to get long life and good returns on its investment in physical space. In recent years this has become even more important at the same time that it has become more difficult.

One reason our institutions must attend even more than in the past to their return on capital investments is that they are now challenged, competitively, by institutions that are largely unburdened by the costs of a campus. Over the coming years, colleges and universities with programs built—literally built!—for residential students will increasingly compete with institutions offering online instruction and able thereby to minimize their investment in physical

[18] Students' favorable comments about the science complex at the college discussed in the previous section of this essay reinforces this view.

plant. In a competitive environment where an institution's campus is often its largest financial asset, the campus and its learning spaces will be either a principal asset or a chief liability.

While these forces are at work generally in higher education, those of us specifically concerned with academic libraries face daunting uncertainties about securing reasonable value over the fifty or seventy-five year life span expected of academic buildings. These uncertainties are of recent date. For most of the twentieth-century, the principal rationale and use for library space was to house burgeoning collections of paper and other physical objects. As recently as the 1990s, the most common need for new investments in library space was to accommodate growing collections. But at the same, many of those responsible for library projects in the 1990s expressed the hope that shelving needs would never again drive library space design in the way it had in the past (*Libraries Designed for Learning*, pp. 6-13). This hope builds on the promise of using virtual space to reduce the demand for physical space and is exemplified by JSTOR, now a major source of online journals. Quite literally, JSTOR was born in the 1993 discussions of the Board of Trustees at Denison University regarding overcrowded book stacks.[19]

The promise of digital space as a substitute for physical space gives welcome new scope to thinking about how library space might in the twenty-first century be used to foster learning. Those responsible for library projects in the 1990s said the second strongest motivator for their projects, after accommodating growing collections, was the changing character of students' study space needs (*Libraries Designed for Learning*, pp. 6, 16-20). But while technology has freed us in thinking about library space to focus anew on student learning, it has also drawn much of learning out of both the classroom and the library.[20] There are today no certainties about learning, comparable to our past certainties about the grown of physical collections, that may be invoked to guide the design of library space.[21]

I have sketched here three different approaches to designing for the uncertainties we face in thinking about library space. They overlap considerably in their concern for library and other

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[19] Roger C. Schonfeld, *JSTOR. A History* (Princeton, NJ: Princeton University Press, 2003), p. 1.
[20] See Malcolm B. Brown and Joan K. Lippincott, "Learning Spaces: More than Meets the Eye," *EDUCAUSE Quarterly*, 38, no. 1 (2003), 14-16; available at http://www.educause.edu/ir/library/pdf/eqm0312.pdf (May 2006).
[21] Craig Hartman argues that "while there is a long tradition to draw on, there is no agreed-on paradigm for the library of the future. Getting to this paradigm is the task before us," in "Memory Palace, Place of Refuge, Coney Island of the Mind: The Evolving Roles of the Library in the Late 20th Century," *Research Strategies*, 17 (2000), 107-121.

instructional activities, for individual and group study, and for the provision of computers and technology services. While these three approaches have much in common, they differ most from one another in the thinking that motivates them and in their potential for yielding space likely to have enduring value for colleges and universities.

As regards motivation, the service and instructional approach springs from the convictions of librarians, information technologists, and student services staff about what would benefit students. The marketing approach turns this around, and asks students themselves what would be useful to them. The mission-based approach, by contrast, focuses first on institutional mission and only second on academic support staff and students. It builds on specific learning behaviors that students and faculty say are important and points to investment in spaces that foster such of these behaviors as advance the college or university's educational mission.

As regards enduring value, investments driven by the service and instructional approach are likely to have the shortest productive half-life, given rapid changes in our service and instructional environments. For instance, building a substantial reference desk now runs counter to marked declines in reference inquires and the possibility of moving reference and instructional services into virtual space or into the physical spaces of information users.[22] Investments driven by the wishes of students conceived of as information consumers are liable to the same volatility, while investments driven by students' preferences among study behaviors may have a longer productive half-life, especially if one believes that student preferences will track the slow-moving paradigm shift in higher education away from faculty-centered to learner-centered practices.[23] Investments driven by attention to learning behaviors that advance an institution's mission are likely to have the longest productive half-life, given the stability of institutional mission when compared to rapid changes in technology. Such mission-based investments also have some potential for affecting the direction and pace on an individual campus of the paradigm shift toward learner-centered education.

[22] For a striking example of the latter, see "Welsh Medical Library [at Johns Hopkins University] Architectural Study," available at: http://cfweb.welch.jhmi.edu/welchweb/architecturalstudy/index.html (May 2006). See also Kathleen Burr Oliver, "The Johns Hopkins Welch Medical Library as Base: Information Professionals Working in Library User Environments" in *Library as Place*, pp. 66-75.
[23] For a much-cited description of this paradigm shift, see Robert B. Barr and John Tagg, "From Teaching to Learning—A New Paradigm for Undergraduate Education," *Change*, 27 (November/December 1995), 12-25.

This view of a mission-based design of learning spaces is strongly argued by Project Kaleidoscope and its Director, Jeanne Narum. For more than a decade, PKAL has been identifying best practices in the teaching and learning of science, technology, engineering, and mathematics. This focus has prompted a strong interest in the design of learning spaces. Narum observes that

> Too often, planning for new spaces for undergraduate teaching in science and mathematics begins with the wrong questions. Sometimes the initial mis-step occurs when faculty say "we do not have enough space—we need more room for faculty, for students, for equipment." Questions about size—"How many square feet per faculty member, per major, per department do you need?"—often surface in response to such demands. . . . These are important questions; they need to be addressed. However when they shape the initial stages of planning, the process is skewed. You will not end up with the building that you need, that your students deserve.

If these questions are the wrong questions with which to begin, what are the right ones? Narum argues that

> Discovering the right first questions happens when . . . faculty focus on student learning—what actually is to happen in the classroom and lab, about the kind of learning that is encouraged as students work together, and have hands-on involvement with physics, or another of the sciences. 'First' questions arise when faculty begin to think about what happens when students have their own spaces for investigative research, when labs accommodate student teams wrestling with questions to which answers are not known, when students have the opportunity to use state-of-the-art instrumentation to do science.

Narum concludes:

> Questions about the nature of the educational experience—about quality and the nature of the learning community—are questions that must be asked first and asked persistently throughout the process, and indeed before and beyond the process of planning a facility.[24]

If these are the right first questions for the design of science facilities, what are the right first questions for the design of library space as learning space? They are most unlikely to be about services that can and should increasingly be delivered in virtual space or in spaces outside the library building. They are unlikely to be questions that conceive of students as information consumers or as consumers of instructional services. The right first questions are those that ask about the quality and nature of the community in which students—and all the rest of us—learn. The right first questions are most fundamentally about the learning behaviors that give life to the

[24] "Building Communities: Asking the Right Questions." Available at: http://www.pkal.org/documents/BuildingCommunitiesAskingTheRightQuestions.cfm (May 2006).

educational missions of the institutions that bring us together physically and, in doing that, create quite wonderful places—called campuses—in which our learning behaviors and the institutional missions they reflect may flourish.

We have ourselves come together on the campus of the University of Guelph with a learning purpose: that of identifying and exploring the questions that should guide our thinking about the design of learning space. I am honored to share in this enterprise with you. I trust we will all come to share Jeanne Narum's conviction that if we get our first questions right, if our thinking is first and persistently about institutional mission, then we will be able to address the many uncertainties of planning with a confidence that we will create the learning spaces our colleges and universities need and our students deserve.

APPENDIX 1

COLLABORATIVE FACILITIES SURVEY INSTRUMENT

With the goal of improving teaching and learning, many colleges and universities have created or are creating new academic support facilities where some combination of librarians, information technologists, student services staff, and other academic support staff work together collaboratively.

It is clear that considerably variety exists among the facilities now being created. None of the names commonly used for them—including information commons and learning commons—adequately reflects this variety or reliably conveys the purposes of these units.

What is distinctive about all of these units is that they seek advantage from having academic staff trained in a variety of service disciplines working in close proximity to one another. These units give spatial expression to collaboration among these staffs who, after the faculty, represent the institution's most substantial investment in the academic success of its students.

The following survey attempts to collect information about the scope of the academic services provided in these facilities. It also seeks information about some key factors in their success. The confidentiality of your responses will be carefully guarded. I ask you only to identify the name of your institution. Having this information will allow possible follow-up activities and will enable a Carnegie classification analysis of the data you and others provide.

I am most grateful for your participation in this survey

Scott Bennett
Yale University Librarian Emeritus
Council of Independent Colleges, Senior Advisor

Name of your college or university:
======
1. What name(s) have you used for your collaborative project(s)?

- o Information Commons
- o Learning Commons
- o Other (please specify)
- o Other (please specify)
- o Other (please specify)
- o Other (please specify)

=========
2. Does your project seek advantage from having academic staff trained in a variety of service disciplines working collaboratively with one another?

- o Yes
- o No [If no, end of questionnaire]

======
3. For your project(s), what *services or facilities* were or will be involved?

- o Library reference service
- o Library circulation service
- o Computer laboratory
- o Instructional technology
- o Digital asset management
- o Digital projects laboratory
- o Media/AV facility
- o Media production laboratory
- o Student tutoring services for writing
- o Student tutoring services for mathematics
- o Student tutoring services for other academic disciplines
- o Language laboratory
- o Faculty development activities regarding teaching and learning
- o Classrooms
- o Offices for faculty in various academic disciplines
- o Other services or facilities (please specify)

=====

4. For your project(s), what *academic support staff* were or will be involved?

- o Library staff
- o Student services tutoring staff
- o Other student services staff
- o Student services administrators
- o Media/AV staff
- o Information technology staff generally
- o Educational technology staff specifically
- o Information technology administrators
- o Language instruction staff
- o Faculty development staff
- o Other academic support staff (please specify)

=====

5. To ensure the success of your project(s), what degree of collaboration/interaction/integration among the relevant staffs is or will be necessary?

- o Minimal collaboration/interaction/integration
- o Moderate collaboration/interaction/integration
- o Substantial collaboration/interaction/integration
- o Full collaboration/interaction/integration
- o Other (please specify)

======

6. To ensure the success of your project(s), was or will it be necessary to cross-train the staff involved or otherwise enhance their previous professional preparation?

- o Yes
- o No

=====

6.A [If Yes to 4] Please check the staff that were or will be cross-trained or have their professional preparation enhanced:

- o Library staff

- Student services tutoring staff
- Other student services staff
- Student services administrators
- Media/AV staff
- Information technology staff generally
- Educational technology staff specifically
- Language instruction staff
- Faculty development staff
- Other academic support staff (please specify)

======

6.B [If Yes to 4] Please check the kind(s) of cross-training and enhanced preparation that is required for the success of your project(s):

- Technical and substantive information/skills
- Pedagogical skills
- Service outlook
- Other (please specify)

======

7. To ensure the success of your project(s), was or will it be necessary to increase the number of staff involved?

- Yes
- No

=====

7.A [If Yes to 5] Please check the type of staff which has been or will be increased:

- Library staff
- Student services tutoring staff
- Other student services staff
- Student services administrators
- Media/AV staff
- Information technology staff generally
- Educational technology staff specifically
- Language instruction staff
- Faculty development staff
- Other academic support staff (please specify)

======

8. To ensure the success of your project(s), was or will it be necessary to increase spending significantly on something other than staff?

- Yes
- No

======

8.A [If Yes to 6] Please check the type of increased spending needed:

- Service space
- Office space for staff
- Computer hardware and software
- Media/AV equipment
- Other equipment
- Other (please specify)

======
9. To ensure the success of your project(s), was or will it be necessary to change administrative reporting lines?

- o Yes
- o No

======
9.A [If Yes to 7] Please check the type of change in administrative reporting lines involved in your project:

- o Library, information technology, student services, and other academic support staff remain in professionally distinct administrative units but report differently within the college or university administrative structure
- o Library, information technology, student services and other academic support staff remain in professionally distinct administrative units but report to the head of one of these units (e.g., the head of information technology)
- o Library, information technology, student services and other academic support staff work not in distinct administrative units but in a "merged" organization employing a variety of professional skills
- o Other (please specify)

=====
10. Please indicate the location(s) of your project(s), checking as many of the following as may be pertinent:

- o Library building
- o Classroom/teaching laboratory building
- o Student union
- o Academic services building
- o Administrative building
- o Specially built building
- o Other (please specify)

=====
11. Please indicate the reason(s) that guided the choice of location for your project(s) by checking as many of the following as were significant considerations:

- o Space was or could be made available
- o Required renovations were cost efficient
- o Adjacent to related services already in place
- o Convenient location for service users
- o Convenient location for service providers
- o Other (please specify)

Thank you for responding to this survey