

8

The Central IT–Local IT Interface

A central power, however enlightened, however learned one imagines it, cannot gather to itself alone all the details of the life of a great people. It cannot do it because such a work exceeds human strength.

—Alexis de Tocqueville, *Democracy in America*

Key Findings

- ◆ Central IT staff constitute only a portion of IT staff within an institution. Within research-intensive institutions especially, a significant number of IT staff who support research are located out in the academic units.
- ◆ EDUCAUSE core data indicate that along three dimensions—IT staff, IT personnel expenditures, and total IT funding—the more research-focused doctoral institutions have a significant level of activity in the local units.
- ◆ Among the three core infrastructure elements, high-performance production networks are managed mostly or completely centrally at 96 percent of institutions. Responsibility for data storage and high-performance computation resides at the local level at about a third of institutions.
- ◆ Among Research Essential institutions, there is a greater tendency for data storage and high-performance computation to be managed at the local level.
- ◆ When asked about the locus of responsibility for 12 research-related IT support services, respondents indicated that the more discipline-specific services (such as Web-site development and maintenance, research tools, and application development) were more likely to be located at the local level. Generic services (such as collaboration tools, vendor contracts, and training) were more likely to be centralized.
- ◆ The tendency to locate responsibility for research support services at the local level was more pronounced in the Research Essential and Balanced institutions.
- ◆ Excessive decentralization of services could cause duplication of effort, gaps in service, a multiplicity of standards, and security risks. Greater collaboration between central and local IT units can mitigate these risks, but survey data revealed that the services most likely to be provided by the local units were also least likely to be coordinated with central IT.

Our focus so far has been on the central IT organization. This is, of course, a partial perspective, as local IT units abound within schools, centers, and departments. Some of these local units support research: others do not. Many are staffed by full-time professionals, while others gain IT support as a “duty as assigned.” Some are grant supported, others not. Some offer a variety of general services, others a specialized suite (such as visualization or geographic information system). Some of the staff report to a dean, others to department chairs, and others to research labs. They are a mixed bag, and as the ECAR case study on Cornell University (Blustain & Goldstein, 2004) highlighted, they can be difficult to identify, especially in a large, decentralized research university.

In this chapter, we focus on the distribution of services and collaboration between central and local IT units. We begin with an overview of local IT organizations, then discuss the allocation of responsibility for infrastructure and other forms of support. We then cover the importance of coordination between central and local resources in service to researchers.

Local IT Organizations

Our survey methodology enlisted leaders within the central IT organizations and did not extend out to respondents in the local units. Still, we can glean some insights into the local IT organizations from the EDUCAUSE Core Data Survey Service for 2004 (Hawkins, Rudy, & Nicolich, 2005), which indicates that significant pockets of staffing resources exist outside central IT. Table 8-1 shows the percentage of total campus IT staff that the central IT staff represent.

For all Carnegie categories, 16.5 percent of FTE IT staff are located within the local units. Doctoral institutions, however, had a greater concentration of local staff—33.6 percent in the doctoral extensive and 24.1 percent in the doctoral intensive—distributed out among the departments.

The EDUCAUSE core data also show that along two other dimensions, a lot is happening in the local units. Figure 8-1 shows, by Carnegie classification, two sets of data: central IT personnel expenditures as a percentage of total campus IT expendi-

Table 8-1. Central FTE IT Staff as a Percentage of Total Campus FTE IT Staff

Carnegie Classification	Percentage of Central FTE IT Staff
All	83.5%
DR EXT	66.4%
DR INT	75.9%
MA I	85.2%
MA II	91.4%
BA LA	90.4%
BA GEN	91.4%
AA	89.8%
OTHER	79.8%

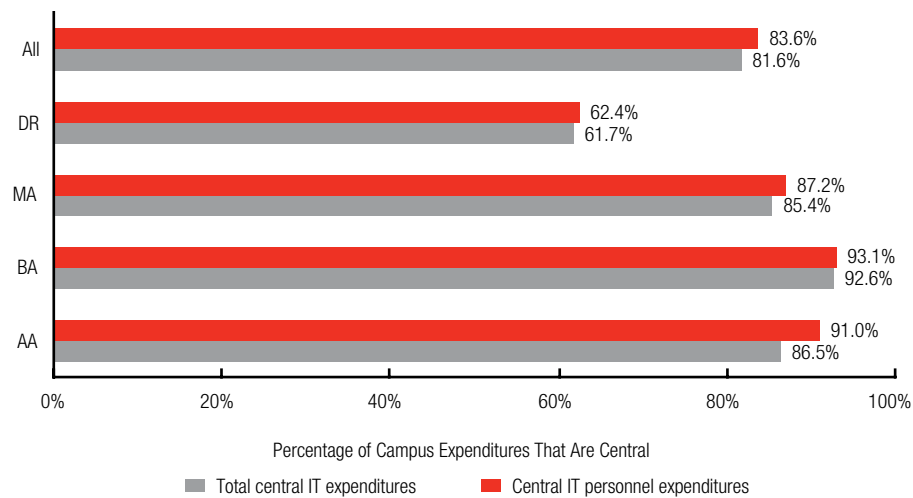


Figure 8-1. Central IT Expenditures, by Carnegie Class

tures, and total central IT expenditures as a percentage of total campus IT expenditures (Hawkins et al., 2005).

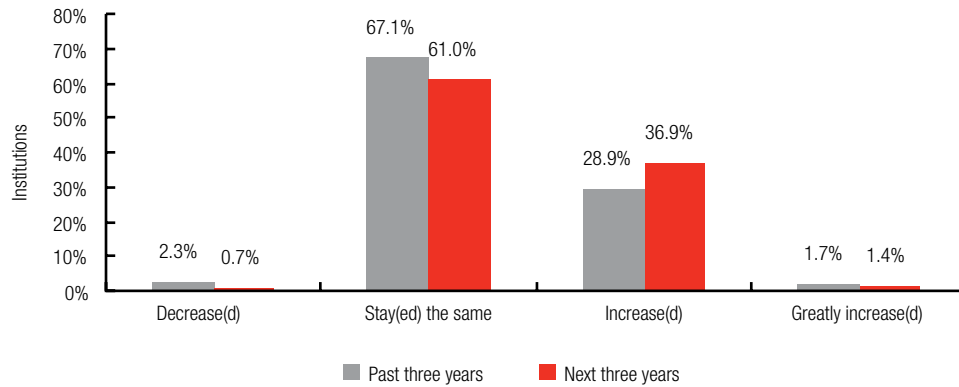
On all three dimensions—central IT staff, central IT personnel expenditures, and total central IT expenditures—the more research-focused doctoral institutions had a greater level of activity residing within the local units. Significantly, the core data also found, with regard to the funding questions, that “the group most frequently reporting not knowing these amounts was doctoral institutions, in all likelihood because of their complexity and distributed nature” (Hawkins et al., 2005, p. 20).

As we consider the central–local interface, therefore, we must recognize that much research support occurs locally; that a greater proportion of that activity occurs locally in research-intensive institutions; and that our survey methodology was not able to capture in detail the characteristics of those local support units, whether located within a college, department, or individual lab. According to Kristine Hafner, associate vice president of information resources and communications at the University of California, Office of the President:

In research institutions, it is impossible to characterize the research computing environment at the campus level. You have to look much deeper into the colleges, departments, and research units to get a clearer picture. Even then, due to the decentralization and lack of coordination, it is very difficult to get the lay of the land. (personal communication, January 25, 2006)

That said, we sought to understand, from the central IT perspective, the extent to which those local units were growing. We asked whether, over the past three years, the number of IT staff in the schools, centers, and departments who support research had decreased, stayed the same, or increased. The responses, shown in Figure 8-2, reveal that over the past three years a negligible percentage (2.3 percent) of institutions had seen any decrease in research-related IT support resources at the local level. Approximately two-thirds (67.1 percent) had stayed the same over the same period, and fewer than a third (30.6 percent) had seen any kind of increase. Significantly, the same pattern holds for the next three years, although expectations shift toward growth in those local resources, from 30.6 percent to 38.3 percent of institutions.

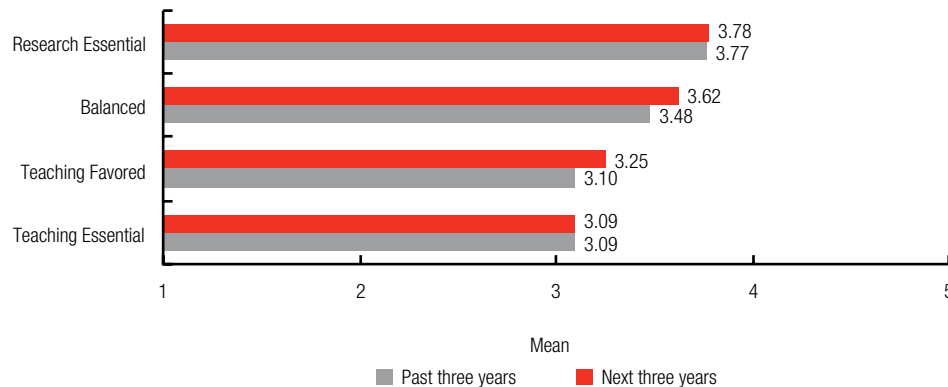
Figure 8-2.
Changes in Staffing of Local IT Units, Past and Next Three Years



Q: In the past three years, the number of IT staff in the schools, centers, and departments who support research has: (1 = greatly decreased, 2 = decreased, 3 = stayed the same, 4 = increased, 5 = greatly increased)

Q: In the next three years, the number of IT staff in the schools, centers, and departments who support research is expected to: (1 = greatly decrease, 2 = decrease, 3 = stay the same, 4 = increase, 5 = greatly increase)

Figure 8-3.
Growth in Local Research IT Staff, by Institutional Mission (Mean Value)



Q: In the next (past) three years, the number of IT staff in the schools, centers, and departments who support research is expected to (has): (1 = greatly decrease(d), 2 = decrease(d), 3 = stay(ed) the same, 4 = increase(d), 5 = greatly increase(d))

The Research Essential and Balanced institutions will continue to experience the greatest growth in local research IT staff (Figure 8-3). Over the next three years, however, the Teaching Favored institutions are also expecting a small surge in local research IT staff. We might speculate that much of the growth is being driven by the demands of undergraduate research, but we do not have the data to support that hypothesis.

Putting the data on central and local staffing together reveals a common pattern of growth in research-related support resources

(Figure 8-4). For both central and local research-related IT, and for both the past and the next three years, the means hover between the “stay the same” and “increase” range.

These data present a classic half-full, half-empty question of interpretation. Some would argue that in a time of budget constraints, with demands on IT resources for security, instructional technology, and other needs, even slight growth represents significant progress. The half-empty scenario presents a somewhat different picture: yes, it is good that resources will be growing at all, but in the face of what

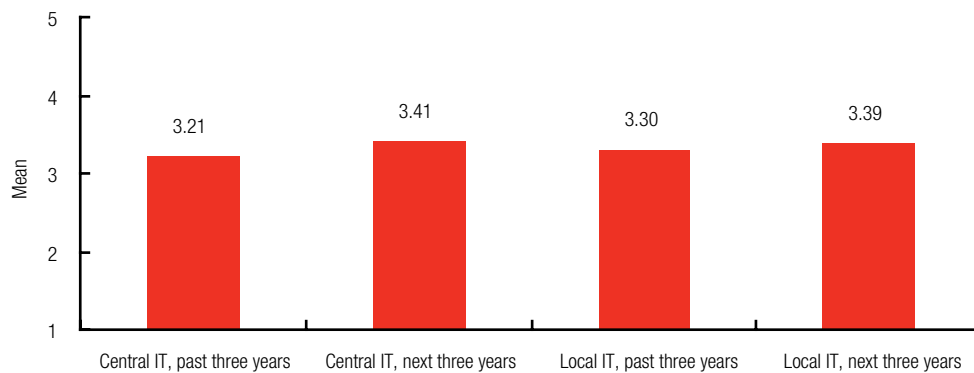


Figure 8-4. Change in Central and Local Research IT Staff, Past and Next Three Years (Mean Value)

Q: In the next (past) three years, the number of central IT staff (IT staff in the schools, centers, and departments) who support research is expected to (has): (1 = greatly decrease(d), 2 = decrease(d), 3 = stay(ed) the same, 4 = increase(d), 5 = greatly increase(d))

is portrayed as an impending revolution in data-intensive research, will the central and local IT organizations be there to provide the necessary support?

The Distribution of Responsibility

The survey asked a series of questions about where responsibility lies for key infrastructure elements: high-performance networking, high-performance computation, and data storage. Respondents were given five choices:

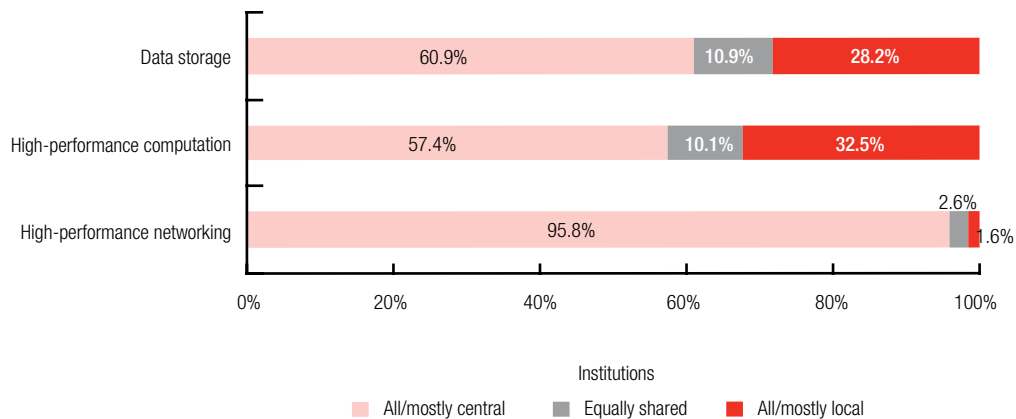
- ◆ Almost all central IT
- ◆ Mostly central IT; some school, center, and department IT
- ◆ Equally shared between central IT and school, center, and department IT
- ◆ Mostly school, center, and department IT; some central IT
- ◆ Almost all school, center, and department IT

As shown in Figure 8-5, the network is managed mostly or completely centrally at almost 96 percent of institutions. This makes sense, given that the network is an institutional resource, enjoys economies of scale, and benefits from consistency of

standards. The other two elements showed more variability, with both high-performance computation and data storage being managed mostly or completely locally at almost a third of institutions. Slightly over 10 percent of institutions viewed these two elements as equally shared, and between 57 percent (for computation) and 61 percent (for data storage) indicated primarily central responsibility.

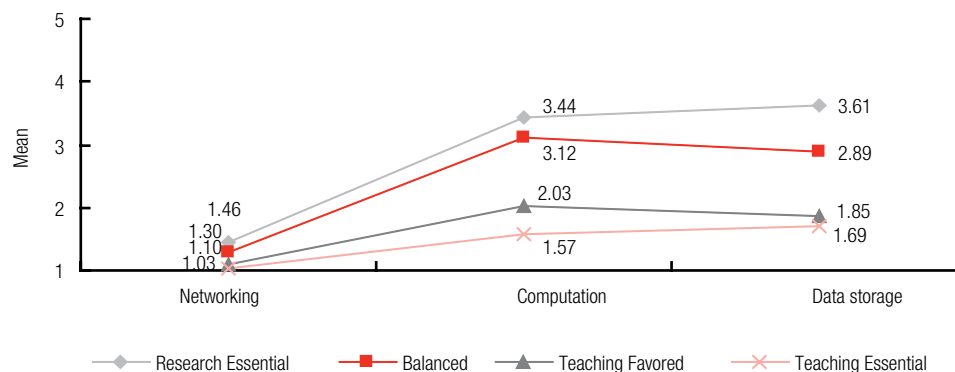
Comparing the means of the locus of responsibility across institutional mission (Figure 8-6) revealed a striking divergence among the four categories of schools. With the exception of the network, which continued to be managed centrally, the greater the focus on research, the greater the local responsibility for computation and data storage. For computation, the mean was 3.44 among the Research Essential institutions, meaning that responsibility lay somewhere between shared between central and local, and mostly local. For the Teaching Essential institutions, the mean was 1.57, halfway between all and mostly central. The means for data storage were comparably differentiated.

Figure 8-5.
Distribution of Responsibility for Infrastructure



Q: Where does responsibility lie for the following IT infrastructure elements related to research? (1 = almost all central; 2 = mostly central IT/some school, center, and department IT; 3 = equally shared between central IT and school, center, and department IT; 4 = mostly school, center, and department IT/some central IT; 5 = almost all school, center, and department IT)

Figure 8-6.
Division of Responsibilities for Infrastructure, by Institutional Mission (Mean Value)



Q: Where does responsibility lie for the following IT infrastructure elements related to research? (1 = almost all central; 2 = mostly central IT/some school, center, and department IT; 3 = equally shared between central IT and school, center, and department IT; 4 = mostly school, center, and department IT/some central IT; 5 = almost all school, center, and department IT)

We asked a similar set of questions about the locus of responsibility for 12 research-related IT support services:

- ◆ Selection and use of standard research applications (such as SPSS and research databases)
- ◆ Software application programming and development
- ◆ Selection and use of research tools (such as visualization, data mining, and statistical analysis)
- ◆ Providing collaboration tools (such as video-conferencing and whiteboarding)
- ◆ Data archive migration through media and software evolution
- ◆ Software life-cycle management (such as upgrades and version control)
- ◆ Training classes (for example, on database use, security, and digital video)
- ◆ Consulting services (such as issue-specific problem solving)
- ◆ Hosting services for individual researchers' servers
- ◆ Development and maintenance of research-related Web sites
- ◆ Maintaining vendor contracts for hardware and software purchases
- ◆ Planning for IT infrastructure in new facilities

The association is not perfect (Figure 8-7), but there is a marked tendency for the more discipline-specific services to be done locally. Web site development and maintenance was the most localized service, with almost 60 percent of institutions reporting this as a local responsibility, followed by research tools (55.3 percent), application development (41.1 percent), and standard research applications (27.8 percent). The most centralized support services were collaboration tools (76.5 percent all or mostly centralized), followed by maintenance of vendor contracts (74.1 percent central) and training classes (70.3 percent). These are fairly generic services that can be applied across even a large, complex research institution. It makes sense that facilities planning is also centralized, since it often involves institutional planning and standards.

As we did with infrastructure, we then looked at the means across categories of institutional mission (Figure 8-8), with 1 signifying that the service is almost entirely the responsi-

bility of central IT, and 5 indicating the locus of responsibility to be all or almost entirely within the school, center, or department. Once again, there is a striking propensity for the Research Essential institutions to have responsibility for their services at the local level. In some cases, such as research tools (4.25), Web site development (4.16), and application development (4.02), the Research Essential schools display a marked preference for managing these discipline-specific services locally.

These findings should not be surprising. It makes sense for the discipline-specific services to be done at the local level. Astronomers (or chemists, or demographers, or ...) have a much greater appreciation for the research problems they are trying to solve, and local IT support staff are more likely to be attuned to the substance of the discipline. As we saw in Chapter 7, central IT organizations typically have relatively few individuals dedicated to the support of research, and they simply cannot provide the necessary expertise in all disci-

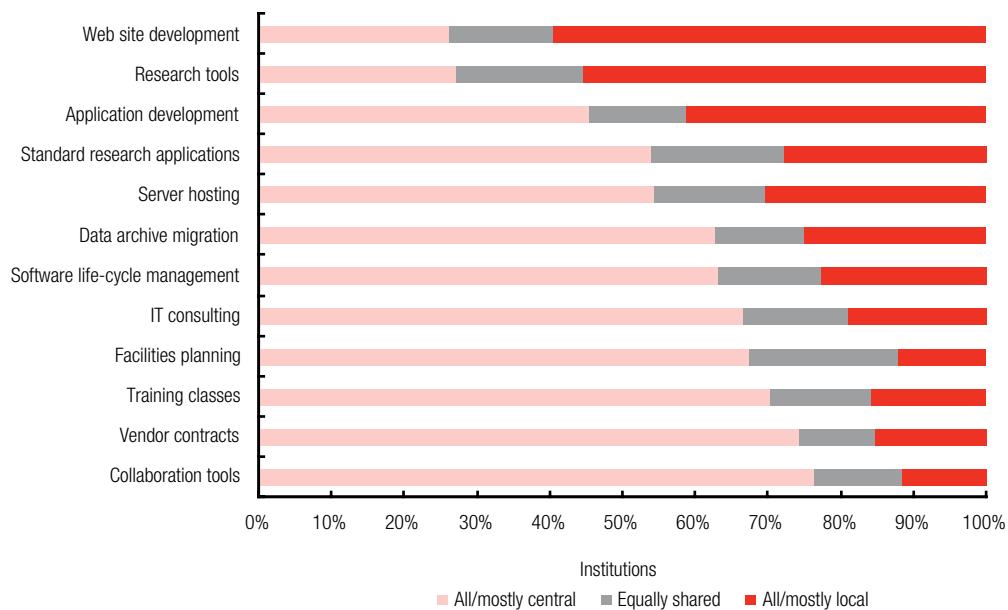


Figure 8-7.
Distribution of Responsibility for Support Services

Q: Which IT organization(s) are responsible for providing the following research-related IT support services? (1 = almost all central; 2 = mostly central IT/some school, center, and department IT; 3 = equally shared between central IT and school, center, and department IT; 4 = mostly school, center, and department IT/some central IT; 5 = almost all school, center, and department IT)

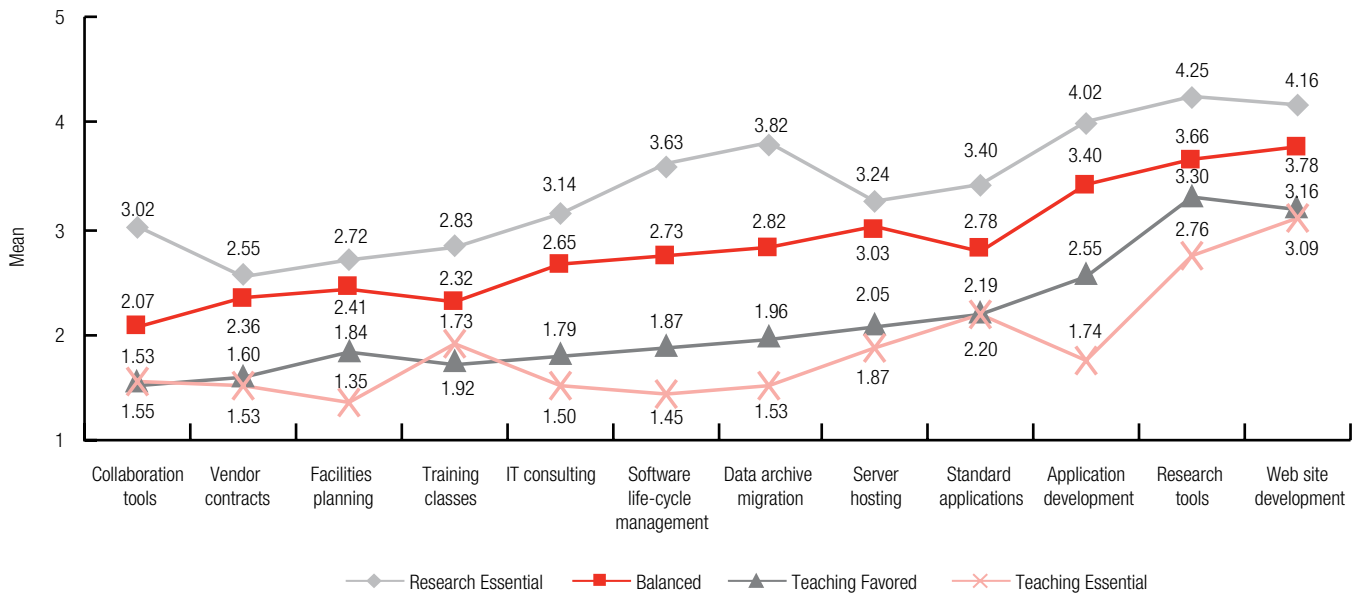


Figure 8-8. Responsibility for Services, by Institutional Mission (Mean Value)

Q: Which IT organization(s) are responsible for providing the following research-related IT support services? (1 = almost all central; 2 = mostly central IT/some school, center, and department IT; 3 = equally shared between central IT and school, center, and department IT; 4 = mostly school, center, and department IT/some central IT; 5 = almost all school, center, and department IT)

plines and departments. Where research is supported by external funding, it is even more understandable that the researcher will recruit his or her own IT support, especially from among the ranks of graduate students.

This trend toward local support for IT services is even more pronounced in the large, complex, decentralized environments that characterize the Research Essential institutions. The research problems are more likely to be specialized, there is greater likelihood of external funding, and the central IT organization is more likely to be hard-pressed to support the diverse needs of researchers across the institution.

But decentralization has its potential costs, including duplication of effort, gaps in service, diversion of people from substantive research, a multiplicity of standards, and security risks. Recognizing many of these issues and seeking to elevate the effectiveness of IT-supported research at its institution, the Research Ser-

vices unit at the University of Iowa conducted a series of focus groups in fall 2005 with researchers across the institution.¹ Comments from the transcripts illustrate the challenges associated with local support:

- ◆ “The person who is the grid person for ITS is my PhD student.... So I don’t have any real problems right now. But if he were hit by a bus or something, heaven forbid, I might have some problems.”
- ◆ “We have a systems sys op, and this person is responsible, with the help of these other folks, to keep the computer systems up and running, to replace computers, to modify them for whatever we need to have [inaudible].... But this is my graduate student. He’s paid as a research assistant in chemistry to do chemical research, and he is maintaining the computer system.”
- ◆ “The more I have to learn about that stuff, the less time I have to do what I really love to do and I’m good at, you know. I know

a little bit about hardware and software, but I'm a lousy hardware/software guy."

Institutions have found several ways to overcome the effects of this tendency toward localization of resources, including greater collaboration and centralization.

Benefits of Collaboration

Collaboration between central and local IT organizations can alleviate some risks of decentralized infrastructure and services. It can also foster the growth of interdisciplinary research by forging new links across academic units. Two instances of collaboration will serve to exemplify the benefits.

The Office of Information Technology at Princeton University recently collaborated with researchers across the institution to purchase Blue Gene, a high-performance supercomputer (News@Princeton, 2005). Among the disciplines that will benefit from the collaboration are astrophysical sciences, engineering, chemistry, and plasma physics. Made up of 2,048 processors that together calculate problems a thousand times faster than a desktop computer, Blue Gene is expected to be one of the world's 100 highest-performing computers. It took almost three years for the collaboration to come to fruition, with the Office of Information Technology paying for half of it. The rest of the funding came from the Princeton Institute for Computational Science and Engineering, the School of Engineering and Applied Science, and seven Princeton researchers who contributed personal grant funds to help buy the supercomputer.

A second example comes from the ECAR case study on Purdue University (Spicer & Metz, 2005), in which a new president and a new CIO fostered a fundamental realignment between the central and local IT organizations. Through the establishment of a collaborative research and engagement division within central IT, CIO James Bottum and his colleagues

were able to institute a number of innovative practices that included shared-management community clusters, the harvesting of cycles from underutilized workstations, a visualization center that supports researchers across the institution, and new strategies for pursuing external funding. According to Spicer and Metz (2005, pp. 11–12):

While the successful alignment of IT at Purdue led to a number of technology initiatives, the experience demonstrates that the best configuration may well be a mix of IT services and capabilities at the central and local level. Centralized services provide the benefits of scalability, standardization, open access to data, and greater security.... They also offer capabilities for faculty who are underserved, including researchers who do not have external funding. Localized services provide researchers the ability to choose the best tool for a unique circumstance, deal with their particular intellectual property concerns, target their research funding to meet their special needs, and readily make their own choices about how a particular service should be tailored. Both categories of service—central and local—are important.

How prevalent is this kind of collaboration? In the following chapter, we will discuss the mechanisms through which the central IT organization engages with researchers. Here, we focus on the services most likely to exhibit collaboration between central IT and researchers and the IT units that support them. Using the same list of 12 research-related support services discussed earlier, we asked, "Which of the following research-related IT services does the central IT organization actively coordinate with schools, centers, and departments?" Respondents could select all that apply.

Figure 8-9 shows the percentage of institutions reporting, for each service, coordination between the central and local units. What is noteworthy is that of the six services most often performed locally, five show the *least* active coordination: Web site development, research tools, application development, server hosting, and data archive migration (refer to Figure 8-7). The greatest coordination (with 74.1 percent of respondents) occurred for the selection and use of standard research applications, such as SPSS. This was followed by collaboration tools, IT infrastructure planning for new facilities, maintaining vendor contracts, IT consulting, and training. All of these were more likely to be centrally based services.

This level of independence—that services delivered out in the units have little coordination with central IT—should not be surprising, but it is a little disturbing. The decentralization of services without collaboration with central IT heightens the danger that there will be a duplication or suboptimal utilization of resources.

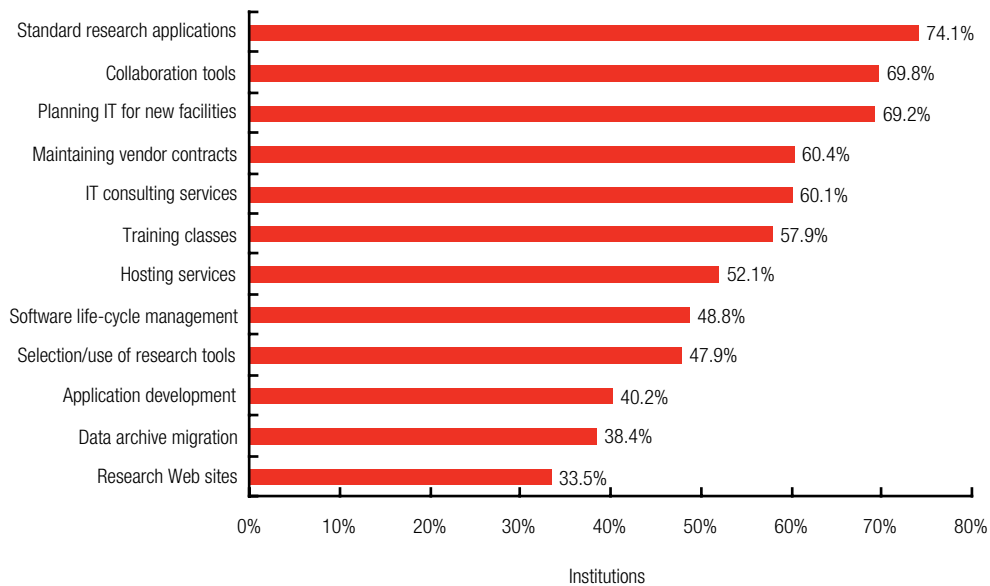
Centralization

Technology organizations have gone through swings of centralization and decentralization. The central data center gave way to cheaper hardware and packaged software, ushering in a period of greater initiative and ownership by local units. This centrifugal force, as Doug Van Houweling, president and CEO of Internet2, explains, fits in with the gestalt of universities:

Remember that when you are dealing with higher education, the natural tendency is always to decentralize. The university, by nature, is decentralized, and this is especially true for the academic aspects of the institution. So the real challenge is how do you provide for and obtain benefits of scale in an environment where the tendency is to operate at the smallest possible scale. (personal communication, January 24, 2006)

Several factors have conspired to cause a fundamental rethinking of the appropriate locus of responsibility for some core infra-

Figure 8-9.
Percentage of Institutions Reporting Active Coordination on Services



Q: Which of the following research-related IT services does the central IT organization actively coordinate with schools, centers, or departments? (Select all that apply.)

structure. Some of these factors were outlined earlier, including the realization that there is a real opportunity cost to having graduate students and other local resources manage the infrastructure. Other considerations include greater efficiency, security, and space utilization. The September 11 terrorist attacks and Hurricane Katrina were wake-up calls for researchers who asked themselves what would happen to years of work if their office servers were destroyed.

We noted in Chapter 6 that George Washington University has started rounding up “rogue servers” in an effort to provide greater security. Randall Thursby, vice chancellor and CIO at the Board of Regents of the University System of Georgia, sees the same trend:

Campuses are wrestling with the issue of reconsolidation. It’s coming back together for a number of reasons, including efficiency and security. We are starting to see clustered server centers where researchers can put their servers. At smaller institutions they may buy capacity from a research institution or externally elsewhere. There is a move, leveraging the service centers, to provide data storage. Campuses can create storage facility and portion it out and charge per use. The trend I see is for recentralization of compute power and data storage at the research institution level. There is some discussion of extending this further, for example, several institutions sharing a server center, but not too much yet. (personal communication, January 25, 2006)

When the University of Iowa began its internal review of research and IT, it paid close attention to the distribution of roles and responsibilities of support across the institution. Boyd Knosp, director of academic technology–research services, expresses it as “a trust issue”:

We need a university effort, but there is no structure to do that. The focus groups were intended to find out what we should be doing. The purpose is to get people talking, to develop a campus community.... The biggest surprise from the focus groups is that people are looking for leadership. People from all over have similar needs. Research computing is near and dear to a lot of people. The numbers are growing and spreading across the campus. (personal communication, January 12, 2006)

Iowa is moving deliberately to rethink and restructure its responsibilities for research. The draft of the “E-Research Needs Assessment” identified several areas for further work, but one of the more intriguing aspects was its discussion of the assignment of roles in the research enterprise: “Most researchers who use computing methods provide much of their own basic support. From the input we collected researchers would like to leave most of their basic IT support to central or collegiate resources” (Knosp, personal communication, January 12, 2006).

Figure 8-10 portrays two support models: the current map of where Iowa researchers get their support, and a possible reassignment of responsibilities. In contrast to the framework used in this report, which distinguishes central IT from a variety of school, center, and department resources, Iowa includes within “centrally supported” IT both their ITS organization and the collegiate units. Still, the alternative model suggests that a major reconfiguration of support is possible, with more support being derived from central resources.

The technologies, economics, and external realities are changing the equation about how support responsibilities are allocated. Researchers’ willingness to reconsider the need to own their infrastructure and sup-

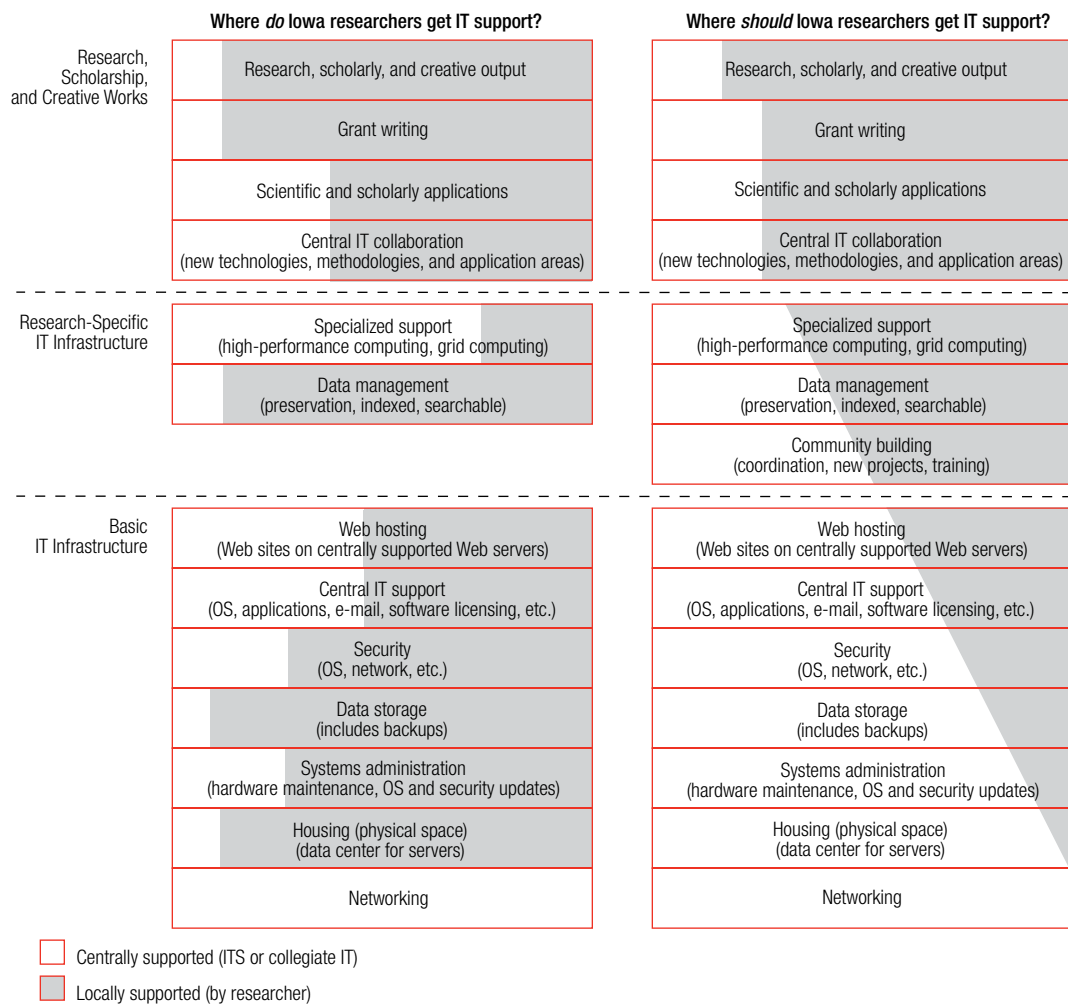


Figure 8-10.
University of Iowa
Models of Central
and Local Support

port resources provides an opportunity for a rich dialogue between central IT organizations and their counterparts in the local units. The success of the dialogue, however, depends on the ability of central units to reach out and engage researchers. How well are they doing it? It is to that question that we turn our attention in the next chapter.

Endnote

1. More about this initiative, including the draft report of the "E-Research Needs Assessment," can be found at <<http://www.at.its.uiowa.edu/rs/rca/E-Research.shtml>>. Transcripts of the "E-Research Focus Groups Report" are at <<http://www.at.its.uiowa.edu/rs/rca/documents/E-ResearchFocusGroups.pdf>>. Comments are from pages 8 and 9 of the "Focus Groups Report."