

A Framework for Managing Core Facilities within the Research Enterprise

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Core facilities represent increasingly important operational and strategic components of institutions' research enterprises, especially in biomolecular science and engineering disciplines. With this realization, many research institutions are placing more attention on effectively managing core facilities within the research enterprise. A framework is presented for organizing the questions, challenges, and opportunities facing core facilities and the academic units and institutions in which they operate. This framework is intended to assist in guiding core facility management discussions in the context of a portfolio of facilities and within the overall institutional research enterprise.

KEY WORDS: academic medical centers, financial management, institutional management teams, organizational efficiency, organizational innovation, organizational objectives, research institutes

The race is on to develop and effectively use core research facilities to strengthen institutions' research enterprises. Although the impetus to do so varies across disciplines and institutions, it is becoming increasingly clear that the performance of research in many areas within and beyond biomolecular science and engineering (S&E) requires complex, expensive technical equipment that often requires operation by dedicated, skilled scientific personnel.

Research institutions—universities, academic medical centers, and independent research institutes—are increasingly realizing the important role that core facilities play in their:

- ability to conduct cutting-edge research;
- competitiveness for recruiting and retaining strong faculty members; and
- competitiveness for external research funding.

With this realization comes an understanding that more attention needs to be placed on effective, proactive, and strategic management of these important components of institutions' overall research enterprises. Example questions being considered include: How should core facility investment decisions be made; How should core facilities be governed and evaluated; and How can core facility sharing and use be enhanced?

Example core facilities relevant to biomolecular S&E are listed in Figure 1. The diversity and complexity of the

core facilities are matched by the diversity and complexity of the research institutions in which core facilities operate. This diversity can increase core facility management challenges faced by research institutions and can make it difficult for members of leadership to feel knowledgeable and comfortable with their institution's portfolios of core facilities.

Major research institutions are working to better understand their portfolios of existing core facilities and to better manage these facilities, and emerging research institutions (and consortia of such institutions) are working to create new core facilities—in areas such as bioinformatics and proteomics—to jump-start their research infrastructures and increase their research capacities and competitiveness. At some of these institutions, faculty members' and researchers' decisions to share sophisticated research facilities are increasingly being born more out of economic realities rather than altruistic behaviors.

Some research institutions with major medical schools and large core facility user bases are investing heavily in areas such as centralized administrative and management offices and sophisticated, web-enabled information systems to support their core facilities, and some institutions without medical schools but with growing research activities in biological S&E areas are looking for less-ambitious changes that can be made to optimize the effectiveness of their core facility operations, investments, compliance, and service to the research community.

Examples of universities that have taken or are taking significant steps to bolster core facility investment and management include Vanderbilt University¹ (J Manning, personal communication, October 2008), Cornell Univer-

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Antibody	Histology	Proteomics
Bioinformatics	Imaging	Sequencing
Biopolymers	Mass spectrometry	Structural biology
Biostatistics	Media preparation	Transgenic mouse
Cell sorting	Microarray	Viral vector production
Flow cytometry	Microscopy	X-ray crystallography
Genomics	Pathology	
Glassware washing	Pharmacology	

FIGURE 1

Example of biomolecular S&E core research facilities.

sity² (G Grills, personal communication, November 2008), the University of Chicago (J Auger, personal communication, November 2008), Northwestern University (H Falk-Krzesinski, personal communication, October 2008), and the University of California, San Francisco.^{3,4} Examples of independent research institutes that have taken significant steps include the St. Jude Children's Research Hospital (J Downing, personal communication, December 2008), The Jackson Laboratory (V Scott, personal communication, December 2008), and the Burnham Institute for Medical Research (C Hauser, personal communication, December 2008).

Several additional institutions, including major research universities without medical schools and emerging research universities, are taking and considering similar adjustments to their core facility management approaches with an eye toward enhanced productivity and payoff.

Furthermore, although federal core grant support (e.g., from programs within the National Cancer Institute and the National Center for Research Resources at the National Institutes of Health) has enabled more institutions to develop sophisticated core facilities, these institutions are facing the subsequent challenges of sustaining and leveraging this federal support.

Figure 2 offers an example approach to schematically mapping an institution's core facilities portfolio. This approach highlights an element of key importance to many members of leadership: the subsidy required to operate a given core facility and to offer the services of the facility in a way that facilitates research. The development of and discussions around schematic diagrams such as this one, particularly if customized to the specifics of an individual institution, can have value in normalizing stakeholders' understanding of an institution's core facility portfolio, thus leading to more productive interactions and discussions about core facility management approaches.

Overall, many different models exist for the management of core facilities within the research enterprise, at the macro and micro level. In theory, many of these models can be successful, and the success of any set of models at a given

institution depends on a number of factors, including the following:

- core facility technology
- core facility age
- numbers and types of current and expected future users
- institutional and unit culture
- institutional and unit available resources
- institutional and unit policies and procedures
- practices and specific personnel involved

Based on our analyses of core research facilities at several institutions, a generalized framework is presented that organizes some of the pressing questions that research institutions are asking about core facility management and some of the common challenges and opportunities being faced by core facilities and the research institutions in which they operate. Although the approaches taken to address these questions, overcome these challenges, and capitalize on these opportunities will differ based on specifics at facility, unit, and institutional levels, we think that a

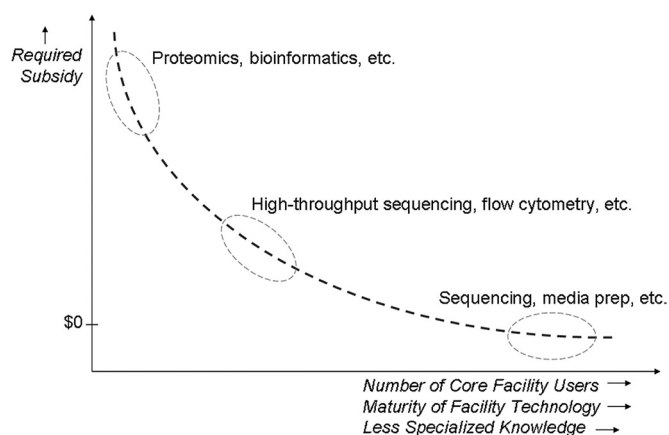


FIGURE 2

One approach to mapping biomolecular S&E core facilities. Schematic relationship between required core facility subsidy and characteristics of facilities and provided services.

Framework for Managing Core Facilities within the Research Enterprise	
1. Visibility and Vision	2. Operations and Management
4. Decision-Making and Investment	3. Review and Evaluation

FIGURE 3

Strategic management framework for core research facilities. Four inter-related areas of questions, challenges, and opportunities related to managing core facilities within the research enterprise.

common, initial framework has value in facilitating discussions about core facility management approaches among diverse stakeholders.

MATERIALS AND METHODS

The core facilities strategic management framework presented in this paper emerged from Huron Consulting Group's focused work on the management of core research facilities within institutions' overall research enterprises.

As an example of this work, Huron Consulting Group's higher education practice was engaged recently by a major research university to review the state of its core research facilities in the biological S&E area with the goal of enhancing the institution's investments in these facilities via recommendations related to core research facility organizational structures and business models.

As part of the process, we interviewed over 40 individuals at the university (including unit leadership, facility managers and administrators, senior and junior faculty, and university administrators), reviewed facilities data, conducted interviews with over 10 peer institutions to discuss their related challenges and opportunities, and reviewed the relevant literature related to regulatory compliance.

Based on in-depth analyses of institutions' approaches to operating and managing core facilities, a generalized framework has been developed to guide discussions about managing core facilities within the institution's overall research enterprise.

RESULTS AND DISCUSSION

Four broad areas—and the key questions, challenges, and opportunities in these areas—form the core facilities strategic management framework, as illustrated in Figure 3:

1. Visibility and Vision
2. Operations and Management
3. Review and Evaluation
4. Decision-Making and Investment

The framework areas are inter-related and feed into one another, with Area 1 (*Visibility and Vision*) feeding into

Area 2 (*Operations and Management*), Area 2 feeding into Area 3 (*Review and Evaluation*), and Area 3 feeding into Area 4 (*Decision-Making and Investment*).

Each of the four areas of the framework is examined below. Overall, the framework can be helpful to institutions in areas such as the following:

- initiating core facility management discussions with facilities, units, and other stakeholders
- most effectively serving and using input from faculty and other facility users
- dealing with underperforming core facilities
- considering core facility investment decisions

Area 1: Visibility and Vision

The visibility of core research facilities within an institution and the institutional vision related to core facilities create an important foundation and set of boundary conditions for strategic core facility management.

Questions, challenges, and opportunities that fall into this area include the following:

- visibility of available core facilities
- availability of core research facilities (especially for junior and new faculty members)
- facility access rules, policies, and processes
- institutional commitment to core facilities (and how this is demonstrated and communicated to faculty members and other stakeholders)
- presence and role of core facilities in research strategic plans (at unit and institutional levels)
- understanding of "Who pays for what?"
- processes and pathways for creating new core research facilities based on faculty needs
- philosophy and culture for sharing research equipment and technologies at institutional and unit/discipline levels (e.g., differences between biological sciences disciplines and engineering disciplines and how these differences can be mitigated when researchers come together for collaborative, interdisciplinary research)

Area 2: Operations and Management

Facility operations and management are the front lines of effective, compliant service delivery to faculty and other researchers.

Questions, challenges, and opportunities that fall into this area include the following:

- core facility business model development and execution
- institutional service center (and related) policies and

procedures governing core facility operations and management

- performing rate calculations based on actual costs
- decision processes in arriving at rates charged to users (e.g., subsidy sources)
- development of rate structures (including differential rates by user type)
- predicting demand for core research facilities
- estimating use of new, emerging core facilities and factoring these estimates into subsidy requirements and expected chargebacks
- managing the queue of users
- tracking use and utilization, conducting billing, and related activities (with or without sophisticated systems and databases)
- defining and communicating facility access and priority policies and procedures
- understanding and managing regulatory compliance
- presence and roles of a technical director, scientific advisor, and other key core facility personnel
- presence and use of user groups, advisory committees, and other organizational structures
- role of service contracts
- managing core funding and other mixes of funding sources
- links between planning and maturation curves for technologies and facilities

Area 3: Review and Evaluation

Formal and/or informal facility review and evaluation can help to translate core facility vision and operations into more effective decision-making and investment, enabling focus on productive facilities across a range of management models.

Questions, challenges, and opportunities that fall into this area include the following:

- processes and policies related to core facility review and evaluation
- approaches to business/financial and/or scientific/technical review
- process for new core facility start-up (e.g., starting from faculty needs and ideas)
- discovery of core facility duplication
- costs and benefits of facility duplication and redundancy
- sustainability planning
- policies and procedures related to sun-setting core facilities
- efforts to measure facility use, value, and service to researchers

- compliance reviews and accountability (and related roles and responsibilities)
- processes for sharing operational “best practices” among facilities
- role for proactive management, review, and evaluation from a centralized office

Area 4: Decision-Making and Investment

Improved institutional mechanisms related to core research facility decision-making and investment can aid all aspects of facility operations and strategy.

Questions, challenges, and opportunities that fall into this area include the following:

- organizational and governance structures (and relationship to the size, history, and culture of institutions and units)
- communication channels between units and related management and governance challenges
- core facility decision-making processes and individuals involved
- role of formal and informal advisory councils, committees, and groups in decision-making and investment
- potential economies of scale and efficiencies from sharing technical/administrative staff among facilities
- institutional core facility investment amounts and goals
- “incentivizing” joint and leveraged investments in core facilities from department chairs, directors, deans, vice presidents for research, provosts, and other leaders and stakeholders
- managing investments from units with differing capacities to invest
- attempts to quantify return on investment from core facility investment via increased competitiveness for external research funding
- equipment funding sources, models, and challenges
- institutional matching fund policies and processes for shared equipment grants
- internal selection processes for limited submission-shared equipment grant programs
- attention to “hidden” core facility subsidies (e.g., space, utilities, opportunity costs)
- benefits and costs of investments in sophisticated systems (e.g., scheduling, use-tracking, billing, and data delivery)

CONCLUSIONS

The introduced framework for managing core facilities within the research enterprise attempts to strike a balance between having sufficient detail to be useful while keeping things simple enough for stakeholders to get their hands around the issues.

It is anticipated that this framework can help institutions start discussions among individuals and groups and form a launching pad for additional exploration. Additional structure and focus can be developed inside this framework in a manner customized to individual institutions. This said, we think that there is value for institutions to initially consider the issues in the generalized framework on more or less equal terms before deciding where the biggest challenges or largest opportunities may lie within a given institution.

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