

# Roadmap

TOOLS FOR NAVIGATING COMPLEX DECISIONS

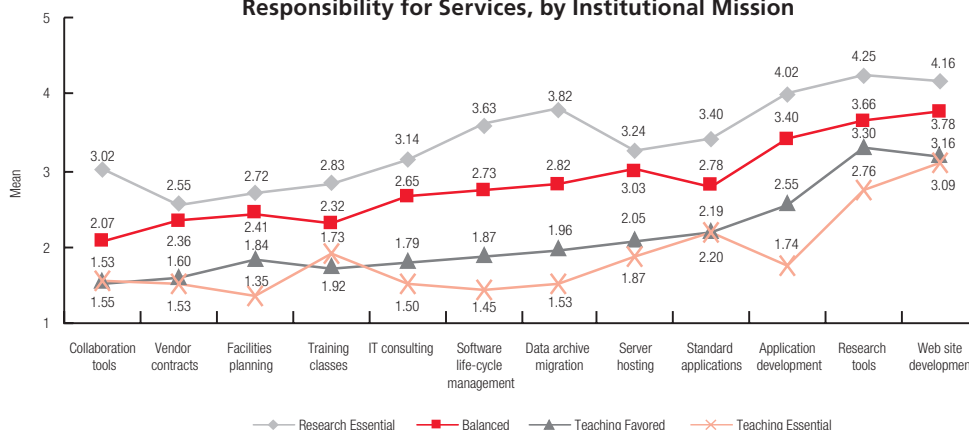
## IT Engagement in Research

By Harvey Blustain, with Sandra Braman, Richard N. Katz, and Gail Salaway

### KEY FINDINGS

- Respondents reported an increase in the level of data-intensive, interdisciplinary, multi-institutional, and undergraduate research, as well as accelerating levels of data-intensive research in disciplines that traditionally have not been computation-intensive, such as the humanities and social sciences.
- Demand for data storage is increasing faster than the demand for high-performance networks or computation.
- More than half of central information technology (IT) organizations had fewer than one FTE dedicated to the support of research, with an additional 23 percent having one to three support FTE. Thirty-eight percent of central IT units expect to increase their research IT staff over the next three years, double the 19 percent who increased such staff in the previous three years.
- Twenty-eight percent of central IT organizations had a specialized unit dedicated to the support of research. Institutions having such a unit reported a higher level of engagement with researchers and higher levels of researcher satisfaction.
- Half of the survey respondents said they do not have a sustainable budget model for research IT infrastructure or for services related to research IT.
- There is a tendency, especially among institutions with research as a core institutional mission, for data storage, high-performance computation, and support services related to IT to be managed at the local level.
- The majority of central IT organizations lack a formal mechanism for engaging researchers, such as advisory boards, long-term planning to determine researchers' IT needs, or participation in pre-award grant planning.

Responsibility for Services, by Institutional Mission



Research represents an increasingly important component of higher education's mission. As universities seek to grow, more of them are turning to research as the engine that will bring them greater prestige, increased revenues, and star faculty. At an accelerating rate, this academic research is becoming data-intensive and reliant on networks, high-performance computation, data storage, sensors, visualization, and an array of other IT tools and services. The culmination of decades of development and innovation, "cyberinfrastructure," in its various manifestations, is

*This ECAR roadmap synthesizes the results from a survey of 328 institutions and qualitative interviews with 26 executives and IT staff members from 23 colleges, universities, and agencies. The roadmap summarizes the 2006 ECAR study IT Engagement in Research by Harvey Blustain, with Sandra Braman, Richard N. Katz, and Gail Salaway. To order the full study or to learn about subscribing to ECAR, visit the ECAR Web site at <http://www.educause.edu/ecar> or contact us at [ecar@educause.edu](mailto:ecar@educause.edu).*

## KEY REPORT CONCEPTS

- Cyberinfrastructure refers to the research environment of hardware, software, communications, services, facilities, and personnel that enable researchers to conduct advanced computational, collaborative, and data-intensive research.
- Institutions in our survey were differentiated on the basis of their espoused institutional mission, which was a powerful variable for understanding their behaviors and orientations. The categories were:
  - *Research Essential*: Research and teaching are the primary missions, but research is what really drives faculty and institutional success.
  - *Balanced*: Research and teaching are both primary missions, and they are equally important for faculty and institutional success.
  - *Teaching Favored*: Teaching is the primary mission, but faculty research is rewarded.
  - *Teaching Essential*: Teaching is the primary mission, and faculty research does not factor heavily in faculty and institutional success.

the term most commonly used to describe the emerging IT-intensive research environment.

ECAR's study *IT Engagement in Research* examines the IT organizational structures and practices that support the academic research enterprise. We found that the division of roles between central and local IT organizations, while having enabled the extraordinary rise of research, is ripe for reconsideration as researcher expectations amplify the demands on IT infrastructure and services. In a resource-constrained and competitive environment, universities and colleges are seeking new ways to apply ever more sophisticated analytical tools while leveraging IT investments.

### Indicators of Research Growth

Our study documented the trends in research that have elevated demands for IT infrastructure and support. Among the Research Essential and Balanced institutions especially (see "Key Report Concepts"), respondents agreed quite strongly that their institutions place high priority on interdisciplinary research, multi-institutional research, undergraduate research, and the use of IT for research.

One of the more noteworthy trends is the extension of data-intensive research methods into disciplines (such as the humanities and arts) that have traditionally not been computing-intensive. Over the past three years, 37.1 percent of respondents saw growth in the use of IT in "nontraditional" disciplines, while 50.1 percent expect growth over the next three years. Yet when we asked about current demands for infrastructure and support among a range of disciplines, the arts, humanities, business, and education were at the bottom of the list, far below biological, physical, computer, and other sciences. This indicates to us that the demand for services and support for research-related IT will continue to accelerate across all academic disciplines.

### The Central IT Organization

To gain an understanding of the role of central IT units in the support of research, we asked how they were staffed, organized, and funded. More than half (55.9 percent) of all institutions had fewer than one FTE assigned to the support of research, and an additional 23.2 percent had between one and three FTE dedicated to research support. Research-oriented institutions, as we expected, had a greater commitment of staff, but approximately one-quarter of both Research Essential and Balanced institutions had fewer than one FTE, and a little over three-quarters of them had fewer than seven FTE assigned to research.

An institution's commitment to the support of research can be measured by the presence of a specialized unit within central IT dedicated to research support. Twenty-eight percent of all institutions had such a unit, with the percentage rising considerably among the Research Essential (42.6 percent) and Balanced (46.6 percent) institutions. Institutions with an IT research unit were more likely to report higher levels of formal engagement with researchers and slightly higher (self-reported) levels of researcher satisfaction, although it is hard to determine cause and effect among these variables. More likely, a commitment to research triggers a number of actions that include the creation of a dedicated support unit within central IT.

Recognizing that much of the infrastructure is multi-purpose, we nonetheless asked how much money is being spent by central IT on infrastructure and services related to research. The results were inexact but illuminating, with 81 percent of all institutions (including 57.5 percent of Research Essential and 58.3 percent of Balanced institutions) spending \$500,000 or less just on research. Thirty-five percent of Research Essential and 19.4 percent of Balanced institutions spent more than \$1 million on research infrastructure and

## METHODOLOGY

- ▶ A quantitative survey of 328 higher education institutions
- ▶ A literature review, both of the history of federal involvement in data-intensive research and of academic studies related to faculty perspectives on research
- ▶ Qualitative telephone interviews with 26 IT professionals, executives, and scholars at 23 institutions and agencies

support. The areas expected to receive the most funding over the next three years were data storage, followed by operations and high-performance networking. Half (49.9 percent) of all respondents indicated that they do not have a sustainable budget model for research IT infrastructure, and slightly more (54.4 percent) said that they do not have a sustainable budget model for research IT services.

### Central IT Engagement with Researchers

Central IT organizations must operate within a well-established academic culture that values autonomy and entrepreneurship. This in turn requires them to take proactive measures to partner with, and demonstrate their value to, researchers. Our study found, however, that the current level of engagement with the research community was low. More than half (55.2 percent) of institutions said they had no formal mechanisms to engage researchers, although two-thirds (64 percent) claimed to do ad hoc consultations, and one-third (34.8 percent) said they do regular informal networking. Formal engagement was strongly associated with institutional mission, with approximately two-thirds of the Research Essential and Balanced institutions claiming formal engagement.

When we looked at other specific measures of engagement, the story was much the same. Two-thirds of all institutions—and even more than half of the institutions focused on research—did not engage in long-term planning to determine researchers' needs for IT infrastructure and support services. More than three-quarters of respondents said that central IT is never, rarely, or sometimes consulted in the pre-award process of contracts and grants to identify IT needs and resources. Almost 91 percent of respondents reported that central IT is never, rarely, or sometimes consulted in the faculty and researcher hiring process to identify their IT needs.

### Local IT Units and the Division of Roles

Local IT staff represents an important element of an institution's total IT complement. The *EDUCAUSE Core Data Service: Fiscal Year 2004 Summary Report* indicates that these staff members are especially important in large and decentralized research institutions. We therefore sought

to understand the role these staff played in the support of research.

Although the network was mostly or completely centralized at 96 percent of all institutions, responsibility for data storage was all or mostly local at 28.2 percent of institutions; the comparable figure for high-performance computation was 32.5 percent. There was a very strong association with institutional mission, with Research Essential and Balanced institutions exhibiting a much greater degree of decentralized management for these two infrastructure elements.

The most revealing set of findings in this area concerned the distribution of responsibility for research-related services. When we asked about 12 support services, we found that there was a marked tendency for the most discipline-specific services (Web site development, research tools, and application development) to be managed locally. This tendency toward localized services was even more pronounced at research-intensive universities. The most centralized support services—collaboration tools, maintenance of vendor contracts, and training—were fairly generic and can be applied across even a large, complex institution. This is not surprising, given that research problems are likely to be specialized and that the central IT organization would be hard-pressed to support the diverse needs of researchers across the institution.

But decentralization has its costs, including duplication of effort, gaps in service, and multiple standards. We therefore sought to discover the level of coordination between the central and local units. Significantly, of the six (of 12) services handled most locally, five were the services with the least active coordination. This, again, highlighted the dispersion of responsibility for research in the current environment.

### Research IT at the Inflection Point

Since the end of World War II, encouraged strongly by federal funding and policy, there has been growing reliance on IT for the conduct of research. This has occurred within an academic culture that has tolerated, if not encouraged, disciplinary boundaries and autonomous research. Central IT organizations within higher education have been focused on other critical priorities and, except for key infrastructure,

## RECOMMENDATIONS

Based on its findings in *IT Engagement in Research*, ECAR offers the following recommendations:

**1. Understand the institutional goals for research.**

Every university and college has its own goals for research, such as economic development, prominence in biotechnology, leadership in the digital humanities, or undergraduate research. The institution's fundamental objectives for research will provide the framework for identifying the most valuable contribution by the IT organization to that effort and will offer direction for the investment of time, infrastructure, and services.

**2. Engage researchers.**

Spending time with researchers is the only way to understand their world, gain their trust, and identify how IT can assist them. Initial efforts can include meetings and focus groups and culminate in the creation of an advisory council that provides ongoing advice.

**3. Determine IT's source of value.**

Understanding the institutional goal for research and engaging with researchers will yield a keener appreciation for where the IT organization can provide the greatest value. Is it in the creation of a cluster condominium? More data storage? More cost-effective coordination of tools or services that are replicated in departments and labs across the institution? With limited resources, central IT organizations must be certain that efforts are directed to the highest-impact activities.

**4. Forge partnerships.**

The IT organizations that are most effective in their support role are those that work with their clients to understand their issues and to develop joint solutions. It is especially important that the central IT organization develop good working relationships with local IT support, since it is local expertise that can help translate researcher needs into technical requirements.

**5. Demonstrate an organizational commitment.**

While establishing a separate unit dedicated to the support of research will not automatically bring benefits, the study provides compelling evidence that central IT organizations with such a unit are more effective in providing services to, and partnering with, researchers.

**6. Remember that it's all about the research.**

The type of IT professional who is attracted to research-related IT is likely to be enthusiastic about leading-edge technical innovations. To the extent that this reminder is worth stating, the entire rationale for developing a research capacity within the IT organization is to serve the needs of the

have largely allowed the research community to evolve its own localized support.

A number of factors are now changing the dynamics of IT support for research. These include more complex research problems requiring more interdisciplinary approaches, more sophisticated technologies demanding more professional management, and increasingly constrained funding. The scale of science now exceeds the capacity of any one researcher or lab. There is greater interest on

the part of researchers for cost-effective and collaborative approaches for support. Many central IT organizations are finding that they have an opportunity to open a dialogue with both researchers and local IT organizations about working together to enhance the quality of the science. From cluster condominiums to the purchase of supercomputers with funding from multiple sources, central IT organizations are re-taking the initiative for advancing the state of the art of data-intensive research.