The Cyberinfrastructure Vision

Advanced cyberinfrastructure offers the potential to conduct new types of research in new ways. Doing this effectively requires holistic attention to mission, organization, processes, and technology.

--- The Atkins Report
The Cyberinfrastructure Vision: Themes

• New/expanded technologies
  – Computation – Applications
  – Networking – Middleware
  – Storage – Etcetera
• Elimination of boundaries
  – Between disciplines
  – Between institutions
  – Across geographies
• Research in traditionally non-compute-intensive disciplines
• Collaboration, communication, and support
• Money (lots of it)

What role do university IT organizations play in this vision?
How well positioned are they to achieve it?
The Sample Population (N=328)

The Survey Population (N=328)

- DR (105): 7%, 32% 42%
- MA (92): 16%, 28% 42%
- BA (60): 15%, 18% 42%
- AA (31): 10%, 20% 42%
- Other (40): 12% 20% 42%

Carnegie 2000 Survey Population
Institutional Mission Was the Primary Analytic Lens

1. Research and teaching are the primary missions, but research is what really drives faculty and institutional success -- “Research Essential” (48)

2. Research and teaching are both primary missions, and they are equally important for faculty and institutional success -- “Balanced” (90)

3. Teaching is the primary mission, but faculty research is rewarded -- “Teaching Favored” (115)

4. Teaching is the primary mission, and faculty research does not factor heavily in faculty and institutional success -- “Teaching Essential” (73)

Q: Which statement best describes your institution?
Correlation of Carnegie and Mission, by Carnegie

![Bar chart showing the correlation of Carnegie and Mission by Carnegie categories.]

Key:
- **Research Essential**
- **Balanced**
- **Teaching Favored**
- **Teaching Essential**

<table>
<thead>
<tr>
<th>Carnegie Category</th>
<th>Research Essential</th>
<th>Balanced</th>
<th>Teaching Favored</th>
<th>Teaching Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR</td>
<td>42</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MA</td>
<td>0</td>
<td>11</td>
<td>61</td>
<td>0</td>
</tr>
<tr>
<td>BA</td>
<td>1</td>
<td>11</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>AA</td>
<td>0</td>
<td>4</td>
<td>26</td>
<td>1</td>
</tr>
</tbody>
</table>
Research Priorities Are Tied to Institutional Mission

Q: My institution places high priority on ___.
   1=Strongly Disagree < --- > 3=Neutral < --- > 5=Strongly Agree

- Research Essential
- Balanced
- Teaching Favored
- Teaching Essential

- Research
- Recruiting faculty who do research
- Use of IT for research
We Will Focus Today on Four Questions

• Trends: What do CIOs see happening with research in their institutions?

• Services: What infrastructure and services are central IT organizations providing to researchers?

• Engagement: How involved and knowledgeable is central IT in academic research activities?

• Resources: What levels of staff and dollars are central IT organizations applying to research-related IT?
Interdisciplinary and Multi-Institutional Research Will Continue to Grow

Q: In the past three years, ____ has:

Q: In the next three years, ____ is expected to:

1 = Greatly Decrease(d) < --- > 3 = Stay(ed) the Same < --- > 5 = Greatly Increase(d)

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Use of IT in Traditionally Non-Compute-Intensive Disciplines is Expected to Grow

**TRENDS**

Q: In the (next/past) three years, computational research in traditionally non-computing disciplines (e.g., humanities) is expected to (has):

1=Greatly Decrease(d) < --- > 3=Stay(ed) the Same < --- > 5=Greatly Increase(d)
Demands for Infrastructure Will Continue To Grow

Q: In the (next/past) three years, the following activities at your institution are expected to (have):

1=Greatly Decrease(d) < --- > 3=Stay(ed) the Same < --- > 5=Greatly Increase(d)

These data represent the percentage of respondents who said that these infrastructure elements would / had Increase(d) or Greatly Increase(d).
Responsibility for Much of Infrastructure Is Distributed Between Central and Local IT

Q: Where does responsibility lie for the following IT infrastructure elements related to research?

1=Almost all central < --- > 3=Equally shared < --- > 5=Almost all local

SERVICES

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
<th>80%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Networking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- All / Mostly Central
- Equally Shared
- All / Mostly Local

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Research Institutions Showed More Local Responsibility for Infrastructure

![Graph showing networking, high-performance computation, and data storage services.](chart)
## Discipline-specific Services Are More Likely To Be Provided Locally

The table below illustrates the percentage distribution of IT services by responsibility location. The scale ranges from 1=Almost all central to 5=Almost all local. The chart categorizes services into different types, and the bars indicate the percentage of respondents choosing each location for the services.

### Services Provided Locally

<table>
<thead>
<tr>
<th>Service</th>
<th>All / Mostly Central</th>
<th>Equally Shared</th>
<th>All / Mostly Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web site development / maintenance</td>
<td>26%</td>
<td>15%</td>
<td>59%</td>
</tr>
<tr>
<td>Research tools</td>
<td>27%</td>
<td>18%</td>
<td>55%</td>
</tr>
<tr>
<td>Application development</td>
<td>45%</td>
<td>14%</td>
<td>41%</td>
</tr>
<tr>
<td>Standard research applications</td>
<td>54%</td>
<td>18%</td>
<td>28%</td>
</tr>
<tr>
<td>Server hosting</td>
<td>55%</td>
<td>15%</td>
<td>30%</td>
</tr>
<tr>
<td>Data archive migration</td>
<td>63%</td>
<td>12%</td>
<td>25%</td>
</tr>
<tr>
<td>Software lifecycle management</td>
<td>63%</td>
<td>14%</td>
<td>23%</td>
</tr>
<tr>
<td>IT consulting</td>
<td>67%</td>
<td>15%</td>
<td>19%</td>
</tr>
<tr>
<td>Facilities planning</td>
<td>67%</td>
<td>21%</td>
<td>12%</td>
</tr>
<tr>
<td>Training classes</td>
<td>70%</td>
<td>14%</td>
<td>16%</td>
</tr>
<tr>
<td>Vendor contracts</td>
<td>74%</td>
<td>11%</td>
<td>15%</td>
</tr>
<tr>
<td>Collaboration tools</td>
<td>77%</td>
<td>12%</td>
<td>12%</td>
</tr>
</tbody>
</table>

### Question

Q: Which IT organization(s) are responsible for the following support services?

1=Almost all central  < --- >  3=Equally shared  < --- >  5=Almost all local
Research Institutions Showed Greater Local Responsibility for Services
Engagement with Researchers

- We asked questions about how central IT engages with researchers on infrastructure and service issues
  - Formal processes for engaging with researchers
  - Advisory groups
  - Long-term planning around research-related IT
  - Central IT involvement in faculty processes, such as grant preparation and faculty recruitment
  - Central IT cooperation with the institutional Office of Research
  - Enforcement of platform standards
Q: How does your central IT organization engage with researchers around the IT aspects of their work? (Select all that apply)
The Most Common Form of “Formal Engagement” is Ad Hoc and Informal

<table>
<thead>
<tr>
<th>Method of Engagement</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad hoc consultations on an as-needed based</td>
<td>210</td>
<td>64.0%</td>
</tr>
<tr>
<td>Regular and active informal networking by central IT staff with researchers</td>
<td>114</td>
<td>34.8%</td>
</tr>
<tr>
<td>Formal consultations supported by specific research grants</td>
<td>64</td>
<td>19.5%</td>
</tr>
<tr>
<td>Regular meetings with deans, chairs, and heads of institutes regarding research-related IT needs</td>
<td>62</td>
<td>18.9%</td>
</tr>
<tr>
<td>A single formal research advisory or working group</td>
<td>37</td>
<td>11.3%</td>
</tr>
<tr>
<td>Open meetings for all researchers to provide input on research-related IT needs</td>
<td>37</td>
<td>11.3%</td>
</tr>
<tr>
<td>Multiple advisory or working groups organized around shared research problems or methods</td>
<td>35</td>
<td>10.7%</td>
</tr>
<tr>
<td>Surveys to colleges, departments, or researchers regarding research-related IT needs</td>
<td>34</td>
<td>10.4%</td>
</tr>
<tr>
<td>Multiple advisory or working groups organized around computing platforms</td>
<td>26</td>
<td>7.9%</td>
</tr>
</tbody>
</table>
Half of Research-Oriented Institutions Lack a Research Advisory Group

Q: If your institution has a research advisory group that addresses research IT issues, in which of the following activities does it engage? (Select all that apply)
The Majority of Research-Essential Institutions Do Not Engage in Planning

Q: Does your institution engage in long-term planning exercises to determine researchers’ needs for IT infrastructure and support services?
Central IT Budgets for Research Are Relatively Modest

Q: Independent of infrastructure that is multipurpose (e.g., network, email), how much money does the central IT organization spend on infrastructure and services related to research?
Funding for All Technology Elements is Expected to Increase

<table>
<thead>
<tr>
<th>RESOURCES</th>
<th>Past Three Years</th>
<th>Next Three Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking</td>
<td>3.60</td>
<td>3.65</td>
</tr>
<tr>
<td>Computing</td>
<td>3.25</td>
<td>3.55</td>
</tr>
<tr>
<td>Data Storage</td>
<td>3.62</td>
<td>3.75</td>
</tr>
<tr>
<td>Apps / Tools</td>
<td>3.28</td>
<td>3.51</td>
</tr>
<tr>
<td>IT Support</td>
<td>3.20</td>
<td>3.43</td>
</tr>
<tr>
<td>Operations</td>
<td>3.53</td>
<td>3.66</td>
</tr>
</tbody>
</table>

Q: In the (next/past) three years, central IT funding for ___ is expected to (has):

1=Greatly Decrease(d) \( \text{< --- >} \) 3=Stay(ed) the Same \( \text{< --- >} \) 5=Greatly Increase(d)
Q: How many central IT full-time staff are currently assigned to the support of research?
There Has Been and Will Be Modest Growth in Central IT Staff Assigned to Research

Q: In the (next/past) three years, the number of central IT staff who support research is expected to (has):

1=Greatly Decrease(d) < --- > 3=Stay(ed) the Same < --- > 5=Greatly Increase(d)

RESOURCES

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Local Research-Related IT Staff Have (and Will) Experience(d) Modest Growth

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) < --- > 3=Stay(ed) the Same < --- > 5=Greatly Increase(d)
The Story Line (1)

• The much-touted trends are becoming a reality.
  – Interdisciplinary research
  – Multi-institutional research
  – Research in traditionally non-compute-intensive disciplines
  – The demand for cyberinfrastructure (or something like it)
• These trends are adding to the demands already placed on central IT organizations in infrastructure and services.
  – Demands on infrastructure alone are expected to grow rapidly.
  – There are expectations of modest growth in central IT resources, but there is every reason to assume that resource growth will lag demand.
The Story Line (2)

- A significant amount of the research-related IT activity is happening in the schools, centers, and departments.
  - Discipline-specific IT activities (i.e., the substance of research) are more likely to occur locally.
  - The more research-focused the institution, the more like that research-related IT occurs locally.
  - Much of the truly interesting work in research-related IT will be in the schools, centers, and departments.
The Story Line (3)

- Central IT organizations are currently not well-positioned to play a significant role in the unfolding of this emerging research environment (cyberinfrastructure).
  - They have limited resources.
  - They are preoccupied with other things.
  - They are not collaborating with researchers in the development of discipline-specific services and tools (i.e., not involved with the content of the research).
  - They have few methods for engaging researchers.
The Story Line (4)

• Therefore, central IT organizations will need to (Select all that apply):
  – Accommodate themselves to being outside the main stream of developments in research-related IT and the development of the cyberinfrastructure
  – Focus on providing core infrastructure elements (i.e., network) upon which the cyberinfrastructure is built
  – Do more of what they are currently doing (i.e., a little bit of everything where possible)
  – Find new ways to add value to the research enterprise
Questions for Discussion

• Based on the data presented and on what you know, does the story line make sense?

• What should be the role of central IT organizations in the development of the cyberinfrastructure?

• How do central IT organizations get from where you are now to where you want/need to be?