

SPACE PLANNING AND MANAGEMENT IN ACADEMIC MEDICAL CENTERS

Issues, Models and Resources

A PROJECT OF THE
GROUP ON INSTITUTIONAL PLANNING AND
GROUP ON BUSINESS AFFAIRS

APRIL, 1991

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ASSOCIATION OF AMERICAN MEDICAL COLLEGES

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Foreword

The growth of academic medical centers during the past three decades is easily measured in people and dollars. During this period, medical student enrollment doubled, while faculties expanded sixfold. The total operating revenues of the nation's medical schools increased in real terms at a compound rate of over 13 percent annually, with much of the increase due to expanded federal investment in research and an improved system of reimbursement for patient care.

To meet the enlarged commitments in education, research, and patient care that accompanied this expansion, the physical facilities that house these programs have become a critical resource. During the 1950s and 1960s, federal construction programs--particularly those of the National Institutes of Health (NIH)--supported the growth of medical school research facilities. However, this support was not sustained. Buildings constructed in the 1950s and 1960s, still prominent on medical center campuses, are now showing their age. Most are in need of renovation or replacement. Deteriorating infrastructure has become one of the most pressing challenges for those charged with leading academic medicine into the next century.

The need for space and facilities is most visible in achieving the research mission of academic medical centers. In a 1988 study by the NIH, 45 percent of medical schools surveyed described their facilities as inadequate to support the needs of biomedical research programs. This assessment is prompted not only by a desire to expand research activities but also by the nature of science (e.g., the emergence of molecular biology and biotechnology), by how science is organized (e.g., the need to promote multidisciplinary research efforts), and by how laboratory work is regulated (e.g., the need to comply with new environmental, health, and safety standards). The facilities needs of academic medical centers are not driven only by the research enterprise. Changes in educational programs are also having an impact--in implementing new, problem-based curricula, in integrating advances in information technology with approaches to learning, and in adapting to the need for more clinical training in ambulatory settings.

Resource constraints are likely to limit our ability to keep facilities current and adequate to the missions of academic medical centers. It is vital, therefore, that we do the best possible job in planning and managing space. The AAMC's Group on Institutional Planning and Group on Business Affairs, whose members are most often assigned this responsibility, have taken on the daunting task of synthesizing much of what is known and what has been done well in this field. Their efforts have

resulted in this volume, which weaves conceptual approaches to various aspects of space planning and management with examples and models provided by our members.

The book is a thoughtful and comprehensive compendium that should become an important reference in the academic medical community. I applaud the Groups for sponsoring the project and thank the many Group members who contributed to it. This project is but one example of the many contributions by AAMC Groups to the work of the Association and the benefit of our member institutions.

Robert G. Petersdorf, M.D.
President

Preface

The Group on Institutional Planning (GIP) and Group on Business Affairs (GBA) of the Association of American Medical Colleges (AAMC) have a particular interest in the problem of providing adequate space and facilities for the future needs of the nation's academic medical centers. In January 1989, Robert Reynolds, M.D., then chair of the GIP, and Roger Meyer, then chair of the GBA, appointed a joint space planning and management task force. Noting that space makes one of the biggest demands on an institution's financial resources and requires one of the largest blocks of time in the planning process, the Group chairs charged the newly appointed task force to "develop, on a pilot basis, information AAMC member institutions can use to evaluate existing space or assess the need for new space."

As a first step in gathering relevant information, the task force conducted a survey of 27 AAMC member institutions. The survey was designed to identify areas of space planning and management of particular interest and concern to participants. The task force also used the survey process to collect documents describing existing procedures in use for managing space and planning for space needs.

After completing the survey and analyzing the results, the task force called on survey participants and other institutional representatives to help define further the critical issues. The task force's initial objective was to gather comprehensive data on space norms. The group soon came to believe, however, that the audience would benefit more from a thorough identification of issues in space planning and management and a beginning identification of information resources, including descriptions of local institutional approaches.

Although the task force uniformly supported these modified objectives, meeting the objectives proved difficult. Initial attempts to involve many people in the creative process caused logistical difficulties. Gradually, responsibility for writing the text fell to three members of the task force: Tom Rolinson, Dick Laverty, and Horace Bomar. Because their contributions to this final report are based heavily on their individual experiences in space planning and management, they have been credited with authorship of their respective sections. Janet Froom served as the essential link to seeing the project through to its completion. The extent of her contribution is recognized by her designation as editor.

This final product of the task force is intended as a guidebook for faculty, department chairs, members of space planning committees, deans, vice-chancellors/vice-presidents, presidents, and administrators who seek to

improve institutional effectiveness in the planning and management of space and facilities. Its scope, by design, is limited to space used for educational and research purposes, and for administrative support. The specialized nature and problems of clinical space were seen as beyond the capacity of the task force to address adequately.

Although substantial, this volume is not intended to be a definitive resource. We present it as a catalyst for thought and further contributions from those who use it. Although we searched extensively for institutional models and procedures in space planning and management, we expect that in ensuing years other approaches will be identified and existing approaches refined. The textbook on space planning and management continues to be written in the ongoing practices of planning and business administrators. Therefore, we urge the GIP and GBA to continue to identify institutional models, methods and procedures, and other resources for effective space planning and management. Only by the continual dissemination of these approaches can the art of space planning and management in academic medical centers be advanced.

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Acknowledgements

Throughout the project, the task force has had the benefit of generous assistance from members of the academic medicine and higher education communities. Work began with a survey of 27 institutions to determine areas of primary concern and to collect documents detailing institutional procedures. As the project evolved and expanded, others were engaged to attend briefings, write background papers, submit institutional examples, and offer expert advice and counsel in other ways. The task force was not always able to include narrative and information submitted specifically for the book because of the need to reduce the scope of the project (and the document) to a manageable size.

It is not possible to detail the specific contributions of each person who gave time and energy to this project, although in many cases the efforts were considerable. We gratefully acknowledge the assistance of the following individuals:

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Master Planning

"Master planning" means different things at different institutions. As described in this chapter, master planning refers to the idea that a campus should pause periodically--at least every 10 years--to take a "snapshot" of its activities and directions. This picture--a genuine assessment of achievements, societal needs, and available and anticipated resources--provides the foundation for continued master planning and is the essence of a master plan.

Needs must be identified before there can be a plan to address them. Although there are many ways to define "need," for planning purposes the most basic approach is to view it as a campus's desire to

- o improve its academic stature, expand its base of influence, and achieve greater recognition; or
- o sustain its current position, direction, and programs; or
- o survive.

All of these options require some form of interactive planning. All demand continued and usually increased resources. Except for a few fortunate institutions, resources--especially funding--are the single most achievement-limiting factor. But in addition to the need to survive, there is an inherent need to plan. Planners develop a justification for continued and improved levels of funding and, as a planned result, an improved existence. As the marketing document used to secure additional resources, the plan itself thus becomes a necessity.

Reality dictates that master planning will be composed of information taken from several different processes, documents, organizations, and individuals. These complex elements can be divided initially into three subsets: (1) program planning--planning that deals with the content, quality, and scope of the academic endeavor and its setting; (2) resource planning--planning that deals with the extent, nature, and capacity of resources required to sustain and improve the academic endeavor; and (3) strategic planning--the design and implementation of actions needed to secure the resources for improvement of programs. Each of these primary types of planning depends upon several "feeder" planning processes, which are described on the following pages.

Program Planning

Program planning can be divided into two subsets. **Academic planning** consists of development by the faculty of priorities for research and instruction. Faculty members are charged with developing plans based on estimates of funding levels, enrollment patterns, community needs, and research interests of the faculty.

Academic-planning documents traditionally have been general in nature. In documents written to express academic need, terms such as "excellence," "quality," and "foremost" have been overused for the positive; while "deteriorate," "destroy," and "unacceptable" all too often have recurred for the negative. In order to be viewed as a responsive statement of academic need--i.e., an effective marketing document--an academic plan should include answers to the following questions:

- o What is the situation as it currently exists? Provide a clear and concise assessment of program strengths and weaknesses, a time-specific delineation of the managed resources supporting these strengths and weaknesses, and a summary of any potential resources and reserves that can be devoted to current activities.
- o Where would you like to go? Include a statement of academic direction that builds upon the strengths of the campus and then proceeds to explain which programs should be improved, added, expanded, left alone, or discontinued.
- o What will it take to get there? Develop a projection of faculty, students, and support required to achieve the objectives set by the academic direction of the campus.

The above should stop short of detailing needs for space and sources of funding. But it should contain alternatives for achieving program objectives, and these alternatives should be assigned priorities. To be successful, the academic plan must be developed and expressed in a manner that allows it to be analyzed and quantified for purposes of procurement or assignment of resources.

Campus character, the second part of program planning, describes how the campus is perceived by its internal as well as external audiences: neighbors, local elected government, campus community, and media. Although clearly part of a new campus's development and planning, the campus character or image is often forgotten as a campus ages. The campus image includes its size, appearance, and general ambiance. Over time the image can change for the worse if elements that comprise the campus character are allowed to change without considering their effect on the whole. For example, reducing the amount of green space, adding parking in a haphazard fashion, building higher and higher, and exhausting more into the atmosphere all affect how the campus is perceived. Campus character influences support, especially when the campus turns to its support groups, communities, and individuals for their assistance and endorsement to modify the campus's master plan.

Resource Planning

Resource planning involves analysis of the products needed by the campus to meet the objectives of the academic plan and to keep within the established and desired image of the campus. Resources are not limited to dollars and space. The following resources all require attention from planners:

Resource	Planners Ask	Planning Type
Land	Is there an adequately sized and located site?	Site Development Planning
Capacity	Will the site support the building and systems plan?	Infrastructure Planning
Space	Are buildings being utilized to their maximum potential?	Space Utilization Planning
Released Land and Funds	When will the buildings become obsolete?	Obsolescence Planning
Funds	Is there adequate funding?	Financial Planning
Support	Can we maintain the support of our community?	Community Communications Planning

The other limited resource we manage, which is associated with each of the above plans or planning processes, is time. How much time should be budgeted to accomplish each of the above objectives in an acceptable manner? Planners must consider not only the time required to accomplish a task, but also the sequence of events necessary to complete certain planning processes.

Strategic Planning

Strategic planning includes the decisions and actions needed to achieve the objectives of the master plan in the shortest possible time, while maximizing benefits derived compared to resources used. The strategic plan or planning process is *not* the campus's master plan; it represents the strategy to achieve the objectives of the master plan.

The success of an institution can be determined by asking if it has reached the objectives set in its master plan in a time frame acceptable to the designers. Unfortunately, few campuses have definitive master plans; few of these plans are composed of the elements outlined above; and even fewer couple a timeline to the achievement of the plan's objectives. Further obscuring the search for a perfectly designed and implemented master plan is the fact that few of the original master plan designers are still around when it is evaluated--if it is ever evaluated. History tells us, then, that master planning has been at best a rather inexact science and that there are few successful models to rely upon. Yet today's academic medical centers demand better justifications, more precise analysis, and clearer pictures of what lays ahead--in other words, better planning.

Institutional Responsibility for Master Planning

Who is responsible for "The Master Plan"? For the master planning process? A coordinated master planning effort requires complete endorsement and involvement by the campus and school leadership. The president or chancellor¹ must be responsible for development of the

¹ The frame of reference for titles used in this chapter is a freestanding health sciences institution. Readers from institutions that are part of a larger university can translate these titles according to their own situation. "President or chancellor," for example, might become "vice-president or vice-chancellor for health affairs."

master plan. Responsibility for the program component should rest with the vice-president or vice-chancellor for academic programs, while responsibility for resource support traditionally resides on the administrative side of the organization. As space has become such a critical resource, responsibility for resource analyses and feasibility studies has gravitated toward the academic side.

Apart from this higher level of master planning, responsibility for many of the incremental plans (subsets of the master planning process) must remain with organizations designed to collect the necessary data and manage the daily operations. A suggested alignment of responsibilities for plans follows:

Type of Plan	Responsibility
Master Plan/Planning	President or chancellor (for overall coordination)
Academic Plan	VP or VC for academic programs (for program definition and delineation)
Campus Character	President or chancellor and those responsible for design and implementation of planning processes
Resource Plans:	
Site Development Plan	VC for administration, delegated to planning office
Infrastructure Plan	VC for administration, delegated to facilities mgmt
Space Utilization Plan	VC for administration, delegated to campus planning office; further delegation to deans
Obsolescence Plan	VC for administration, delegated to campus architect/engineer or facilities management
Financial Plan	VC for finance, delegated to campus budget officer; further delegations to deans
Community Communications Plan	Chancellor or VC for academic programs; further delegations to deans
Strategic Plan	Chancellor and deans

The actual management of the master planning process should rest with one office or individual. The individual should be removed from the rigors of dealing with daily operations but should be in a position within the leadership to know not only what is going on but how well the campus or school is following its previous plans. In the past, funds received more

attention than space, and most planning activities emerged within the campus's administrative structure. In schools, planning evolved as a part of the dean's office, usually vested in one individual or a part thereof. As the need for better planning--not only for funds but for space and other support elements--has increased, planning offices (or offices of institutional studies or resource analysis) have assumed the responsibility of coordination. The individuals who coordinate master planning can now be found just as readily on the academic as on the administrative side of the campus organizational chart.

The information systems office is another unit that has an essential role in the design, maintenance, and responsiveness of all the plans and processes that support collectively the master plan. Without accurate, timely, and complete data, none of the various interdependent plans would be reliable. One office on the campus and in each of the major schools should be assigned to collect, verify, and disseminate information required by any planning process and to answer queries from outside the campus. This responsibility should not be assigned to the office responsible for the daily functioning of the computer hardware and software.

The above does not include the consultative processes and necessary involvement of the faculty senate or approved student governance. Those are formal organizations that are the responsibility of the chancellor or president.

The Master Planning Process: Suggested Approaches

The process of master planning should never end. Only the periodic snapshot of achievements and future aspirations need be time-targeted. When should the snapshot--i.e., each master plan--be finalized? In the past the definitive answer would have been "every 10 years," but this guideline is no longer necessarily relevant. On one extreme, it takes an average of 10 years just to design and build a new major building; on the other hand, the onset of an overwhelming virus such as AIDS or a molecular breakthrough can change the direction of campus programs in a very short time. The best response to the uncertainty with which we live is to design and implement a planning process that is continuing and open, that looks ahead by accurately analyzing the past, that is sensitive to the surrounding environment and interest groups, and that can be summarized and priced-out in as short a time as three months or in six months maximum.

The planning process, then, must be flexible. Each of its primary subsets should be continually "on-call" for current status and evaluative information. The need for timely updates calls for a planning process that is coordinated, that represents vital campus and community interests, and that concludes with a reference document reflecting the master plan of the campus or school. This process can be seen as a continuum involving three elements: time, organizations and individuals, and functions.

Time

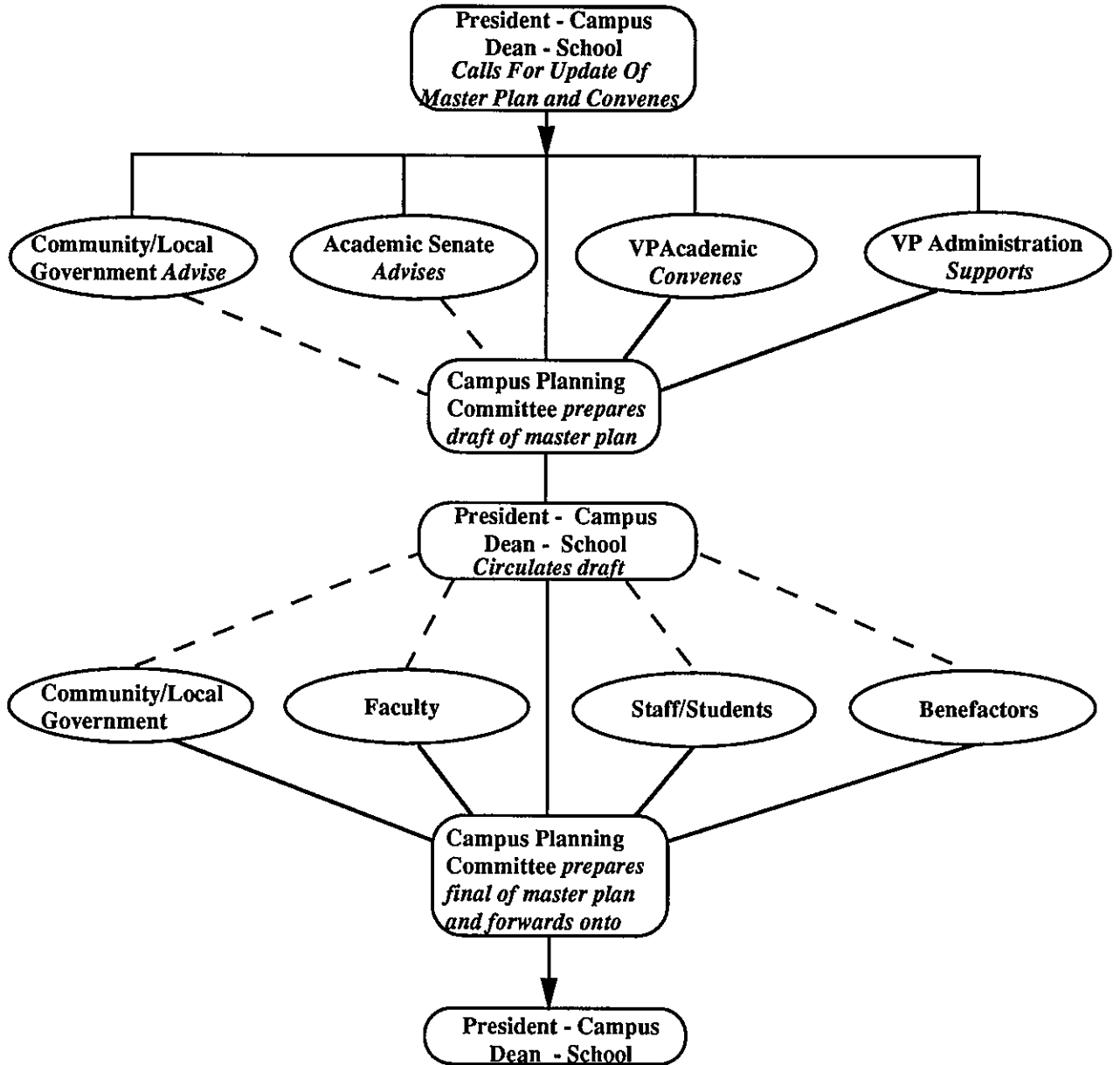
The planning process should include the following time-related elements:

- o An annual faculty/administrative forum, where program direction is debated
- o A quarterly meeting with a representative group of neighborhood residents, where the campus openly discusses its plans and planning processes and accepts feedback
- o An annual (or more frequent) planning meeting with local government, where each party details its plans and highlights areas where there might be an impact on the other
- o A bimonthly meeting of the campus planning committee, whose role is the continuing coordination of all the subset processes needed to assure that the campus planning process can generate a timely assessment of programs
- o Preferably a monthly, but not less than quarterly, meeting of the key managers and professionals responsible for the various planning processes and plans

Organizations

The organizations that have primary responsibility for the master plan are summarized on the following page.

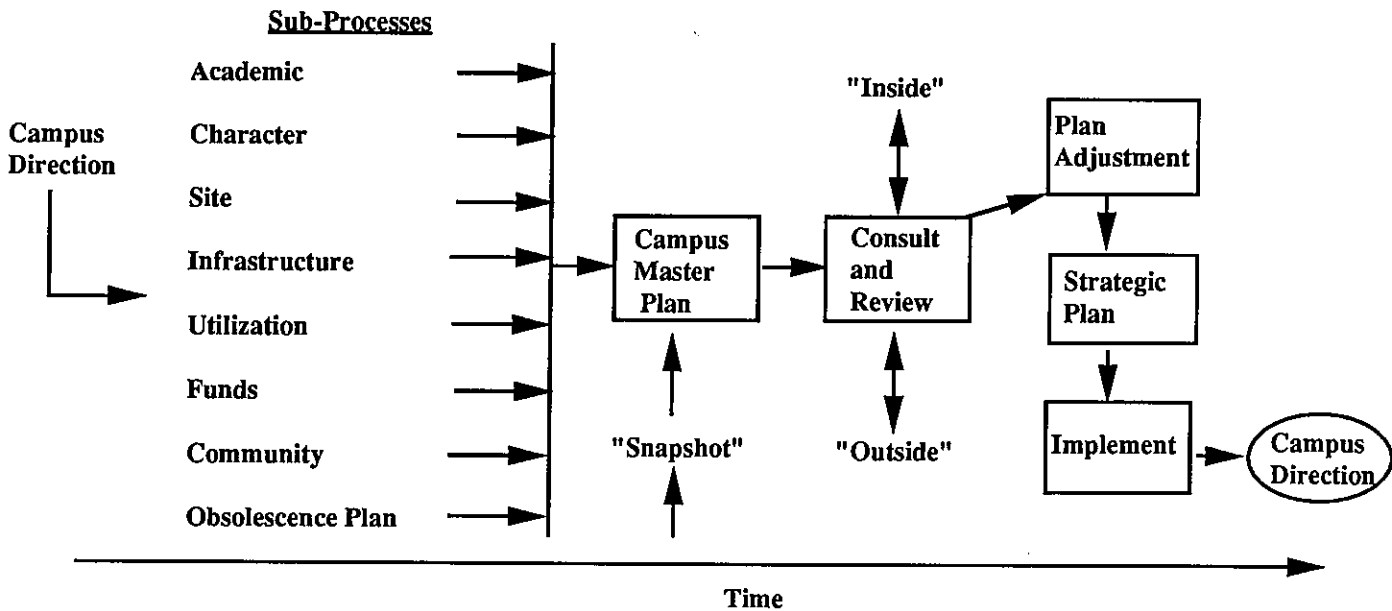
Master Plan Responsibility (Organization)



Function

The master planning process described above can be summarized as follows:

Planning Process - Function



Products of the Planning Process

This section will discuss the contributions that each subset plan makes to the overall master planning effort. The list of products outlined below is not all-inclusive, but it represents a general consensus of some of the important information expected from those responsible for each of the feeder plans or processes.

Academic Program Plan: The plan needs to be definitive, so that the scope and depth of each component can be translated into needs for space. The products of this planning process should include

- o Listings, from the smallest to the largest, of the organizational units that comprise the academic program

Space Planning

- o Diagram of the organizational and functional dependencies associated with any of the units that require proximity to each other
- o Summaries depicting the current space assignments, proximity configurations, and commitments of infrastructure for each organizational or functional unit
- o Tables summarizing all essential resources, as of a specified date, garnered and approved for each unit
- o Projections of the resources presented above, gauged to coincide with what could be expected at the completion of the revised master plan
- o Designs of the changes in space required to handle the projected resources expected at the conclusion of the master planning process
- o Analysis of any substantive changes in infrastructure required to handle projected modifications and/or additions to programs

Campus Character Plan: What should the campus look like? The product of this plan is more a statement of intended image than it is a plan. It represents a model of how the campus hopes to appear when a "picture" of the campus is shown to its various supporters and critics. It speaks not to the academic programs conducted within campus space, but rather to the nature, feeling, look, and attitude that the campus conveys. The statements should be presented in a manner that can be measured--for example:

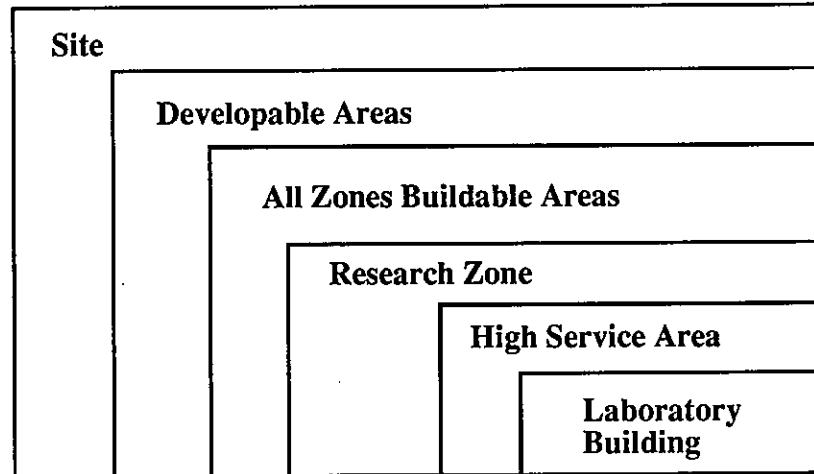
- o Ratio of footprint of built and planned structures to open space
- o Ratio of height and bulk of structure to available footprint
- o Percentage of campus population housed on site
- o Census of campus population and visitors

- o Design, content, and scope of campus logistical and access systems
- o Mix of primary functional focuses
- o Degree of dependence on surrounding community services
- o Extent of dependence on and influence of multiple sites

Site Development Plan: How should the site be developed not only to accommodate the current and projected needs of the academic program, but also to achieve the objectives detailed in the statement of campus character? All land is not equal. To maximize overall site utilization, this plan should match the assets that can be developed at each campus site with logistical, programmatic, and aesthetic considerations. Site-development planners use zoning concepts similar to those used in the planning and development of a city. Such concepts include:

- o Protect land that cannot be developed and environmental "set-asides" in laying out the campus's acreage.
- o Design the campus/neighborhood boundaries and interfaces so that they complement and enhance one another.
- o Develop the infrastructure plan so that it supports the concentration of activities in specific site zones that match available and planned capacity of utilities.
- o Design area-utilization formulas for each functional zone of the campus, and concentrate structure and permanent systems accordingly. Assign measures to a stepdown model, as depicted on the following page.

Campus Zoning Stepdown



Infrastructure Plan: Planning for utilities and support services is the foundation against which proposed program changes designed into the master plan must be assessed. Because of time considerations, infrastructure planning and its implementation must precede the implementation of dependent master plan projects by several years if the campus is to develop in a cost-effective manner.

Without adequate assessment of the capacity of systems, any of the components of an infrastructure plan might become a "weak link" and therefore constrain development of the master plan. The primary elements are listed in the chart on the next page. Each of the elements of infrastructure should be evaluated in the following context:

- o Is there sufficient system and/or structural capacity to accommodate revisions and expansions?
- o Are the currently maintained systems and structures safe (i.e., are they in conformance with code)?
- o Is the mix of infrastructure elements matched, in the most efficient and effective manner, to requirements for program utilization?

**Organization Of Facilities Support Systems Components
That Comprise The Infrastructure Plan**

I. STRUCTURES (Buildings)
<p>A. DYNAMIC/MOVING/CONVEYING SYSTEMS</p> <ol style="list-style-type: none"> 1. Mechanical System 2. Electrical System 3. Water System <p>B. BUILDING ENVELOPE</p> <ol style="list-style-type: none"> 4. Roofs and Drains 5. Exterior Walls, Windows , Entries and Frames/Foundations <p>C. INTERIOR AND COMMON SPACES</p> <ol style="list-style-type: none"> 6. Public Areas 7. Other <p>D. STRUCTURAL DESIGN</p> <ol style="list-style-type: none"> 8. Seismic 9. Other
II. UTILITIES/CENTRAL SYSTEMS
<ol style="list-style-type: none"> 10. Electrical System 11. Signal System 12. Domestic Water System 13. Compressed Air System 14. Steam, Chilled Water and Condensate Return System 15. Sanitary and StormSewer System
III. CIRCULATION
<ol style="list-style-type: none"> 16. Pedestrian Circulation 17. Vehicle Transportation 18. Materials Handling 19. Animal Handling
IV. GROUNDS
<ol style="list-style-type: none"> 20. Hardscape 21. Softscape

Space Utilization Plan (Space Plan): The primary objective of the space utilization plan (or space plan) is the most efficient utilization of buildings. If the site development plan and infrastructure plan are adhered to, space planning becomes easier. If you build research buildings--with more than adequate support systems--and locate research programs in those buildings, you achieve an objective of space planning. However, pressures will work against such an idyllic conformance and must be managed. These pressures include

- o Cannibalism of one functional type of space (usually teaching) for another functional type (usually research)
- o Transfers of programs from one building to another in a nonconforming zone (usually following departmental reorganizations or transfer and/or promotion of faculty)
- o Temporary assignment of space in a building that does not provide the services the program requires, causing large capital expenditures; or, conversely, locating a low-service-use program in a full-service building, causing an inefficient use of space
- o Housing programs in obsolete structures where the resources required to match the program needs are not available or the buildings are not usable and require large commitments of resources for renovation
- o Commitments of space for recruitment purposes regardless of the fact that the space does not match the recruitee's needs

These are a few of the recurrent pressures that, if not resisted or accommodated in other ways, will push the space plan out of sync with efficient utilization. If space allocation is allowed to proceed merely as a response to pressure rather than as a match of program to structure, it will not take long--probably about a decade--before orderly, longer-range planning becomes exceedingly difficult and the solutions become increasingly more complicated and expensive. When pressures for short-term needs are accommodated, the summary of these accommodations becomes a primary input to the revision of the master plan. The results of these accommodations should be recorded in the campus space information inventory.

In addition to incorporating solutions to decisions driven by pressure in the past, the space plan includes responses to two evaluative factors: (1) What is the current ability of each building and its inclusive space to accommodate the functions it was designed or renovated to house? and (2) What is the ability of that building and its inclusive space to accommodate functions different from those for which it was designed or is currently housing? These factors can be measured. The chapter on obsolescence planning details a "Building Assessment Model," which offers a quantitative method to determine the answers to these two questions.

Master planners will look for the following information in the space utilization plan: (1) What valid commitments have already been made, and what are their real program requirements? (2) What is the capacity of current buildings to house existing programs, and is it being done efficiently? and (3) Can existing buildings be modified and/or used more efficiently to house other functions that more closely match the current program direction? In other words, can the space now occupied be better utilized?

Obsolescence Plan: This component involves the planning, beyond traditional long-range planning, that allows obsolete structures and systems to be removed so that the site can again be used to meet the projected needs of the campus. This plan and its importance to master planning are discussed in detail in its own chapter. The primary contribution of the obsolescence plan to the master planning process is the timing it sets to remove existing space from the space inventory, thereby displacing programs that may or may not have to be accommodated within the revised master plan.

Financial Plan: What funds, in what amounts, and over what time periods will be required to achieve the objectives of the master plan? Little can be accomplished without expenditures, and expenditures require offsetting revenue. As with obsolescence planning, a separate chapter has been devoted to financial issues. The financial plan's primary contribution to the master planning process is verification that the funding needed to accomplish the objectives of the master plan can be achieved.

Community Communications Plan: Community planning not only means involvement (or lack thereof) in the affairs of the campus, but the consequences resulting from the community's support or opposition to the

objectives of the campus's master plan. "Community" is used here to mean primarily those individuals and interest groups external to the campus population. But the internal campus community (i.e., students, staff, patients, and faculty) must not be forgotten. Designers of the campus planning process need to know

- o Who is the campus community? Where are members of the community located? What are their cultural identities and needs? Ages? Health and education requirements? Levels of mobility? What surveys need to be conducted to collect this information?
- o To what extent do community members understand the purpose of the academic medical center? To what extent should they? What educational outreach programs need to be designed and conducted?
- o What does the community expect from the campus (e.g., educational programs, recreation, safety, health care, parking)? What resources are required to be a good neighbor?
- o How do representatives of the media (print and video) perceive the campus? Is this perception accurate or should it be addressed? Does the campus staff include internal communication coordinators?
- o Does the campus plan incorporate a responsive approach to environmental and community safety issues? What mitigating measures need to be adopted, and at what expense?
- o Does the campus anticipate legal obstacles to implementation of the master plan? Can these be overcome, and at what expense?
- o What economic impact does the campus have on the community?

As campuses revise their long-term expectations, it is not unreasonable to expect growing neighborhood concern about and involvement in the institution's planning processes. This increasingly

complex factor is explored further in the chapter on community and environmental coordination and planning.

Additional Sources of Information

The following documents, abstracted in this book, may be useful to those interested in master planning:

1. "Health Sciences Space Planning Model" (1989), University of California, San Francisco (see page 170).
2. "Final Report for the University of Texas Health Science Center's Space Standards Committee" (1988) (see page 182).
3. "Final Report of the Task Force to Review and Update the Planned Renovation of the Health Sciences" (1989), University of Washington (see page 186).
4. "Needs Assessment: Research Space Survey Form," Washington University School of Medicine (see page 176).

The following institutional representatives have volunteered to share their recent experiences in master planning with interested persons:

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Community and Environmental Coordination and Planning

What do community and environmental issues have to do with space planning at the academic medical center? Naturally, the answer varies from campus to campus. But for planners at any institution, neglecting community and environmental concerns can add time to the space acquisition process, generate credibility problems for the institution and its leadership, increase the funds required to staff response and image management organizations on campus, and open the door to legal challenges.

These consequences usually can be avoided when the institution's space planners anticipate and deal with the community's concerns. These concerns might include the following: Will research to be conducted in the planned space be safe? Will the campus's need for additional land swallow up the surrounding neighborhood? Will the campus's growth change the character of the neighborhood so that property values decrease or local taxes increase? Will increasing numbers of visitors to the campus and surrounding area monopolize parking and services to the detriment of local needs? Will campus staff and students absorb all of the community housing rentals and create a transient, little cared-for environment? What really goes on in those large, overpopulated buildings with all the mysterious vapors rising from the rooftops?

In essence, community members want to know what the institution is doing, what it is planning, and how it will affect them. Probably as important, they do not want to feel ignored by the neighboring institution.

The degree to which community concerns affect timely development and implementation of the campus's master plan will depend on a number of institutional factors, including

- o The extent of dominance: What are the characteristics of the campus location? Is it a university town, rural setting, or large city? Are there multiple sites? What is the site's intensity in bulk and population? What aesthetic features are prominent?
- o The extent of independence: What is the extent of the institution's land bank? This determines whether campus planners rely only on land already owned or must reach into the community to acquire land to meet needs for space.

- o The remembrance residual: What is the history of past institutional dealings with the community? This will influence the amount of trust community members will exhibit when support is solicited for new planning endeavors.
- o The image: How is the campus perceived by those who influence or who can influence the institution's plans and direction?

Environmental and situational factors also influence whether a campus will meet resistance in carrying out its master plan. Publicity, initiated from within the campus, should be positive in content. It can be negative in effect, though, if it is too intensive, does not represent fact, creates its own expectations, loses touch of the primary institutional functions, or becomes reactive and defensive. Societal demands must be accounted for within the planning context to assure that the campus is not seen as out-of-step with reality. Fear of things unknown or uncertain must be dealt with when presenting program details needed to justify additional space. Issue targeting by media and interest groups for self-serving purposes increases as issues and projects surface in the planning process. Coordination with local government can bridge communications with the public and assist the campus. An antagonistic local government, however, can be decisive in polarizing resistance.

When institutional planners misjudge or misread the will of their communities, negative and costly effects can result. The need for careful attention to community needs is illustrated by the ways public support changes depending on which major campus function (instruction, patient care, or research) is involved. There may be broad acceptance for increases in class size for professional doctoral programs or strong support for clinical advances in neonatology, but research of just about any type in the academic setting will raise concern. Those leading the campus planning process must take time to assure that the process is designed and conducted in a way that anticipates these concerns, understands their underlying causes, and manages solutions in a sensitive manner.

With campuses running out of land, becoming intensely crowded, requiring full operation for longer hours, absorbing larger clinical workloads, and existing in aging infrastructures that cannot keep up with program demand, institutions need the support of their communities,

media, and politicians in space planning. The following section discusses alternatives to organizing and proceeding to secure this support.

Campus Organizations Responsible for Community Relations

Some of the organizations that provide the interface, coordination, and communication with neighboring communities appear below.

Staff	Responsibility	Focus of Activity
Campus/public relations	Provide written and verbal responses to requests for information from external community	Individuals
Community programs	Design and conduct programs, events, and classes that benefit and meet community health prevention and awareness needs	Groups and subject matter
Media relations	Manage daily exchanges between campus and newspapers, television, and public interest groups	Events
Environmental health and safety	Assure safety of operations and buildings, not only for campus workers but for visitors and neighbors	Monitoring and incidents
Planning office	Provide liaison and communication with local government offices on issues of zoning, service support, logistics, and community concerns	Projects

In addition to these five campus organizations, the legal affairs staff is responsible for assuring that whatever the campus does in support of its community is done in accord with sound legal precedent.

This list is not exhaustive but representative of the organizations that have formally recognized relations with the community. Although there should be a central authority for each of these organizations, often responsibility is shared by the dean's offices and central administration.

The six organizations are described below, with specific attention to the responsibilities that influence community support and resistance.

Public Information

The campus should explain the need for growth, justify the growth, and develop plans to manage growth in a consistent and accurate manner. Institutional representatives should use reliable reference documents that represent the same periods of time. A guaranteed way to lose institutional credibility is to release information that is inaccurate or that keeps changing. The public information office should assure that (1) it collects data and information relevant to campus operations and essential to planning activities, (2) it has in place systems that verify accuracy and inclusiveness, (3) information can be distributed legally, (4) those responsible for data development are aware that it has been released, and (5) information is provided in a manner and form that garners support.

The types of space planning data and information that should be coordinated for distribution by the public information office include (1) space inventory information, to include types of space, square footage, utilization, stations, etc.; (2) campus character information, to include population, location, aesthetics, functional mix, etc.; (3) infrastructure data, to include capacities of permanent systems, status of maintenance, reserve balances, etc.; (4) program information, to include academic disciplines, faculty's areas of focus, student enrollments, publications, awards, etc.; and (5) campus operations data, to include amounts of purchasing, traffic, housing, hours of occupancy, services, etc. Planning projections and justifications are based, in whole or in part, on all of these. The community expects that the information presented by the institution has been researched and verified and that it represents fact.

Public Programs

Public service provided by the faculty and staff can benefit the campus's longer-range planning. Education about what the campus does, how it does it, and how that benefits society can enlist support and maintain friends. Presentations and forums about what the campus would like to do can be just as helpful in this regard. Some of the specific responsibilities of the public programs office are to

- o Meet with community groups not only to explain the campus's plans and programs, but to dispel myths and misstatements that, if left unanswered, can hurt credibility.
- o Coordinate general information meetings for the community (annually or semiannually) that answer questions, explore joint ventures, detail future planning efforts, enlist support and, in the long term, build trust.
- o Conduct seminars on research issues and subjects that communities feel are relevant. These meetings can help dispel alarm about topics such as toxins and hazardous waste. They must be conducted in a timely, straightforward, professional, and understandable manner.
- o Organize and conduct environmental review hearings that are required by state law or are determined by the institution's governance to be warranted. The objective of the hearings is to establish facts about what, if any, environmental impacts large capital or land-acquisition projects may have on the surrounding area.

Organizing to treat the community differently can have its own problems, especially if trust between community and campus in the past has been high. But the perceptions held by individuals, interest groups, and local government should be assessed before the campus gets too far into a major revision of the campus's master plan. This may help to mitigate hostile, time-consuming debates and potentially project-stopping litigation.

Media Relations

Historically, campuses have relied on their faculty publications to spearhead external communications. Faculty awards, recognition in other forms, scientific findings, and publications collectively help portray a campus's public benefit. A year-end report and internal periodical aimed at faculty and staff can complement these efforts. Institutions traditionally have deemed these adequate forms of communication. But if a campus has changed its image, is contemplating new directions, has entered into controversial programs, or is expanding, the attention attracted by any or all of these actions may require a more organized and professional

approach. If the situation warrants or if future plans might require a change, the campus should consider a new approach to the information needs of the community. As part of added or strengthened responsibilities, a campus media office might

- o Coordinate external media contact with campus activities, programs, and employees
- o Review material developed in response to media requests to assure that it accurately reflects the position and policies of the campus
- o Assist faculty in the preparation of newsworthy information about works in progress; and review the campus's project plans to determine whether they are newsworthy or may cause concerns in the community
- o Conduct research and prepare responses to public inquiry received through the public information office, mail to campus representatives, and media articles or programs
- o Review school and institutional announcements or publications to assure conformity to campus policy and plans

When plans and projects require increased treatment by professional media, the campus can purchase the needed services--especially if the need appears to be of short duration. Strengthening campus staffing on a continuing basis is expensive. Should the level of media exposure increase, administrators should consider organizing campus efforts to acquaint deans, faculty, and administrators with the media and techniques of response; forming a campus committee to review methods of approach to the community and marketing strategies; enlisting media support through proactive involvement in activities; and heightening sensitivity of the campus staff to neighborhood concerns.

Environmental Health and Safety

The role and influence of the environmental health and safety office are changing due to societal factors including growing public concern about a shortage of open space. Many campuses are located in park-like settings

that draw attention if they are changed. There is also heightened awareness and alarm about the use and disposal of toxins and hazardous materials. Campuses, which are large users, are under increasing public scrutiny as to how hazardous chemicals and biomedical and radioactive waste are transported, used, and disposed of. Concerns about air pollution and public awareness of fume hood exhausts and incineration requirements have increased. Finally, as campuses grow, so does congestion. Traffic, noise, and crowding all result from trying to do more in less or the same amount of space.

These concerns can and have been voiced by neighboring communities when they see a campus about to embark upon master planning. Community members perceive that master planning may result in additional buildings and changes in the campus to which they are accustomed. These and other concerns have resulted in numerous federal and state laws and regulations aimed at assuring quality of life and public safety. Traditionally, environmental health and safety offices have been involved primarily in monitoring the campus's conformance with regulations. That responsibility has broadened in recent years, however, to include substantial participation in the planning process. It is now common to find environmental health and safety offices with the following responsibilities:

Hazardous waste management and disposal--to assure that radioactive materials, chemicals, biomedical materials, and flammable materials are received, stored, used, residuals collected, and disposed of in a safe manner; and that future buildings, permanent systems, and projects incorporate all necessary personal and environmental safeguards.

Asbestos removal/containment and monitoring--to complete a comprehensive asbestos survey, assess exposure risks, determine methods of containment and/or removal, justify methods recommended, and coordinate implementation of the overall asbestos plan.

Baseline studies, monitoring and audit--to establish the information database against which all future environmental calibrations are gauged, continue surveillance testing as required, and initiate actions to correct and improve conditions as studies and data dictate.

Regulatory code conformance--to assure that all applicable laws and regulations are interpreted correctly, applied uniformly, and monitored consistently; and, where necessary, that adjustments in operations are made.

Mitigation measures--to follow through on all formal and legal measures, agreed upon during a project's planning process, that require the campus to initiate and maintain certain conditions as part of the campus's continuing operations.

Education and training--to design and implement training for environmental health and safety staff, and to conduct whatever education programs are required to assure that faculty and professional research staff are proficient in operational safeguards and conformance with accepted techniques. Almost every federal and state code and regulation regarding the handling of hazardous materials now includes a training component.

It is not hard to see why a campus's attention to all of the above areas is of concern to the community. When a campus decides to expand programs that have a perceived impact on environment health and safety, the community's concern with planning grows.

Planning

The planning activity should be organizationally independent from operational responsibilities. Planners must have time to conduct research on the need for emerging projects, to consult adequately with those affected, and to develop alternatives for meeting identified needs. This type of staff work and analysis cannot be achieved if planners are involved in day-to-day "combat." Although they need to understand the operational problems the campus faces, their objective must be to look ahead.

Because they analyze and coordinate changes in direction, new buildings, and site acquisitions, planners become active participants in the campus's dealings with its community. Leaders of the planning office must be aware at all times of what is being discussed in the decision-making hierarchy about the future of the campus. In its role of justifying the campus's future initiatives (the reason for much of its interaction with the community), the office has responsibility for: (1) coordinating development

of program definitions, trend analyses, and justification research for campus planning activities, projects, and plans; (2) providing support services for the development and/or revision of the campus's master plan and supporting plans; (3) preparing the campus justification for space and land acquisitions; (4) projecting trends in resources and utilization; (5) verifying that information used in justifying projects and analyzing alternatives is reliable and reconcilable; and (6) compiling and presenting plans and other results of planning.

These activities give the planning office staff an influential role in maintaining the campus's credibility with the community. Mistakes in data display, arithmetic, and projections can all rebound adversely; whereas, on the positive side, accurate and professionally displayed data and understandable narratives can help cement support.

Legal Coordination

Broader involvement of the legal profession in the process and products of institutional and program planning is a relatively recent and evolving phenomenon. Given a burgeoning field of environmental law, an increasing number of Freedom of Information requests, and legal challenges to university growth, legal counsel associated with each of the staffing responsibilities detailed above is important. Expanded legal responsibilities include preparation and presentation of initial documents, and the defense of positions already taken. Responsibilities of campus counsel in the area of community and environmental planning include

- o Reviewing, routing, and coordinating responses to Freedom of Information requests, many of which have to do with planning activities and projects on campus.
- o Reviewing and editing responses to state or federal environmental reviews. The number of such documents is increasing on major projects.
- o Preparing the campus position on litigation, with an increasing area of law covering management of environmental and hazardous waste.
- o Rendering opinions concerning the appropriateness of mitigation measures, compromises in planning, and

commitments to the community to assure that these are legally sound and in keeping with campus governance.

One danger of the expanding legal review of the planning function is the potential for suppression of creativity and the development of alternatives. Is there a legally permissible boundary between conceptual planning and idea development on one side, and concrete plans and projects on the other? When do feasibility studies and analyses of alternatives become statements of intent, therefore open to formal public critique? To avoid legal entanglement, the institution must develop clear definitions, open avenues to information, consistent approaches, and understandable analyses of the campus's current and planned impact upon its communities.

Organizational Options

Where do these six areas of responsibility belong in the campus organization? Can one manager be responsible for all of them? The president or chancellor¹ is ultimately responsible, but it is impractical to have all organizations reporting to the institution's chief executive officer. What delegations are feasible? In considering organizational options, we must keep in mind the following factors: Two of the organizations--environmental health and safety, and legal coordination--are focused on conformance. That is, they usually enforce regulations required by a governing body or law, and report to the highest level of administration. Three of the organizations--media relations, public information, and public programs--have the public, in one form or another, as their primary audience. The remaining organization--planning--bases its success on its ability to know what the campus leadership and faculty think about the future. Therefore, reporting close to the top, as well as coordination throughout the campus, is imperative. Each of these organizations should include representatives from the dean's various staff offices, so that the campus faces external communities as a cohesive team.

¹ The frame of reference for titles used in this chapter is a freestanding health sciences institution. Readers from institutions that are part of a larger university can translate these titles according to their own situation. "President or chancellor," for example, might become "vice-president or vice-chancellor for health affairs."

On most campuses, at least some of these organizations report to vice-chancellors or vice-presidents. Traditionally, the administrative vice-president has been assigned responsibility. But as space takes on growing importance to the development of academic programs, and as planning and environmental health and safety have faculty as their primary benefactors and critics, a strong case can be made for assigning most if not all of the organizations to the academic vice-president.

A Suggested Approach to Community Relations Planning

When planners undertake any revision to the campus's master plan, or start anew, they involve the following groups:

- Group A The campus leadership and faculty, whose objective is to provide an overview of the campus direction. They review and place in proper context the analyses and recommendations of faculty, staff, and consultants.

- Group B The primary managers of support services, who are and will be responsible for the analyses, studies, documentation, and results required to design and prepare the final master plan.

- Group C The campus professionals who will be responsible for marketing the plan to the community, local government, and others.

- Group D Representatives of the community who can speak objectively for the various neighborhood organizations, interest groups, and locales that influence and are influenced by the campus.

- Group E Representatives of campus administration, local government officials, leaders in society, and respected businesspersons who can balance objectively the institution's goals with society's needs and economic realities.

Our concern in this chapter is how to interact with and manage responsively Groups D and E throughout the planning process. The problem that quickly arises is how to identify these people.

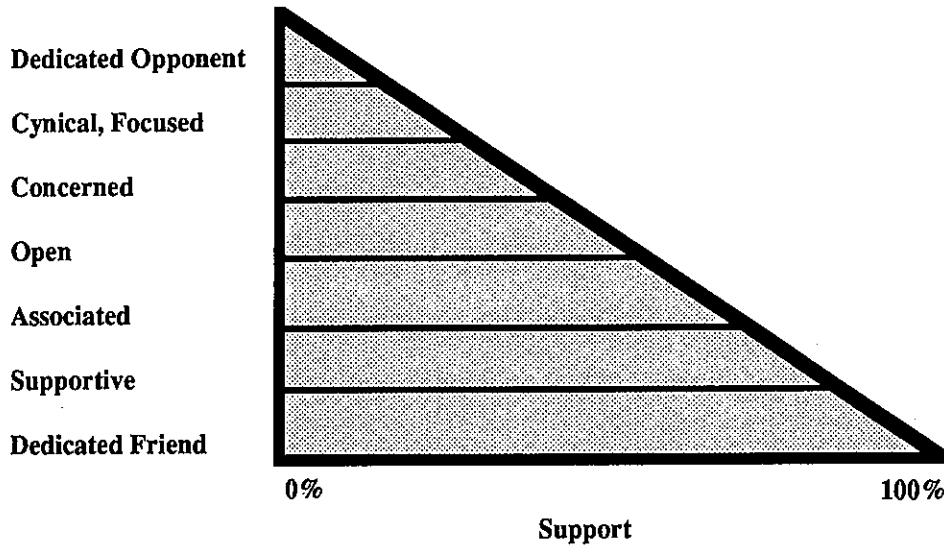
Makeup of the Community

Who represents the community? There will be turnover among those actively involved during a lengthy planning process. Planners are likely to encounter a mix of the following types of community members:

- o The dedicated friend of the campus, who can be relied upon to support a campus position.
- o The supportive individual or group who understands the mission of the university and will support growth and change if it benefits the institution and/or community as a whole.
- o The individual who has an association with the campus and who, if convinced, will support the campus. If unconvinced of the campus's position, this person may take a counter position.
- o The large number of individuals who do not have a position, are open to change one way or the other, and are usually influenced by the events of the moment.
- o The people and groups who have valid concerns about a plan and/or project.
- o The cynic, who may eventually follow consensus but will always find something wrong.
- o The dedicated opponent, who will fight the campus all the way.

A graphic portrayal of the degree of support the campus can strive to achieve from each of these representative types appears on the next page.

Community Support Mix



The challenge of the community planning process is forecasting the number of individuals who will become involved in the process and the skew of the mix among category types.

The Community's Demands

When mixed community support surrounds a project, the campus staff should prepare positions for dissemination to the public. Campus leaders can expect requests from the community including (1) the desire of individuals to be part of and invited to any and all campus meetings and discussions that could influence campus plans; (2) the request that all such meetings and discussions be tape recorded, minutes taken, and the results widely distributed; (3) the request for more time, to be accomplished by scheduling additional meetings and by extending the "period of review" for study material and drafts of plans; (4) requests for unlimited access to campus records and information, and use of duplication services; (5) the charge that the campus is not open and is not communicating with, involving, or listening to the community; and (6) the claim that community meetings are not scheduled at a convenient time, nor are adequate and timely notices given.

Although most of the above can be handled through the design and implementation of an open and comprehensive process, the campus should be prepared to respond to events that could change the environment within which the plan evolves. In preparing a comprehensive plan, it is prudent to anticipate and plan for resistance. If unanticipated resistance occurs, time and credibility are lost.

Suggested Strategies for Involvement of the Community

For some institutions, establishing and maintaining a community support committee--a formal information and feedback outlet--can be a useful means of inviting the community into the planning process. The committee's stature will be enhanced if community members are elected by their representative groups. The committee approach works more effectively as a continuous, long-standing activity rather than one that is project-focused. An ongoing effort smooths the hills and valleys of support and resistance to campus projects.

Another important component of community-based influence is the involvement of recognized and respected political, financial, and society representatives. The institutional governing body (i.e., board of regents or trustees) may serve this need for consultation if the board structure can accommodate the time requirements of the planning process.

A third essential element of the community information process is the periodic scheduling of general information meetings. The purpose of the sessions, which should be held at a time convenient to most of the community, is to describe campus plans and projects as developed at that time. The meetings should occur at least once a year, or more often if events and planning activity warrant. Administrators should avoid the perception that the institution only calls such meetings when it wants something. These meetings provide valuable feedback to the campus on how it is perceived, at least at that point in time. Suggestions for the management of information meetings appear on the following page.

Managing a Crowded Hearing

- Keep the offensive--don't become defensive.
- Stage the event--elevate the platform, provide a microphone.
- Limit the time each person or group can speak.
- Establish the time at which the meeting will end.
- Extend (spread) the public exposure time.
- Limit the scope of the presentation.
- Have one master of ceremony.
- Take written questions in the order received.
- Remain calm--don't show anger or hostility.
- Prepare for the worst.

If a campus project or revision to the master plan is controversial, planners might want to prepare for a hostile audience. Techniques to consider appear below.

Managing a Hostile Meeting

- Immediately dispel and counter misstatements and untruths.
- Do not give up the microphone.
- Keep everyone to a set time.
- Be prepared to shut down the meeting.
- Have friends in the audience.
- Do not show or respond to anger and hostility.
- Be firm--stay focused.
- If a question has no answer, say so firmly.
- Move on and over questions meant to provoke.
- If discussion becomes too focused, suggest a separate smaller meeting.

It has often been stated that planning is a team approach. This section of the chapter has endorsed a planned approach to the involvement of the community in that team.

Mobilization of External Resources

What external resources might be mobilized to carry the campus's message of the need for more and improved space? Although a campus can bring extensive resources--from alumni to dollars--to an issue, some

resources are more specific to the cultivation of goodwill between the campus and community. These resources are divided into four areas: organizing community-based individuals and groups; developing agendas for, scheduling, and conducting targeted meetings; packaging materials and information; and providing services and associated cost-reimbursement. The items listed below are representative, not all-inclusive.

Groups/Individuals. Establishment of the following formally recognized groups can help a campus market its image, explain its operations, and support its future plans:

Board of Consul/Overview: a group of prominent individuals in the community who represent a wide spectrum of influence in local politics, finance, business, education, and society at large. Their involvement is aimed at keeping the campus foremost in community leaders' minds while objectively informing the campus of the impact its plans and projects may have on board members' specific agendas.

Community Response Forum: a campus-established organization comprised of leaders of the neighborhood associations and interest groups that inhabit the areas surrounding the campus. This group should represent homeowner associations, merchant groups, and special community-focused groups that are dependent upon and/or influenced by the functions of the campus. Composition of the forum should reflect the attitude, mix, and makeup of the neighborhood. Meetings should be held regularly to discuss events and plans relevant at the time. An objective summary of the discussions and actions of the forum can be produced for neighborhood distribution.

Campus Council: a formal organization, comprised entirely of campus faculty and staff, whose primary objective is to advise leadership on the impact that plans and projects may have on the quality of campus life. Meetings can be open and results can be summarized and distributed to the campus community, but the agenda should be proactive in generating ideas rather than reactive to presentations by the administration.

Meetings. In addition to the meetings organized to conduct the business of the resource groups described above, some general information meetings should be conducted at a time and place convenient to the targeted audience:

Meeting for Neighborhood Information: A general information meeting should be scheduled annually or semiannually for the campus's neighbors. Depending upon setting and size of the campus, this type of meeting can be extended and expanded to meet particular demands for information. The meeting should be organized to include community items as well as issues the campus wants to present. It should represent "a report at a point in time" on planning and planned projects. In other words, it should not be perceived as the campus presenting what it has already concluded.

Coordination Meeting for Local Government Services: Campuses are small cities unto themselves. The range and complexity of services needed to keep the campus operational are either mirrored in the surrounding community or there exists some degree of mutual dependency between the campus and its surrounding municipality. Given campus dependence on local government for connecting roads, utilities, and logistical support services, there is a continuing need for information-sharing between campus staff and local government agencies. Traditionally, campus service departments have initiated and maintained communications with their counterparts in city government. Although this form of interchange is essential, it is usually targeted too narrowly. Meetings should cover the plans and planning, both in the city and on the campus, that will or could affect the other. These meetings should occur no less than yearly and more frequently if events dictate.

Meeting of Campus Family: A couple of times a year, at a time convenient to most faculty and staff, the campus and schools should conduct a briefing on "what is going on." Although the focus should slant toward plans and planning, the meetings should also address needs for resources and changes in program that affect everyday campus life. Meeting topics could be summarized and distributed.

Materials/Communications. In addition to the support that efficiently-run meetings and well-organized groups bring to the campus and community

environment, several campus-produced materials and communications should be considered to enhance the community's understanding of the campus:

Dean's/Chancellor's Letter: The community should receive from campus leadership periodic personal communication that briefs them of events and plans they might find of interest. Campus magazines, annual reports, and newspapers lack the personal appeal that an information letter from a vice-president or dean provides. This form of communication is important to the people living in the immediate neighborhood of the campus.

Emergency Action Plan: The community, understandably, is concerned about how the campus will react in case of an emergency. The compilation and distribution of an emergency response plan, developed with community input, demonstrate how the community and the campus can perform a mutually beneficial task. The process of updating the plans will also establish the basis for a continuing relationship.

Environmental Baseline Information/Data: The campus should be able to respond to neighborhood fears that the work conducted at the campus might not be "safe." This means that the institution must know itself what environmental readings and exposure levels exist on and in the immediate area affected by campus wind patterns and refuse routes. Establishing this form of baseline analysis and information allows the campus to monitor against this base and dispel misstatements that might generate concern and even hysteria if not countered with accurate and understandable information.

Facts and Figures: Nothing can make a situation worse than incorrect numbers, different numbers covering the same situation, changing the rules, and statements that are repeatedly changed. The importance of campuswide, coordinated gathering, checking, and distribution of information cannot be stated strongly enough. The information and data collected could be published every year, thus providing a formal reference base against which internal as well as external plans are developed and questions answered.

Services and Costs. From the community's perspective, costs come in two forms: those that the local community must come up with to house the total campus enterprise and those that might be realized if the campus were not there in the first place. The first of these costs is referred to as the **fiscal impact** that the presence of the campus has on the surrounding economic environment. These costs represent the need of the campus for locally-provided access roads, police and fire protection, provision of utilities, schools and social services. The second cost set is, in most cases, a cost offset. It pertains primarily to the value the campus enterprise brings to the economy of the local area and is referred to as the **economic impact**. The economic impact is felt essentially through revenue paid to employees who transfer this economic benefit to the local area, through community vendors who reside in and provide services to the area, and through improvements made to the local area by the campus.

The intent of mentioning these two types of economic analysis is not to design the formats or discuss the pros and cons of either, but to suggest that the campus look into these two factors, understand what the numbers mean, and be prepared to discuss and, if necessary, negotiate and correct substantial variances between the two. To do otherwise could lead to community and campus disharmony.

Additional Sources of Information

1. Robert G. Winfree prepared a background paper for the AAMC Task Force on Space Planning and Management entitled "Environmental Health and Safety" (1990). For a copy, write to the author, associate vice-chancellor for health affairs, Duke University Medical Center, P.O. Box 2901, Durham, North Carolina 27710.
2. In the "Harvard Longwood Campus Master Plan" (1989), planners anticipate environmental impacts of construction and suggest mitigation measures. They also consider the institution's relationship with the community, providing examples of the campus's community programs and services and proposing a process for community participation in planning review. For further information, contact Ann Schwind, associate dean for planning, Harvard Medical School, 25 Shattuck Street, Building A, Room 103, Boston, Massachusetts 02115. Telephone (617) 432-0870.

3. A law firm with extensive and nationwide experience in the environmental area has prepared a basic handbook entitled *Environmental Requirements for Colleges and Universities*. The document summarizes key points of federal environmental laws containing provisions that could affect educational institutions. Published in 1991 by Hale and Dorr, 1455 Pennsylvania Avenue, N.W., Washington, D.C. 20004. Telephone (202) 393-0800.
4. See abstract of "An Economic Impact Analysis of the Biomedical Research Building for the University of Kentucky College of Medicine" (1989), page 172.
5. Animal care is a major focus of concern in community and environmental coordination and planning. The subject is too large to tackle in this volume, but the following beginning references may be useful:
 - a. *Saving Lives: Supporting Animal Research* (1989), Association of American Medical Colleges, addresses the public relations aspects of the issue. It is a resource notebook designed to help institutional leaders develop ongoing strategies that promote internal and community support of the use of animals in research and education. Available from AAMC Publications, One Dupont Circle, Suite 200, Washington, D.C. 20036. Telephone (202) 828-0400.
 - b. Arthur B. Butterfield, D.V.M., Ph.D., has prepared a comprehensive outline of the "Fundamentals of Planning for Institutional Animal Care and Use Programs." The document suggests key factors for program success and includes a list of laws, regulations, and guidelines governing animal care. For a copy, contact the author, associate vice-president for research services, University of Louisville School of Medicine, Louisville, Kentucky 40292. Telephone (502) 588-7307.
6. The following are selected references important for those seeking more information about occupational safety in the health care setting:

Ashbrook, P. C. and M. M. Renfrew, eds. 1990. *Safe laboratories: Principles and practices for design and remodelling*. Lewis Publishers.

Klein, B. R., ed. 3rd ed., 1990. *Health care facilities handbook*. National Fire Protection Association.

LaDou, J., ed. 1990. *Occupational medicine*. Appleton & Lange.

U. S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, and National Institutes of Health. 2nd ed., 1988. *Biosafety in microbiological and biomedical laboratories*. Washington, D.C.: U. S. Government Printing Office.

U. S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, and National Institutes of Health. 1988. *Guidelines for protecting the safety and health of health care workers*. Washington, D.C.: U. S. Government Printing Office.

Construction and Renovation

Why does it cost so much to build or renovate space? Why does a construction or renovation project take so long to finish? Who is responsible for the construction process? What *is* the construction process? We could restate the meanings hidden behind these questions as follows: "There aren't enough dollars to build it right, so something has to go." "We didn't plan for the building, but we needed it yesterday anyway." "Those responsible for the funding and program should be in charge of construction." "Whatever the construction process, make sure it's speedy and economical." Planners might respond to these concerns with the following suggestions:

- o Define and develop specifications for the program before you develop the budget.
- o Planning, design, and building take a long time; plan on it.
- o Only one person can be responsible for construction--the chief campus officer.
- o Take the time, and include the people, it takes to build it right.

Construction should be the culmination of the planning process. But what does it take to get to that point? What elements of the construction planning process assure its success or failure? The basic steps leading to construction are program definition, program delineation, and design and documentation.

Program definition

It seems a simple, logical concept: you have to know what you are going to put into a space before you can build it. Yet many projects get planners into trouble precisely because not enough effort is spent at the start defining the project's scope. Too often, pressure to meet a critical need for space or to meet funding deadlines precludes the development of an adequately defined program statement. The program definition should include no less than the following: a title and description of the program, a primary program focus, and the primary activities that are to occupy the structure.

The **program description and title** should include not only the eventual name of the structure but also a description that conveys to the lay reader the purpose for the building. This should be a concise and clear statement that will last throughout the life of the project.

The **primary program focus** should describe the utilization that will occupy 70 percent or more of the assignable space in the structure. As a guideline, planners can rely on the traditional functional classifications associated with the academic medical center--i.e., instruction, research, clinical services, library, institutional administration, and support services. This section of the program definition should also include the campus zone into which the building fits, limitations on infrastructure capacity, any environmental and community agendas, criteria associated with the campus character, and an estimated "life term." This section should not include the budget. The most important thing to convey to the lay reader is why the building is needed. In this statement, planners should summarize the results of the campus study or needs assessment that planners used to move the project into the campus's list of priorities for capital programs.

The **primary program activities** that are to occupy the structure must be defined as follows:

Organizational relationships: To the extent that different organizations will be housed in the new structure, the scope of each should be explained. The explanation should include the subsets of the organization(s) that will move to the new structure and should explain how those units work with the balance of the organization. Areas of commonality and dependence should be developed.

Program relationships: The extent to which certain programs depend upon and/or achieve benefit from others should be explained. This section should also explain the extent to which activities are influenced by elements exterior to the building, such as the public, deliveries, and security.

Program scope: How large is each program in terms of numbers of employees, visitors, and students? What is the composition of the staff and what is the direction that each of the major activities in the building expect to pursue?

Special considerations: Any other factors that will have an impact on space design--e.g., the need to accommodate large equipment, extra floor-bearing capacity, natural lighting, soundproofing, limited access, and any needs that are peculiar to that group or individual activity--must be identified on an activity-by-activity basis.

All of the above must be developed in enough detail so that the designers can understand the facility's space "packaging" requirements, the space planners can site the building and apply acceptable standards or guidelines for allocation of space, the financial staff can estimate the project costs, and the campus leadership can support and market the project.

Program delineation

The next step in the programming stage of a capital project involves the conversion of the program definition into space layout. If the program definition is too vague, or if the descriptions of activities cannot be expressed in space parameters, the project will have little chance of meeting prospective users' expectations, of staying within budget, or of being completed on time.

The conversion from program definition to actual space assignments is usually completed in one of two ways: by determining how much of a type of space can be built for a set amount of available or projected funding (the wrong way); or by applying standards or guidelines that represent experience obtained from developing like or equivalent space (the right way).

In addition to understanding the need for a responsive programming stage of the construction process, all parties involved with the process from program approval on must be sure they are using the same terms to refer to the project budget. Although the appendix to this publication contains a complete dictionary of space definitions, a few terms warrant additional attention as they relate to the budget (construction and project costs) and to space (gross square footage and assignable square footage):

Construction cost: total cost of the shell, interiors (less moveable equipment), mechanical equipment, building-site development, and

logistical and servicing systems. In practice, every cost except fees to ready the building for occupancy.

Project cost: total cost of completing the building, including fees.

Gross square footage: all space in the building measured from the outside of the building walls. Represents 100 percent of the space budgeted and to be built.

Assignable square footage: only that space, measured from the inside of the walls and ceilings, that is actually occupied by program activities.

Keeping these definitions in mind, and remembering always that accurate program definition and delineation are prerequisites to a successful new building, we can address two additional considerations that affect the *renovation* of structures. The first consideration is obtaining adequate information about the quality of a building's space to determine when to discontinue renovation, maintenance, and occupancy. The chapter on obsolescence planning provides information and measures to be used in making such a decision. The second consideration is the imperative need for surge space to accommodate the program activity housed in the space that is to be renovated. Surge space is defined as "temporary replacement space required for a short term while permanent space is readied." General experience shows that, without adequate surge space, a renovation can cost up to twice the amount of a like project with surge space and can take up to twice as long to complete.

The programming phase for renovations should be no less rigorous than for a new building. The start and finish of the capital process should also be no different. The full process is outlined later in this chapter.

Design and Documentation

The essential requirements at this stage of the program development process are accuracy and thoroughness. The architect must accurately depict what the program narrative describes in understandable design terms, and the drawings must be thorough in order to leave no margin for misinterpretation by the contractor. There is probably no greater area of exposure in which a project can go wrong than the interface between the

architect and the contractor. That interface has as its primary focus the reading and understanding of the project's architectural documents.

Who Is in Charge of Construction and Renovation?

Unlike most areas of administrative support, in which one person takes charge, responsibility in the capital planning and construction processes is not always clear-cut. Everyone seems to have a say in the project, and if they don't, they want to (sometimes with good cause). There are many ways to manage the responsibility for construction and renovation. Ultimate responsibility rests with the vice-chancellor or vice-president for administration or the equivalent.¹ From that position on down, there are several different involvement scenarios. They usually can be grouped into three organizational frameworks: longitudinal, segmented, and phased.

Longitudinal responsibility takes all of the organizational units that have responsibility for part of the capital construction or renovation process and places them under one manager. The organizational units under one manager in this configuration would include capital planning, architect and engineers/design, environmental health and safety, construction management, inspection, maintenance and operation of plant, and plant accounting and capital budgeting. All the responsibility, both reward and blame, rests with one organization.

The primary benefit of this organizational arrangement is that it facilitates a faster and less expensive process because communication is easier and timelines for interaction between units can be shortened. The primary negative aspect is that, with the time pipeline in the capital process lasting as long as 10 years, mistakes and mismanagement can stay undetected for a long time. When using a longitudinal pattern of responsibility, it is imperative that planners build into the capital process an evaluative mechanism, usually in the form of a high-level review committee that measures the organization's effectiveness against a set of performance criteria.

¹ The frame of reference for titles used in this chapter is a freestanding health sciences institution. Readers from institutions that are part of a larger university can translate these titles according to their own situation. "Vice-chancellor or vice-president for administration," for example, might become "assistant vice-president for administration."

Segmented organizational arrangements are the most typical in universities. Specifically focused units are assigned to various managers, none of whom has responsibility for the complete process. This type of configuration relies on the match, or lack thereof, of responsibilities to personal management strengths.

The primary benefit of this arrangement is that the institution can mix and match organizational needs to individual management capabilities and requirements to experience. The primary negative aspects are that it raises questions of who is really in charge and lends itself to intra-organizational competition (which is not necessarily all bad).

Phased organizational patterns originate with one basic objective in mind: to separate the operational demands of the campus from the forward-looking (i.e., planning) and evaluative (i.e., feedback) activities. The reasoning behind such a pattern is that operational demands can absorb all of an institution's resources. This form of organization divides responsibility into time phases--i.e., events that have already happened, current events, and events that may or could happen.

In this format, plant maintenance and operation represents a completely operational function, while the capital planning office typifies a forward-looking office best isolated from the rigors of everyday crisis. Plant accounting would fall within the past, and units such as architects and engineering and environmental health and safety would fit into either a current or future organizational grouping.

The primary benefit of a phased organizational arrangement is that it clearly leaves some staff to look back at what happened and try to correct it by looking ahead, unencumbered by the workload of today and tomorrow. The primary negative aspect, again, is the difficulty of not knowing who is in charge of the continuum of a project from conception to occupancy.

The following matrix summarizes some of the above alternatives, although experience has shown that there is almost no limit to the mix and match of organizational variables.

Types of Organization			
Areas of Responsibility	Longitudinal	Phased	Segmented
Capital Planning	A	P	P
Capital Budget	A	P	F
Architects & Engineers	A	P/O	P
Envir. Health & Safety	A	P/O	P
Project Management	A	O	O
Inspection	A	O	O
M & O Plant	A	O	O
Plant Accounting	A	O	F

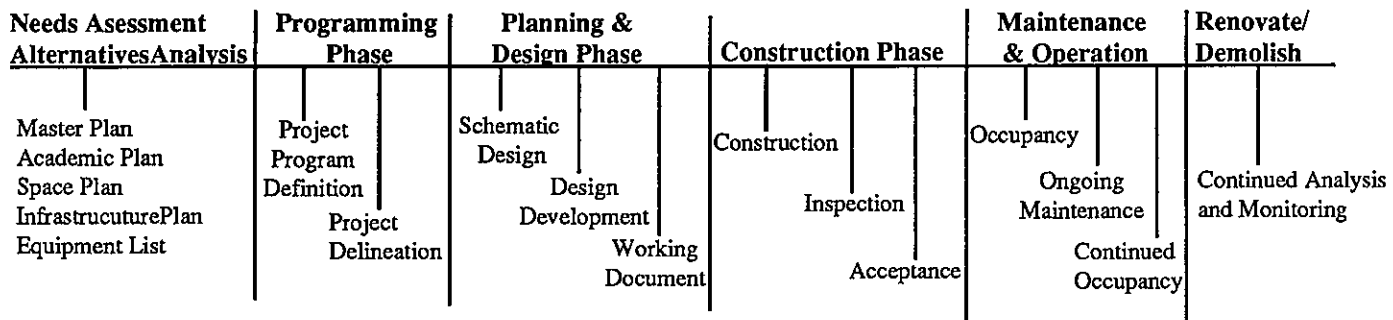
Management Assignment:

- (A) dministration
- (F) inance
- (O) peration
- (P) lanning

Alternatives to Managing the Construction Process

Construction and renovation follow a fairly straightforward process. The important question is not so much "How is it done?" as "Who does it?" "When?" and "How many resources will it require?" The process can be explained simply as identifying a need, developing a solution, securing the resources, and building a building. Another way to look at the total process is depicted on the diagram that follows.

Capital Project Phases



Internal Versus External Expertise

How much of the construction process should be managed externally? The answer will depend more on the location of the campus and its age, history, and tradition than on anything else.

The location of the campus can determine its ability to rely upon the design and construction services provided in the surrounding community. Large institutions located in densely populated areas can draw upon a large range of community-based resources to supply their design and construction needs. Whether campus leaders want to avail themselves of these resources and become more dependent upon their community is a product of tradition, attitudes toward change, and, in the end, dictated institutional policy. If there is a trend, it is for more and greater dependence upon the private sector, not only for construction but also for the study and design phases leading to construction. Over the last decade, many nationally-based firms have added substantially to their service portfolios, which now include everything from space planning to layout, interior and exterior design, engineering, construction, and construction management.

In the academic world, however, traditional wisdom and practice are hard to break. That wisdom holds that, "If it is to be done right, we have to do it ourselves." Although there is no set formula to conclude whether or to what extent a project should be managed internally versus externally, planners should address the following general questions if they consider changing the traditional approach to design and construction management: Will increased dependence on the outside add to the project costs? If so, are there offsetting attributes? What is the impact on time if a project is managed by one outside organization? Is competition generated by a larger number of firms doing business on the campus good for the quality of work done? Does more reliance on the outside mean a loss of control over the campus's future program? Is the institution at the mercy of the outside organization for completion schedules? Can you safeguard against this with adequate construction documentation? Are dealings with outside entities or individuals as "friendly" as dealing with campus staff? Are you prepared to deal more deeply, and at what risk, in the for-profit environment? Who is ultimately responsible for work done by an outside group? Is everyone aware of this assignment of responsibility? How can the overall architectural integrity of the campus be sustained given increased dependence on the outside?

There are other reasons for seeking outside help if you haven't already: you'll never know if it will be successful unless you try it; you can always remove an outside contractor from a project or preclude the contractor from future awards, which is not so easy on the inside; and if it doesn't work, you can always go back to what you were doing and use the experience as an evaluative example.

Responsibility for Project Management

Given the right mix of outside and inside expertise, how is the construction stage of the project best managed? The choices, for the most part, are management by the architect, the contractor, campus architecture and engineering or facilities management services, or a project manager. Someone must be responsible for the day-to-day management of the project, or chaos and cost overruns will prevail. History has taught that if the primary players in construction management--i.e., campus, architect, and contractor--are not compatible, trouble can be expected. One of these players is the eventual occupant--the faculty.

The decision as to who is in charge of a project depends in great part on a campus's construction history and its use of reliable professionals, but the use of the construction manager has been increasing. The essence of this approach is to designate one individual--either a member of the campus design-construction team or an outside person--to represent the campus in the day-to-day project operation. Although this approach is not new, what is new is the increasing involvement of the project manager early in the program definition stage. Participation in the planning phase gives the project manager a more thorough understanding of the project and thus gives that individual further wherewithal to coordinate with the architect and contractor. To assure the fit of structure to program, the project definition and delineation planner can be included through building occupancy. Regardless of what project management scenario is adopted, the active involvement of the project's sponsor or client (i.e., faculty) in every step of the project's development and management is essential to acceptance of the eventual project.

Timing of Construction

In addition to the confusion associated with who is in charge of the construction process, the other most pressing concern is the time it takes to complete a renovation or construction project. The time to carry capital projects from the "identification of need" stage to occupancy appears to be lengthening. Some of the most obvious reasons follow:

- o Individual projects are being reviewed more intensely against the campus's master plan, and some situations call for a total update and revision of these plans.
- o Environmental reviews and legal challenges (or the threats thereof) are requiring more initial justification of programs.
- o Studies for alternative solutions to space needs, both in terms of other space or sites and costs, have increased.
- o Lawsuits from contractors over inaccurate and/or incomplete construction documents are extending the degree of detail and time needed to prepare documents.
- o In more complex projects, the amount of time-consuming "change orders" is growing due to rapid changes in technology during a project's development, incomplete working documents because of "fast-tracking," and changes in eventual occupancy.
- o The state of the campus infrastructure has deteriorated to such a degree that time and funds have to be found and devoted to correct those deficiencies before dependent projects can commence.
- o There are fewer construction and renovation funds for more projects, and many of the most desired projects are very utility-intensive and require complicated structures and support systems.
- o Campuses are landlocked and require either site clearance or surge space before a project can start.

All of the above take time, incur the need for additional dedicated professional expertise, and thereby add to the project's cost. Some of the most common situations that are or can be part of a construction or renovation project and can add to its final cost in time elapsed are listed below:

Site clearance and relocation of old program	1-3 years
Master-plan update or verification of program needs	1-2 years
Program definition and delineation	1 year
Environmental and legal review	1-2 years
Design and documentation	1-2 years
Construction or renovation	3-4 years
Occupancy, move, and settle-in	1 year

This amounts to a range of from 5 to 15 years. No wonder programs change in the meantime, leaders leave, and costs increase! We can estimate from this breakdown that a 10-year time span is a reasonable planning target for a major new addition of campus space.

Costs of Construction

All of the elements described above--size and scope of the campus, organizational arrangements, methods of construction, and the time pipeline--generate costs. The outline that follows attempts to give relative weights to major cost components that comprise a final project budget of a general multi-purpose academic building.

The costing outline does not include costs arising from master-plan updates, environmental reviews, legal challenges and defense, program relocation before site availability, or inflation. It represents a template composite of building cost breakdowns associated with several major projects at a large academic medical center. Each campus will vary, of course, as will regions. The composite is simply a starting point, a checklist that can be presented as an overview of the elements of cost to a faculty member or other interested party.

BUILDING COST EVALUATION**I. Construction****Shell**

(1) Excavations and Foundations	70
(2) Load-Bearing Walls and Columns	40
(3) Floor and Roof Structures	80
(4) Exterior Cladding, Windows, and Doors	70
(5) Roofing and Waterproofing	<u>20</u>
	280

Interiors

(6) Interior Partitions, Doors, and Glazing	65
(7) Floor, Wall, and Ceiling Finishes	<u>35</u>
	100

Equipment, Specialties, Stairs, Elevators

(8) Function Equipment (fume hoods, glass wash, etc.)	45
(9) Stairs and Vertical Transportation	<u>25</u>
	70

Mechanical and Electrical

(10) Plumbing Systems	45
(11) Heating, Ventilation, Air Conditioning	100
(12) Electric Lighting, Power, Communications	65
(13) Fire Protection Systems	<u>10</u>
	220

TOTAL BUILDING

670

Sitework

(14) Site Preparation and Demolition	30
(15) Site Paving, Structures, and Landscaping	10
(16) Utilities on Site	<u>10</u>

TOTAL SITEWORK50**SUBTOTAL BUILDING AND SITEWORK**

720

Other Construction Costs

(17) Security Systems and Fire Alarm Hookup	5
(18) Utility Shutdowns and Air Balancing	10
(19) Telephone and Computer Cabling	10
(20) Keying and Signage	5
(21) Asbestos Removal	<u>10</u>

TOTAL OTHER CONSTRUCTION40**SUBTOTAL CONSTRUCTION COSTS (BUILDING, SITE, OTHER)**

760

(22) Construction Contingency	<u>40</u>
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TOTAL CONSTRUCTION COSTS

800

II. Fees

(23) Project Definition (legal/envir. review/mitig./bidding)	20
(24) Design Consultant(s)	100
(25) Special Studies (lab, landscape)	30
(26) Inspection	10
(27) Project Management	30
(28) Contingency (fees)	<u>10</u>

TOTAL FEES

200

TOTAL PROJECT COST (CONSTRUCTION + FEES)

1000

Contingencies are listed in both the construction and fees sections of the table. This represents sound budgeting--as the costs and responsibilities for each section belong to different organizational entities--and thus adds some degree of accountability for each.

The fee segment of the outline equals 20 percent of the total project cost. This amount appears about normal given traditional university cost-accounting for construction, but with the relatively recent additions of increased detail in programming, code-conformance requirements, and expanded demands for special studies, this fee segment is increasing on many projects. Given the complex design, testing, and study requirements associated with construction and renovation of high-intensity research and clinical buildings, it is becoming increasingly more common to see the fee segment of a research or clinical project approach and even exceed 30 percent.

As stated earlier, the costs of time--e.g., inflation and debt--are not figured into the calculations. These costs eventually will represent the items that must be forecast, budgeted, and included within the campus financial plan.

Although the above breakdown provides a general guideline of what the cost elements of a composite building might look like, it does not address the extent of costs nor the reasons for differences in total costs. Construction costs vary greatly due to three variables: the location of the medical center and the prevailing cost indexes associated with doing business in that area, the building site and the constraints associated with constructing on that site, and the nature and complexity of the building itself and the accuracy of the program delineation associated with each specific project.

While the cost categories that comprise all eventual project costs are similar, each project takes on an expenditure profile all its own. These differences are due to influences that are not only quite dissimilar from project to project, but can result in large variances even within a specific cost category. The cost variances, common to new construction as well as renovation, often emerge from circumstances involving either logistical and technical factors or factors related to human behavior and communication. With carefully, thoroughly planned projects, logistical costs can be forecast. They are variations that occur because assimilation requirements are not yet firm. They require adjusting the project's phasing and could result in

changes in space layout and some redesign. Costs due to behavior or communication, on the other hand, are usually either not expected or so situation-dependent that forecasting is almost impossible, other than on an all-inclusive contingency basis. They result from

- o Disagreements between the project manager(s) and faculty regarding the precise nature of what is included in the approved project budget. These result in delays, change orders, and, sometimes, redesign.
- o Alarm, reaction, and demands for mitigating measures on the part of campus neighbors and interest groups when construction projects intrude into or disrupt their real or perceived lives. This extends project completion periods, adds costs for redesign, and results in compromised access and environmental safety measures and possible litigation costs.
- o Perceptions by those outside the campus design and construction profession that universities are just too difficult, bureaucratic, and restrictive to work with. Thus, collective wisdom and tradition demands that project estimates advanced to cover university-managed projects slide toward the high end of the cost of doing business.
- o Contractors' perceptions that construction contracts are too restrictive and inhibiting. Therefore, incremental costs are built in throughout the project budget to cover the costs attributable to the lack of contractor flexibility.
- o On-site project manager's inability, either through the lack of authority and/or fear of risk, to make timely changes in the project's scope. Resulting stoppages in construction for consultation absorb contingencies.
- o Too many bosses--e.g., campus architect, project manager, budget director, president, faculty, dean--all with a vested interest and favored position. The costs of compromise and tinkering with a project to accommodate individual preferences can soon add up.

- o Overreaction to suggestions and, at times, demands for mitigating measures (usually safety-related) that expand the scope of a project beyond need. This can affect not only the design, cost of material, and sequencing of the project, but may also result in a substantial residual cost of operation.
- o Fear of litigation. This can result in increased cost and will add time to the project as all appropriate individuals and interest groups that could raise legal obstacles are pacified and/or rendered ineffective.
- o Political gerrymandering--i.e., the change of a project in midstream due to any of a myriad of reasons, such as unexpected additional funding, a new dean with different objectives, potential recruitment or loss of a "star," or accommodation of an unexpected change in technology or emergency. This can result in total rebudgeting.

All of the above, and more, can surface before a construction project reaches conclusion. The increased costs can easily exceed a project's contingency reserve. Part of the success in project management lies in the ability to anticipate these factors and to plan for the unexpected. Of course, sometimes there just is not enough money, time, or vision to achieve that noble objective.

A final note: one of the benefits of integrating the campus's general financial ledger with the space inventory system is the ability to generate historic per-square-footage costs. With a computer interface in place and with several years of construction and renovation costing experience, a campus should be able to develop a cost-per-square-footage guideline. The guideline--expressed in current day costs--gives a range of costing experience, from a general office structure to the most complicated, utility-intensive research laboratory. Such a guide not only assists planners in estimating project budgets; it also gives faculty a better understanding of what it will take to house their expectations.

Additional Sources of Information

1. At Columbia University, planners in the office of the deputy vice-president for health sciences operations prepare detailed pie charts

to represent the actual cost of renovating space as soon as a job is completed and the account closed. Their library of such charts has been helpful in preparing estimates for different types of renovations in different types of buildings. For more information, contact Isis R. Wilson, deputy vice-president for health sciences operations, Columbia University, 630 West 168th Street, New York, New York 10032. Telephone (212) 305-5738.

2. *Facilities Planning News*, a division of Tradeline, Inc., publishes *Facilities Planning Handbook: Terminology and Practical Ideas for Planners*. The second edition (1990) contains (1) a collection of findings, recommendations, reflections, and warnings from facilities planners across the country; (2) a compilation of profiles of recently completed facilities projects, presenting the "vital statistics" and design objectives of selected biotech, corporate office, R&D, and training facilities; and (3) a glossary of more than 700 words and phrases related to facilities planning. For more information, contact Tradeline, Inc., P.O. Box 1568, Orinda, California 94563. Telephone (415) 254-1744.
3. A "project management by data system" merges data from the SARA Systems, Inc., Database--a capital projects database covering all phases of project management--and from the Association of University Architects (AUA) capital projects database. The data covers a period of 25 years and is the largest construction cost and project database ever organized. The system, usable in desktop and portable PC environments and UNIX mini/mainframe environments, provides a standard format for calculating and comparing project areas, costs, and schedules for facilities construction or renovation. Examples of uses:
 - a. Using historical data from the data base, such as type of program and number of people, the system will calculate the amount of square feet required, the net to gross ratio of the building, and the cost of construction.
 - b. The system will define a facility's condition based on the date of construction, subsequent renovations, and ongoing maintenance information.

For more information about the SARA/AUA system, contact Bruce H. Jensen, FAUA, 2319 Foothill Drive, Suite 265, Salt Lake City, Utah 94109. Telephone (801) 466-3613.

4. In 1988, Adamson Associates conducted a study of the factors influencing the costs of construction and renovation at The University of California-San Francisco, Parnassus site. For more information, contact Eric Vermillion, director of financial analysis, Office of Construction Management, UCSF, Box 0894, 3130 20th Street, San Francisco, California 94143.
5. See abstract of "Final Report of the Task Force to Review and Update the Planned Renovation of the Health Sciences" (1989), University of Washington (page 186).
6. See abstract of "180 Longwood Avenue Building Utilization Study" (1988), Harvard Medical School (page 174).
7. The following bibliography may also be of interest:

Braybrooke, S. 1986. *Design for research: Principles of laboratory architecture*. New York: Wiley and Sons.

Kershner, E. G. 1987. Why do university buildings cost so much? *NACUBO Business Officer*, Apr., 29-35. (National Association of College and University Business Officers)

Rush, S. C. and S. L. Johnson. 1989. *The decaying American campus: A ticking time bomb*. Association of Physical Plant Administrators of Universities and Colleges.

Obsolescence Planning

With space rivaling funds as the campus's most critical resource, pressures to renovate and use even the most marginal space have increased dramatically. At the same time, costs of renovation and conformance with regulations, especially those requiring that older structures be safe, have multiplied. Faced with excessive inflation in construction costs and ever-extending time pipelines to design service, secure approvals, and construct new space, campus leaders sometimes bow to the "quick fix." But such short-term solutions can result in spending large amounts of funds to renovate structures that have long since ceased to be cost-effective to maintain.

The space accumulating in this "obsolete" category has become an increasing segment of the available space inventory throughout the nation. Why? There are three primary reasons:

- o A vast amount of space constructed in the 1960s is wearing out.
- o Accelerating changes in new technology have placed on old structures complex infrastructure demands that they can accommodate neither easily nor economically.
- o The pressures for safer, cleaner, and more environmentally pleasant surroundings have resulted in a wave of regulations, which has taxed the economies of institutions and resulted in a growing number of available but nonconforming structures.

How to address this dilemma? Certainly there is no single or easy solution. Planners need to establish a uniform method to evaluate the capacity of buildings to house certain types of activities. This should be a method that exceeds the timeframe traditionally dictated by long-range planning norms, yet one that is easily updated and that accurately measures the continued utility of each building.

This chapter presents an approach to longer-range facilities planning that measures the "life term" of buildings. The results of a capacity analysis of each building's remaining life term could be incorporated into each revision of the campus's long-range development plan. A building's life term could be modified only if certain rigidly adhered-to analytical and evaluative factors supported an extension of the building's occupancy. Such factors could include a change of zone to accommodate a less intense utilization, renovation early in a building's life term that permits a longer

and/or different type of utilization, a building evaluation supporting an extension of the life-term date, or designation as a "national treasure." The decision whether to remove a building and either replace it or put the site to another use would be set in motion so early in the capital planning process that it would be somewhat (though certainly not totally) immune from capricious decisions of relatively short-term leaders or politicians.

For the purposes of this chapter, we will use the term "facilities obsolescence planning" or "obsolescence planning" to refer to the management of the quantitative measures and related evaluative factors associated with each building's life term. The model proposed below is conceptual and is offered as a starting point in measuring the obsolescence of our facilities. Because this concept is a new way of looking at an old and growing problem, we will start by trying to define the term "obsolescence planning." Several possibilities follow:

- Definition One: The result of decisions, made during the design and construction stage of a building or support-system project, that attach space utilization and term-of-occupancy measurements to a building's life term. These measurements quantify the financial benefit of continued utilization as opposed to demolishing and building new.
- Definition Two: Objective measurements attached periodically (at least every five years) to a building or support system, the sum of which determine when that site should be considered in the next institutional long-range development plan.
- Definition Three: That segment of campus capital planning removed from the pressure of immediate needs for space and reactive leadership.
- Definition Four: Structure or infra-system planning that goes beyond long-range development planning.
- Definition Five: Nonpolitical capital planning.

The success of obsolescence planning rests on two essential elements: (1) accurate data on infrastructure and support systems, and (2) visionary leadership.

The Importance of Accurate Data

Data systems can be subdivided into at least three subsets: space inventory data (e.g., room type, square footage, physical characteristics), campus character data (e.g., campus setting, size and makeup of campus population, height and bulk profile), and infrastructure or system data.

An accurate infrastructure database provides the foundation for assessing the campus's ability to accommodate changes or improvements in program, and even to continue existing programs. Understanding the limitations and potentials of the campus infrastructure system is undoubtedly the most critical component in the obsolescence planning process. The infrastructure information system includes data elements based upon three separate measurements: How much is currently available? What amount of the available capacity remains untapped? and What is the potential of the existing system to add capacity?

Examples of the data elements that should be part of the infrastructure information system are energy source(s) capacity, water supply, steam generation, exhaust potentials, sewage treatment and disposal, availability of tunnel and mechanical space, potentials for emergency responses, and ability to communicate (both via computer and telephone). In addition, information on the logistical capacity of the campus--e.g., capacity for storage, parking for service vehicles, commercial and emergency access, capability for handling hazardous waste, space for construction phasing, and utilization and capacity of elevators--must be captured in the database. These are all important data elements that must enter into the long-range planning process. They deal primarily with capacity but also must be collected and analyzed in such a manner that they can be translated into increments of additional square footage that can be accommodated on site.

The Need for Visionary Leadership

Because obsolescence planning deals with a time period beyond traditional long range--50 years might be a reasonable base of reference--it exceeds the tenure of any one leader or set of leaders. Thus, the important role for leaders in obsolescence planning is not the realization of the results of planning but the support and sustenance of the process. Without the advances in information and systems management of the last decade, obsolescence planning would not be possible. Now, leadership must be convinced that obsolescence planning is needed, that the resources necessary to design it are warranted, and that its database and periodic analysis should be maintained. Leaders must also decide how obsolescence planning is to be managed.

The overall responsibility for obsolescence planning rests with the vice-chancellor for administration or its equivalent.¹ Although residing on the administrative side of the house, obsolescence planning gets its primary support, as we have stated previously, from the organization that manages the database upon which its analysis and projections depend.

Obsolescence planning will be managed best if it draws upon a campuswide information management office or clearinghouse for consistent and reliable data, if it coordinates analysis and assessment of infrastructure capacity with management of physical plant, if it works within the overall site development plan (zoning) and campus character profiles that have been endorsed as part of the current long-range development plan, and if it uses consultants for engineering studies of specific buildings and systems. In addition, obsolescence planning will probably be managed best if it is part of the campus planning team or office. Within the planning office, an individual or unit should be set aside and given the continuing responsibility of support to the obsolescence planning process and the necessary data collection and analysis. Continuity, consistency, and reliability are the key criteria upon which the process and its management should be judged.

In some instances, the planning office might not be the best organization to assume this responsibility. As with any campus, individual

¹ The frame of reference for titles used in this chapter is a freestanding health sciences institution. Readers from institutions that are part of a larger university can translate these titles according to their own situation. "Vice-chancellor for administration," for example, might become "assistant vice-president for administration."

talents and organizational strengths and weaknesses determine where responsibilities can be assigned. Some of the organizational options are listed below:

Physical plant, responsible for the maintenance of structures and systems, should be in the best position to determine their capacity and status. The danger in this assignment is one of preoccupation with operations at the expense of looking ahead.

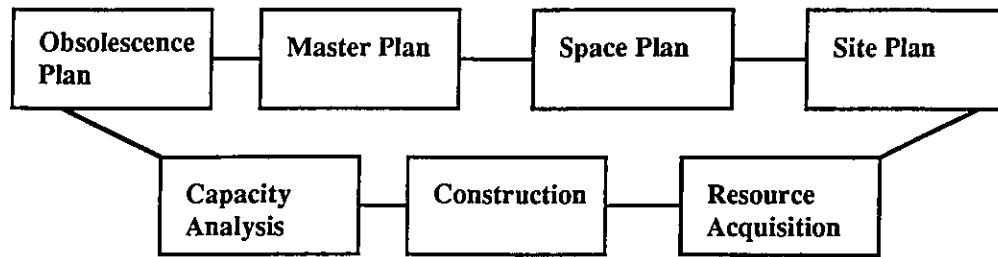
Data/systems management could assume the management of obsolescence planning, acting as a broker between the plant/engineering, capital planning/development, and academic functions.

Business operations could manage this activity if it were kept within cost-to-benefit parameters. Resulting data and cost analysis could be channeled into the long-range planning process in the form of strategic alternatives.

These choices do not include assignment to the academic side of the administration, as this would defeat the objectivity of removing decisions about buildings' life terms from the intense pressure for solutions to short-term space problems.

A Proposed Model for Obsolescence Planning

Obsolescence planning is the end--the analytical finish--to the capital process. The final set of determinants concludes that a building is not worthy of continued utilization. But the process is not over, because that decision leads to a new structure and the start of another process--continuing long-range development, or master planning. Obsolescence planning, then, is part of the continuum of campus space planning. An illustration of the complete process appears on the following page.



We can treat obsolescence planning as the end of capital planning or the start of the master planning process. But what goes on within the framework of obsolescence planning? The internal process is comprised of data collection and analysis in two dimensions: (1) building by building or system by system, and (2) the overall infrastructure capacity and status to handle individual building or support systems.

Dimension #1--Specific Building/System Analysis

Obsolescence planning targets primarily the status of campus structures. They are the most visible, they house the individuals who have or who will acquire an insatiable appetite for more space, and they are the initial focus of problems associated with a space-to-program mismatch and/or deterioration of facilities. The challenge is to design and implement a base of measurement against which periodic evaluation of a structure's continued utilization can be gauged. Three measurement techniques--Life Term, Building Assessment, and Cumulative Economic Impact--follow. They can be developed and applied independent of one another. If the results of each are examined in context with the others, however, a clearer picture of structural obsolescence, or the lack thereof, emerges.

Measurement One--Life Term

On its face, measurement of life terms is a simple, logical technique: target a self-destruct date for each building and use this date when planning future site development of the campus. Construction professionals are not likely to endorse such a technique, but that does not preclude campus administrators from adopting the concept as a planning

criterion. As a starting point, planners can divide buildings into three time periods:

	Use	Life Term
Temporary/Surge Structures	To meet emergency, relatively unplanned, and short-duration needs for programs and/or events	Up to 25 years
Standard Structures	Designed and built to accommodate normal campus functions	Up to 50 years
Special Structures	Specifically designed and constructed either for more intense use and/or to last longer	Up to 75 years

Setting a life term of utilization for buildings at the design stage can influence the cost of construction because it sets a parameter not usually taken into account in traditional university construction programs. We have a tendency to "overbuild." Either we are concerned about providing the best possible for our public and our students, or we are convinced that no building is "temporary," or we haven't been precise enough in our long-range planning to match buildings to projected needs. The results are that we build everything as if it must last forever. Thus, ineffective and inefficient buildings are kept on the inventory and modified over time for no other reason than that they cost so much in the first place.

The process of setting a life-term date for each building on the campus can be one of the byproducts of the building assessment process, described next.

Measurement Two--Building Assessment

This section describes a tool for evaluating quantitatively the current physical condition of a building. The tool is also used to assess a building's potential for conversion to other uses. It provides a framework within which decisions can be made about repair, renewal, renovation, and removal.

A number of factors contribute to a change in a building's usefulness. Some of these factors include

- o Piecemeal conversion and renovation, which place increased stress on electrical, mechanical, or other building systems by demanding more service than the systems were designed to provide or by adding incompatible components to existing systems
- o Insufficient maintenance programs, resulting in a backlog of repair and renewal work
- o Changes in research and instruction methodologies, requiring new building systems--e.g., computer networks, environmentally-controlled rooms--which the building may not be able to accommodate
- o Code changes that may or may not have been implemented to protect building occupants and the environment

The cumulative effect of these changes makes it prudent to assess periodically each campus building to determine the extent to which it represents opportunities or obstacles for meeting future needs. By understanding the potential and constraints of each building, planners can make informed plans for the long-range use of space.

The building assessment provides a method for evaluating buildings according to criteria related to condition, capital renewal, and replacement needs and the potential for converting the building to alternate uses. The assessment is composed of two parts: building condition and conversion potential. Each part includes a number of building attributes, which are weighted according to relative importance. Each attribute is then evaluated on a scale of 1 to 10. The total resulting weighted score is based on a total possible score of 1,000 points.

In the two-part model shown on the following pages, the sources of information used to evaluate a building are a facilities audit, which identifies building deficiencies on a cost-per-square-foot basis; capacity studies, which identify existing system loads; and data about structural design. In the absence of such data, alternate measures may be submitted.

Part One--Building Condition addresses the building's age, its compliance with applicable safety codes, the condition of its structure and systems, and

expenditures required to meet current programmatic requirements. The low end of the scale (1) indicates a high need for repair and renewal. Higher scores indicate buildings that are in good condition. The objective criteria for assigning scores follow.

PART I			
RATINGS OF BUILDING CONDITION			
Higher score indicates building with lower repair and replacement costs			
BUILDING ATTRIBUTES	WEIGHT-ING FACTOR (A)	BUILDING #1	
		BUILDING SCORE (B)	WEIGHT-ED SCORE (A x B)
<u>STRUCTURE</u>			
1)FRAMES, WINDOWS, WALLS, FOUNDATIONS	8		
2)ROOFS	8		
3)PUBLIC AREAS	6		
<u>SYSTEMS</u>			
4)ELECTRICAL	9		
5)PIPED SYSTEMS	9		
6)MECHANICAL	9		
7)ELEVATORS	8		
<u>CODES</u>			
8)FIRE SAFETY	8		
9)SEISMIC SAFETY	9		
10)OTHER CODE	8		
<u>OTHER</u>			
11)AGE	8		
12)TOTAL COST/SQUARE FOOT	10		

	100		
TOTAL POSSIBLE			1000

Building Condition Scoring Criteria

STRUCTURE		
1) FRAMES, WINDOWS, WALLS 1 = >\$6 per gsf maint/renewal cost 3 = \$5 to \$6 5 = \$3 to \$5 7 = \$2 to \$3 9 = \$1 to \$2 10 = <\$1 per gsf	2) ROOFS 1 = >\$3 per gsf maint/renewal cost 3 = \$2.50 to \$3 5 = \$2 to \$2.50 7 = \$1.50 to \$2 9 = \$1 to \$1.50 10 = <\$1 per gsf	3) PUBLIC AREAS 1 = >\$3 per gsf maint/renewal cost 3 = \$2.50 to \$3 5 = \$2 to \$2.50 7 = \$1.50 to \$2 9 = \$1 to \$1.50 10 = <\$1 per gsf
SYSTEMS		
4) ELECTRICAL 1 = >\$6 per gsf maint/renewal cost 3 = \$4 to \$5 5 = \$3 to \$4 7 = \$2 to \$3 9 = \$1 to \$2 10 = <\$1 per gsf	6) MECHANICAL SYSTEMS 1 = >\$6 per gsf maint/renewal cost 3 = \$5 to \$6 5 = \$3 to \$5 7 = \$2 to \$3 9 = \$1 to \$2 10 = <\$1 per gsf	7) ELEVATORS 1 = >\$42,000 per door opening 3 = \$32,000 to \$42,000 5 = \$22,000 to \$32,000 7 = \$12,000 to \$22,000 9 = \$2,000 to \$12,000 10 = >\$2,000 per door opening
5) PIPED SYSTEMS 1 = >\$3 per gsf maint/renewal cost 3 = \$2.50 to \$3 5 = \$2 to \$2.50 7 = \$1.50 to \$2 9 = \$1 to \$1.50 10 = <\$1 per gsf		
CODES		
8) FIRE SAFETY 1 = >\$6 per gsf maint/renewal cost 3 = \$5 to \$6 5 = \$3 to \$5 7 = \$2 to \$3 9 = \$1 to \$2 10 = <\$1 per gsf	10) OTHER CODES	
9) SEISMIC SAFETY 1 = Very poor (extensive structural damage and/or falling hazards representing high life hazards in major seismic disturbance) 5 = Poor (significant structural damage and/or falling hazards representing appreciable life hazards) 7 = Fair (structural damage and/or falling hazards representing low life hazards) 9 = Good equivalent (built before most current seismic standards but improved to meet current code requirements) 10 = Good (some structural damage and/or falling hazards that would not significantly jeopardize life)		
OTHER		
11) AGE 1 = Built before 1935 3 = 1935 - 1949 5 = 1950 - 1959 7 = 1960 - 1969 9 = 1970 - 1979 10 = After 1980	12) TOTAL COST/GSF	
ALTERNATIVE SCORING IF COST DATA IS NOT AVAILABLE		
1 = Totally unsatisfactory. System or structural element must be replaced. 3 = Requires major remodeling. Estimated cost is greater than 50% of total replacement. 5 = Requires major modernization. Estimated cost is between 25-50% of total replacement. 8 = Requires restoration. Estimated cost is not more than 25% of total replacement. 10 = Minimal or no renovation required.		

Part Two--Conversion Potential evaluates the potential for using a building for some purpose other than that for which it was designed. It is a measure to be used, for example, when considering the conversion of an office building to use for research. The scoring system follows the same format as that used in the section on building condition. Lower scores indicate buildings with more limited capacity for intensive use.

PART II RATINGS OF BUILDING CONVERSION POTENTIAL Higher score indicates building with greater potential for complex, intensive use			
BUILDING ATTRIBUTES	WEIGHTING FACTOR (A)	BUILDING #1	
		BUILDING SCORE (B)	WEIGHTED SCORE (A x B)
(1) FLOOR LOADING	10		
(2) FLOOR TO FLOOR HEIGHT	10		
(3) DESIGN/LAYOUT	9		
(4) MATERIAL HANDLING/ACCESS	8		
(5) UBC CONSTRUCTION TYPE	8		
(6) MECHANICAL SYSTEM CAPACITY	8		
(7) ELECTRICAL CAPACITY	8		
(8) PIPED SERVICES CAPACITY	7		
(9) ELEVATORS	8		
(10) FIRE SAFETY	6		
(11) AGE	8		
(12) EXISTING CONDITION (See Part I Total)	10		
	----- 100		
TOTAL POSSIBLE			----- 1000

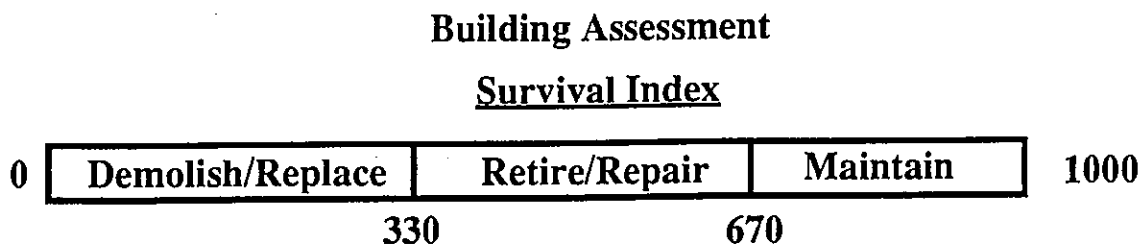
CONVERSION POTENTIAL EVALUATION CRITERIA

- 1) FLOOR LOADING
 - 1 = Residential
 - 3 = Existing office; cannot be used for research
 - 7 = Existing office/warehouse; can be used for research
 - 10 = Existing research
- 2) FLOOR-TO-FLOOR HEIGHT
 - 1 = Residential/office
 - 5 = Industrial/warehouse with ceilings > 9 feet
 - 7 = Existing research with no interstitial space
 - 10 = Existing research with interstitial space
- 3) DESIGN/LAYOUT
 - 1 = Inflexible redesign options for placement of walls and access to mechanical/utility/systems
 - 5 = Medium flexibility; can be redesigned with some effort/expense
 - 10 = Maximum flexibility; requires no redesign
- 4) MATERIAL HANDLING/ACCESS
 - 1 = No freight elevator or adequate stair access for large/heavy equipment; corridor width < 3'6"
 - 5 = Stair access for heavy equipment; corridor width > 3'6"
 - 10 = Two or more freight elevators; corridor width > 6 feet
- 5) UBC TYPE
 - 1 = Wood frame construction (Type 5)
 - 3 = Light incombustible frame (Type 4)
 - 5 = Ordinary masonry construction (Type 3)
 - 7 = Heavy timber construction (Type 2)
 - 10 = Fire-resistive construction (Type 1)
- 6) MECHANICAL SYSTEM CAPACITY
 - 1 = In poor operating condition; insufficient for current use
 - 3 = Can support current demand
 - 5 = Can support 30% increase in demand
 - 7 = Can support 50% increase in demand
 - 10 = Can support 80%+ increase in demand
- 7) ELECTRIC CAPACITY
 - 1 = In poor operating condition; insufficient for current use
 - 3 = Can support current demand
 - 5 = Can support 30% increase in demand
 - 7 = Can support 50% increase in demand
 - 10 = Can support 80%+ increase in demand
- 8) PIPED SERVICES CAPACITY
 - 1 = In poor operating condition; insufficient for current use
 - 3 = Can support current demand
 - 5 = Can support 30% increase in demand
 - 7 = Can support 50% increase in demand
 - 10 = Can support 80%+ increase in demand
- 9) ELEVATORS
 - 1 = No elevators or handicapped access; remote location
 - 3 = Inadequate handicapped access to rooms, upper floors
 - 5 = Appropriate handicapped access; insufficient elevator access to upper floors
 - 10 = Sufficient number/adequate speed of elevators; appropriate handicapped access; convenient location
- 10) FIRE SAFETY
 - 1 = Building design and suppression systems do not conform to minimum fire code requirements
 - 5 = Conforms to low-intensive-use fire code requirements
 - 10 = Conforms to maximum fire code requirements (e.g., high-rise or hospital standards)
- 11) AGE
 - 1 = Built before 1935
 - 3 = 1935-1949
 - 5 = 1950-1959
 - 7 = 1960-1969
 - 9 = 1970-1979
 - 10 = After 1980
- 12) EXISTING CONDITION
 - 1 = > \$40 per gsf maintenance/renewal cost
 - 3 = \$35 to \$40
 - 5 = \$20 to \$35
 - 7 = \$10 to \$20
 - 9 = \$5 to \$10
 - 10 = < \$5 per gsf

Rating the buildings on the same weighted scale allows comparison of buildings. The model also allows for comparison of buildings on specific factors, making it possible to rank-order buildings in terms of cost-effectiveness of repairs and renovation. If necessary, each part also can be analyzed independent of the other. The system provides a mechanism for identifying buildings that may soon be deemed obsolete and then considered for demolition.

The assessment identifies on a line-item basis those attributes that must be improved in order to change the building's use or to improve its condition. It thus provides information to those interested in taking over space in the building but unaware of the possible structural ramifications of such a decision. The assessment also applies a quantitative measure to what is often an intuitive judgement about a building's condition or best use. The educated conclusion of facilities managers is translated into a simple numeric scheme that can be communicated to campus planners and decision-makers.

Completion of the model for each building allows campus administration to develop an overall index against which each building's score is compared. The index can be divided into segments, each of which represent a suggested action to be taken with the structure. An illustration follows:



In addition, completion of the analysis of the building model allows the administration to establish "remaining life terms" for each primary building. Admittedly, the new baseline life terms would be set based upon each building's comparison to the whole, but they would represent the start of a comparative base. Economic realism could be factored into the baseline by using the current capital program or master plan and by

backdating the building replacement program by approximately 10 years (the planning period needed from the realization of a space need to occupancy of a new or replacement structure).

Measurement Three--Cumulative Economic Impact

Obsolescence planning would not be possible given the state of data management, hardware, and software even 10 years ago. Today the ability to merge and initiate cross-analysis between space inventory files, the infrastructure database, and ledgers of plant expenditures presents exciting analytical and evaluative opportunities.

The longer-range look at capital planning is hard to sell on most campuses because conventional wisdom usually endorses an incremental approach to problem-solving, especially when it comes to space. The many issues associated with removing buildings, moving the occupants, building new structures, and finding large amounts of funding deter even the most dedicated and tenacious deans and chancellors. Funding, most of all, forces incremental approaches. Yet postexpenditure analysis of the cumulative effect of incremental funding secured to achieve small-scale relief to space problems underscores the need for an information system that ties expenditures to space over time. Such a system should be designed to capture at least three basic data sets: lifetime data on capitalized costs, by structure; expenditures for environmental health and safety (both operating and capital); and expenditures for maintenance and repair.

Lifetime expenditures for every primary building and major infrastructure system should be captured on an annual basis and fed into a cumulative database. The data then can be used to provide the following sets of analysis: (1) total renovation expenditures (over a certain threshold per renovation) spent on each building or system compared with the initial building cost and current marketplace estimate for replacement; and (2) a cumulative cost per square foot, not only for the building as a whole but for dedicated areas and room types within a building. These two relatively simple sets of analysis go a long way toward providing management with a picture of the economic history of certain space-related projects. They also provide information to assist in making decisions about longer-range capital replacement rather than continuing incremental approaches to planning.

Environmental health and safety expenditures should be identified and accounted for separately within the campus's general-ledger system. These costs will be primarily driven by regulation and will fall into two categories of expenditures: mitigating measure of a capital nature; and operating expenditures required to monitor, manage, and dispose of materials. Although these should be accounted for separately, they should be added to the totals resulting from the lifetime analysis described above. They should be kept separate because they are relatively new arrivals on the budget scene, they escalate in total amount, they are usually associated with certain types of space (i.e., cost centers), and they are real in today's world but until now a hidden and little understood cost.

Maintenance and repair expenditures provide a valuable gauge of the quality of space if costs can be identified with specific buildings and categories of interior space. The ability to combine data from general-ledger expenditures, the space inventory, and the system that assigns physical-plant workload creates many analytical opportunities. The ability to add a cost of maintenance to the cost of renovation and cost of conformance with regulation gives management a solid base against which to set priorities for capital planning.

In sum, the results of Measurement One give us the approximate date a building should be replaced, Measurement Two tells us the physical status of the building, and Measurement Three alerts us to how much the repair and maintenance is costing the campus. Age, health, and cost taken together provide a fairly accurate and thorough base for obsolescence planning.

Dimension #2--Infrastructure Capacity

The chapter on master planning contains detail about the need for an infrastructure plan and for an information system that captures the potentials for and constraints on infrastructure. The ability to renovate or replace buildings means little if their foundation and the supporting and logistical infrastructure are inadequate to accommodate them. Infrastructure analysis is based on "weakest link" theory--i.e., the component of the supporting systems with the least capacity will restrict the campus's ability to add new space or renovate old space.

One way to meld program-related building needs to infrastructure capacity is to develop a simple capacity-utilization model. The model need have no more than two variants: a building or program module dedicated to wet laboratory research, and a building or program module on the opposite side of the support needs spectrum (e.g., an office building program). The two model modules would represent a set assigned square footage (e.g., 10,000 asf) and would comprise generic space with a set utilization (e.g., 70 percent).

Calculations setting minimum and maximum needs for energy, access, population, and utilities would be set for each module. These would be layered over the existing infrastructure to determine if they could be handled with existing resources. Capacity analysis developed for each supporting component of the infrastructure plan would be developed to determine strengths and weaknesses in a quantitative manner. Information abstracted from the master plan, or long-range development plan, covering additional square footage needs and/or changes in the campus's activity mix from dry to wet laboratory space, would be multiplied by the capacities needed to accommodate the new space or change in program. Variance between projected need and available capacity would form a major input to the long-range infrastructure plan.

The comparison of what exists to what is planned is not as important as the match of building needs to infrastructure capacity. The model, designed to meet individual campus profiles, can assist in looking to future capital plans and making certain that the base will support the expectations and will do so as economically as possible.

Resources Needed for Obsolescence Planning: Staff, Funds, Space

The resources required to implement obsolescence planning can be substantial. Certainly the first determinant of resources needed is the scope of the campus inventory of buildings and support systems: How many buildings, located on how many sites, and encapsulating how much space, of what types, and of what age exist on the campus? Because of individual campus differences, we cannot specify here actual cost estimates. But we can summarize the categories of resources that will be needed.

At a minimum, each campus needs to appoint an obsolescence planning analyst who is assigned to the planning office to coordinate and

provide longitudinal guidance to the process. The individual will be a high-level professional analyst who has garnered several years of experience in understanding the written history and unwritten folklore of the campus. The person must be isolated from campus emotions and power politics. He or she should have strong analytical and systems skills. The need to coordinate efforts with data managers, plant staff, and other planners requires a person with good communication skills, a persuasive and analytical style of presentation, and years of experience on the campus.

Other resources required include operational support as follows:

- o Systems software and hardware to abstract the critical data elements from the space inventory, infrastructure, and plant workload systems
- o Funding to cover the use of consultants for the initial assessment of construction and infrastructure needs
- o Continued funding for consultants or incremental additions to the physical plant or planning office to complete periodic updates (every five years) of the assessments
- o Specifically designated funding in the long-range capital process to remove structures deemed by the process to be obsolete
- o Office and staff support and space, as determined by the size of the endeavor

Probably the most important resource, in whatever form it appears, is the one that it takes to start the process.

Additional Sources of Information

The following documents, abstracted in this book, may be useful to those interested in obsolescence planning:

1. The building assessment process referred to in the chapter was abstracted from "The Building Report Card," as developed at the University of California, San Francisco (see page 169).

Space Planning

2. "The Final Report of the Task Force to Review and Update the Planned Renovation of the Health Sciences" (1989), University of Washington, provides insight into the process, approach, and results of a major renovation planning effort (see page 186).

Financial Management and Planning

Renovation, construction, master planning, community involvement, and site redevelopment all cost dollars. Where do these funds come from? Can we forecast the long-range potentials and constraints of the funding sources that traditionally have supported our campuses and schools? What other funding arrangements might match today's economic environment with the acquisition of space? In other words, how will we fund the future?

Space planning and management operate in a "Catch 22" environment: You need space to generate dollars, but you need dollars to purchase the space. You must keep your program of acquisition and improvement ahead of institutional needs for space, but you need specific details about programs to justify additional space. Faculty members' requirements for space are expanding, but increasing costs and limited funds restrict the amount of new space that can be developed. And while the faculty need for space is becoming more acute, increased regulation and requirements for review are extending the time needed to build new space.

The aim of master planning is to balance program needs with space realities over time. But that objective assumes that funds will be available. Given the perfect mix of dollars, program needs and time, there is little a campus could not achieve. Reality, however, continually forces one constraint or another in the path of successful implementation. That constraint is usually one of limited funding.

In this chapter, "financial planning" refers to the processes of analyzing an institution's historical mix of funding, developing assumptions for adjustments in sources of funding, adding and subtracting new or modified funding arrangements, and projecting all sources of revenue far enough into the future to accommodate the master plan. If the results of financial planning indicate that there is insufficient funding to carry out the master plan, a campus has three options: cut the program, extend the timeframe for implementation of the program, or secure additional funding. Institutions usually choose the latter option.

The Growing Need for Alternative Sources of Funding

The gap between expectations and funding appears to be widening. Why? The factors affecting the current financial environment of the academic medical center include the following:

- o Accounting for inflation, space is much more expensive than ever. The cost continues to spiral. Increasing costs for construction materials and labor have been augmented by demands for more complex structural and support systems, due both to increasingly stringent safety regulations and to more precise program demands.
- o Our campuses are aging. The support systems of buildings are more expensive to maintain. When renovation is required, the project budget must include substantial costs for retrofit of infrastructure and code-related updating.
- o The faculty would like to have everything within close proximity: office, laboratory, equipment, animals, staff, storage, copying service, parking, food service, rest rooms, elevators, and classrooms. But mixing utility-intensive activities (e.g., wet laboratories) and non-utility-intensive activities (e.g., offices) in the same structure is not cost-effective. It is even more expensive to retrofit space with less intensive infrastructure systems to accommodate wet laboratories.
- o Stylizing space to meet individual needs is not only cost-ineffective but can result in less space because of higher costs per square foot of construction. Costs of renovation due to faculty retirements, transfers, and promotions--coupled with changes in research methodologies, needs for equipment support, changes in codes, and requirements for sharing across disciplines--can amount to the initial cost of new research space in less than the half-life of the building. If this is the case, institutions should consider the initial construction of generic, modular laboratory space--with stylization and adaptation to follow on a separate timeline, separate program definition, and separate budget.
- o When program definition is insufficient or incomplete, costs can increase. Time spent defining the requirements of a program before the design phase helps reduce time-consuming and costly modifications.

- o As the gap between needs for space and acquisition of space widens, campuses crowd more employees into less space. This results in expensive modifications to accommodate the crowding and in more intense utilization of space, which in turn increases the cost of maintenance and speeds obsolescence.
- o Computers, now an integral part of campus life, add considerations for space planning and budgeting that are often overlooked. Institutions must house the mainframe and computer services staff, place satellite dishes, and provide cabling and junction space. Computers also take up laboratory and office space. The additional need for space (equalling approximately 10 percent) increases assignment standards and results in expense traditionally unbudgeted in construction projects.
- o Expanding and intensive reviews by governing boards, fire marshals, environmental agencies, and community interests all add time and expense to the process of acquiring and constructing space.

Given the above factors, it is not hard to understand why additional or improved space costs more. Since faculty expectations are unlikely to diminish, pressure will continue to build on deans, chairs, and chief executive officers of academic medical centers. As we explore how campus administrations might fulfill this need for funding, we will consider (1) the institution's financial strategy in planning its expenditures, (2) how institutions might best organize to use the funds they have, (3) who generates various funding sources, and (4) who controls the funds that are eventually generated.

Financial Strategies

Spending strategies vary widely, not only from campus to campus but between central administration and schools, between schools and departments, and from one individual to the next. Approaches range from the conservative, even frugal to the extravagant, even reckless. Individuals and strategies either fit and are successful, or create mismatches that can

lead to financial chaos and uncertainty. Certainly the perception of the campus as either fiscally sound or otherwise influences the support that an institution will receive for planning initiatives. Financial strategies include the following:

Borderline Bankruptcy: a strategy of risk-taking, i.e., approving expenditures based on optimistic projections of revenue, coupled to the requirement of holding expenditures within confined budgets. Few planned or accomplished reserves are tied to emerging projects. This strategy appears in a reactive planning environment.

Debt/Asset Limit: a strategy that commits to mortgaging the future revenue of the institution while limiting the extent of financial obligations to the collateral of known and creditable assets. An important calculation in this strategy is setting a limit on the repayment of debt at a level that will not have a negative impact on revenue needed to sustain program quality, i.e., operations.

Cash on Hand: a simple, straightforward, conservative, and safe strategy that says, "If you don't have it and can't count it, you don't commit it."

Reserve-Dependent: a strategy that depends upon the master plan. It determines the major projects needed to accomplish the plan, designs and attests to financial projections of revenue required to fund these projects, and sets aside revenue (reserves) and/or commits future revenues over the duration of the plan's schedule.

Administrators live with some combination of all of the above. It is possible, though, to weigh the fiscal experience of an institution and approximate its financial strategy somewhere on the continuum of reactive to ultraconservative.

Organization of the Financial Function

Once administrators understand how an institution goes about managing its funds, they are in a better position to determine how best to organize the administrative structure. The offices that comprise the financial organization of the campus or school follow:

Financial planning and forecasting should include both the revenue needs of the capital as well as the operating programs and projects.

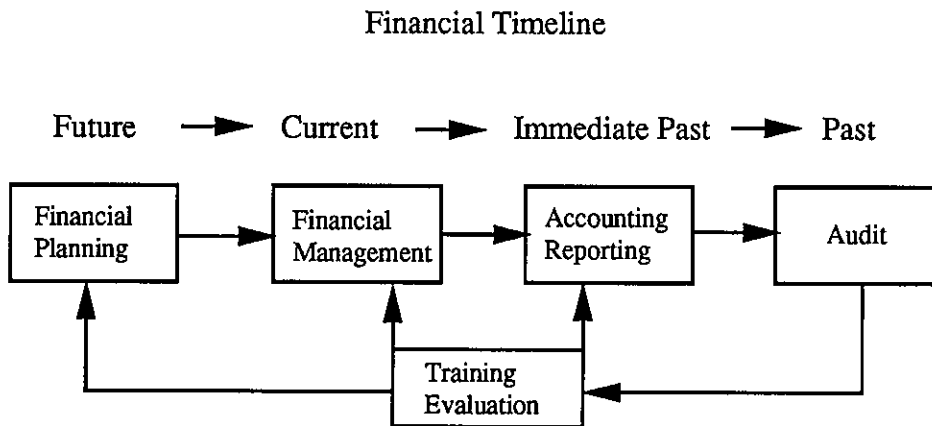
Financial management deals with the daily and annual oversight of the utilization of available funds. Budget control, negotiations of service and overhead agreements, monitoring of revenue, and financial analysis are conducted here.

Accounting, and reporting of expenditures and revenue receipts after the fact, is responsible for accounts payable and receivable activities.

Financial audit covers both internal reviews of the propriety of expenditures and the coordination of audits initiated from agencies external to the campus.

Financial training and assistance provides education in financial systems and methods, in an effort to assure sound financial management.

The activities from "financial planning" through "audit" all progress along a time continuum, while education and training interrupt the continuum to offer and at times insist upon corrective or new methods. The following illustration depicts the process:



These activities occur in the dean's office as well as in central administration, and must be organized in a manner that best complements

the organization's financial strategy. Usually one of two administrative structures will emerge. One structure groups the full continuum of financial activities (with the possible exception of audit) under one manager. This arrangement, which generally is aligned more closely with less conservative financial planning, allows authority to be applied along the continuum between offices. The objective is to provide results in a shorter period of time. The second administrative structure divides the offices between managers (associate deans or vice-chancellors).¹ This provides additional checks and balances but also adds time and expense to the process. It is more compatible with conservative approaches to financial planning and management.

Responsibility for Generation of Funds

Planning in times of economic affluence differs markedly from planning with limited financial resources. When funds are abundant, planners work to ensure that appropriate institutional priorities--not just those that have ample funding--are advanced. In this environment, fiscal responsibility seems to gravitate closer to the faculty, as they absorb credit for the economic abundance. The dean and chancellor function as referees to assure the faculty that academic program quality will not be sacrificed to those who may be currently well-funded. There is a subtle call for thorough planning, comprehensive involvement, and prudent expenditures.

In times of limited funds, responsibility for keeping the checkbook solvent moves up to the chairs, dean, and chancellor. Their roles broaden to include those of development officer, entrepreneur, solicitor, and salesperson. Although faculty pressures for enrichment and improvement are intense, negotiation and compromise emerge when space projects are advanced. The process exudes a feeling of urgency and pressure for quick, incremental, sometimes cost-ineffective solutions.

Regardless of the institution's economic state, the responsibility for fund generation is shared. But those who share the responsibility must understand the institution's financial condition and plans. Although few institutions can say precisely what part of the whole belongs to whom to

¹ The frame of reference for titles used in this chapter is a freestanding health sciences institution. Readers from institutions that are part of a larger university can translate these titles according to their own situation. "Vice-chancellor," for example, might become "assistant vice-president."

fund, schools and campuses can develop financial profiles and summaries of financial information that explain the institution's financial status. Too often a campus's annual financial report, while beneficial in marketing the campus to the external community, contains little to inform the faculty, deans, campus managers, and staff about the institution's real financial health, history, and potentials for future funding.

Such a campus report could follow a number of different formats. The profiled information, however, should include

- o Historical expenditures by source of funding (20-year base with five-year increments), last completed annual expenditures, permanent current budget, and a projection of future (five-year minimum) expenditures.
- o Revenue received by source, corresponding to the expenditure data, and projections of revenue expected to cover both the operating and capital programs.
- o Source of funding over the period reviewed and forecasts showing changes in past and projected funding mix.
- o Match of funding sources to functional activities.
- o State of campus indebtedness and extent of annual repayment shown by funding source. This analysis should be stated both as it compares to the campus's asset base and as it relates to the projections mentioned above.
- o Calculations of past, current, and future indirect costs (overhead), revenue generated, projections, and allocations.
- o Composition of the endowment balances between restricted and unrestricted purposes, including changes in that composition and allocations of unrestricted balances together with an analysis of aging, equity, and rate of return.
- o Analysis over the review period of the extent to which the campus's auxiliary and service enterprises are self-sufficient and, if campus funding is allocated, the extent and source of that funding. The same analysis should be presented for

instructional support activities--e.g., animal care, audiovisual-television services.

- o Analysis of reserves for all carry-forward balances, showing growth or reduction trends.

All of this information should be presented simply and clearly, cross-explained where necessary, and sorted not only by source of funding and function but by organization (to a level no less than departmental).

Understanding the financial state of the campus, schools, and departments helps dispel fiscal myths and accurately summarizes the ability of the campus to meet the fiscal requirements of the master plan. If additional funding is required, everyone has access to the same information when they move to acquire these resources. Income generation, or expenditure reduction, becomes everyone's business.

Management and Control of Funds

If the campus community had its way, neither the chancellor nor the dean would have any money. Their primary responsibility is seen as acquisition and allocation. Admittedly, it is the campus that accepts revenue, and therefore the chancellor is responsible for the fiscal integrity of the campus, its schools, and support units. But when the major educational institutions of the nation adopted "fund accounting" as the foundation for their overall financial systems, they set the precedent for as many "would-be managers" as a campus had sources of funding. With every fund operating as a separate checking account--with its own balance statement, signature authorization, and restrictions on expenditures (or lack thereof)--the real question about who controls funds is linked to how far the chief executive officer of the academic medical center delegates.

Coupled to the degree of delegation of authority is the corresponding issue of assumption of risk. Without an overlay of monitoring and processing, delegation is a straight line to risk, from 100 percent control to 100 percent trust. Although no campus operates without an accounting office and audit division, the degree of financial authority that has been delegated to schools varies in degree as do the number, extent, and sources of funding that comprise the fiscal sum of the nation's academic medical centers.

Space acquisition and planning tend to be centralized, campuswide activities. Fund-specific management of expenditures and generation of revenues, on the other hand, are closely associated with and protected by the faculty. The potential for financial trouble grows with the divergence of financial strategies and corresponding administrative structures a campus can embrace. Because the success of space planning is so closely tied to the institution's financial success, responsive and accurate financial planning in this area is imperative. Are there any guidelines, lessons, or processes that can help financial planners?

Essential Ingredients of Financial Planning

Successful financial planning depends upon responsive data systems that capture and report accurate information, efficient and effective management of funding sources, and a realistic appraisal of the time pipelines associated with each funding source. All three elements--data, management, and time--are essential to ensuring that deans and chancellors have what they need to make decisions about the acquisition and allocation of space. These elements must be coordinated and assimilated to produce acceptable results.

Data

In order to understand the institution's economic health, administrators must have access to a campuswide database that allows accurate analysis and projection of what the economic future might look like. Line managers of the physical plant, accounting office, and other operational units will have budgets for their parts of the master plan. But the dean's and chancellor's planning staffs must attest to the reasonableness of incoming data, add the analysis and overhead required, and manage a data collection process that keeps these data and analyses up-to-date.

Management

Members of the planning staff have little control over the campus's day-to-day operation. They are in a position, though, to overlay actual operational results with guidelines and analytical tests and to alert

leadership to variances from the expected. Some of these guidelines and measures appear below:²

- o Expenses for institutional support (administration) should range from four to six percent of the overall campus budget and should not increase faster than the total growth of the campus's expenditure base.
- o Each dean and chancellor should have sufficient unrestricted fund balances to make an immediate program decision costing up to one percent of the annual budget of the campus or school.
- o If the institution's expenditures for auxiliary and service enterprises increase at a rate higher than the campus's total expenditure base, and do so for more than a year, economic decay may have started.
- o An institution's net worth, or asset base, should grow no less than two percent per year.
- o If a major change in campus program or direction has been implemented, it will take three full fiscal years before the expenditure base will accurately reflect the change and can be used for projections.
- o The composition of gift and endowment funds should be at least 10 percent unrestricted funds to ensure schoolwide financial flexibility.
- o If schools provide professional and/or operational services to affiliates, the resulting financial transactions should be conducted on an advance or break-even basis. If the balance of expenditures over revenue exceeds one month's average expenditures, corrective action is advised.
- o Faculty compensation plans should be accounted for in a manner that shows the fund balances assigned to the

²The guidelines were presented by the author at the spring meeting of the AAMC's Group on Business Affairs, March 18-20, 1985, at the Hyatt Union Square in San Francisco.

management of the deans as compared to the faculty. The deans' balance should exceed 10 percent of the sum of the balance of the funds.

- o Interest income earned on school- and campus-managed balances should approximate plus or minus one percent of federal T-bills' short-term rates.
- o Campus parking, transportation, and housing programs should generate at least five percent over the sum of expense and depreciation.
- o Campus overhead receipts, uncommitted as expense offsets, should fund short-term programs and/or one-time capital projects.

The above represent examples of measures planners can use to test whether or not the current financial health of the campus or school can be used to forecast the future. Analyzing a minimum of five years of data on expenditures and revenues is the minimum needed to establish a base for future projections.

Time

Given five years of actual data and a solid current-year budget, financial planners must next determine the extent of revenue in the pipeline that is associated with decisions already made.

The time between solicitation and realization of revenue varies substantially depending on the source of funding. Approximate timespans for some representative funding sources appear on the next page.

Fund Source	Time from Solicitation to Realization
Venture Returns	8-10 years
Gifts and Endowments Solicited	3-5 years
State Appropriations	5 years
Auxiliary Profits	3-4 years
Overhead	3 years
Federal Awards	2-3 years
Student Fees/Tuition	2 years
Professional Fees	1 year
Gifts and Endowments	1 year
Internal Recharging	6 months
Commercial Loans	6 months

An analysis of each funding source that supports the institution's capital and operating programs must be completed to identify the fiscal commitments made against that source of funding, to chart the time it will take to realize the revenue against that fund source needed to retire those commitments, and to summarize the remaining balances and deficits over the period of commitments. The results of this revenue-to-commitment-to-time analysis dictate the fiscal starting point in determining the institution's ability to undertake new projects.

Major Sources of Funding

The basis for sound financial planning consists of identifying, collecting, and verifying actual expenditure and revenue data; assuring that the current budget base is efficiently managed and provides a sound foundation for forecasting; and attesting to the extent that revenues can be accrued that are associated with decisions made and actions already taken. The next step is to assess accurately the potential of each funding source and to design the funding packages necessary to acquire more and better space. In this section we examine the potential of each major funding source to generate revenue.

State Appropriations

If an institution receives state funding, chances are that it is not the primary source of funding for new or renovated space, that it has been a decreasing percentage of the whole over the last decade, that the time it takes to receive it is extending, that it costs more to justify than other sources, and that it supports only projects with strong political and public appeal. Few public institutions, however, are affluent enough to omit state money from their strategy for funding space.

Once state funding becomes a component of the total campus funding plan, it almost invariably sets the pace for all capital space projects. This makes it even more imperative that the institution's master planners sequence space projects strategically and select only those that have solid public support, are of large scope, and can be phased independently of other projects in terms of their requirements for infrastructure and funding.

Federal Awards

Federal funding is almost always project-specific and usually brings with it restrictions on utilization and life terms. Too often, projects thrown together to match emerging legislative requirements bear little resemblance to priorities developed within the context of the master plan. However, the master planning process should help more fully define and develop targeted projects that will be "on the shelf" when federal funding opportunities arise. The less these targeted projects depend upon other funding sources or sequential constraints, the better.

Overhead Receipts

The timeline for returns on overhead is several years long, but the imposition of a "cap" or "ceiling" percentage can happen in a very short period of time. If an institution's governance policy permits overhead to be recycled into the campus's needs for space, funding plans should include strategies for the allocation of overhead to safeguard against arbitrary reductions. Such strategies might include allocating only the incremental overhead revenue justified since the project was included in the master plan; allocating no more than one-third of the overhead receipts for the last year accounted for; allocating no more than the amount substantiated in

the cost pool for building depreciation; or allocating one-third of all receipts each to faculty research, the capital program, and infrastructure.

Although the campus's overall financial strategy will dictate the allocation of overhead funding, a primary consideration in dedicating this funding source to long-term capital financing is the relative instability and uncertainty of the base amount. Financial planners can be certain only that overhead will be controversial, little understood, and often challenged. A target paper has been appended to this chapter in an attempt to provide a better understanding of the principles and practices associated with overhead.

Gifts and Endowments

When all else fails, the optimist turns with great expectation to the philanthropy of the private sector. Unfortunately, the great majority of funds received through gifts and endowments are earmarked for specific projects, programs, and/or individuals. Campuses with more than 10 percent unrestricted gift and endowment funding are rare.

Gifts and endowments are defined, and therefore accounted for, as one of the following: "designated," which usually means they are given to support the broad functions of education, research, patient care, or public service and are to be expended under the direction of or upon allocation by the chancellor or dean; "restricted," which carries the above designation of purpose one step further and specifies the type of research, education, or care, and even the location of performance and individual who is to manage the funds; or "unrestricted," which comes with little or no restriction other than the enhancement of the institution.

In addition, gifts and endowments are identified as having been secured through either unsolicited action on the part of individual donors or by solicited, usually organized, actions conducted by the institution and its faculty. Solicitation ranges from faculty who are strong advocates for their activities to the chief executive officer or dean seeking funds for multidisciplinary programs and general institutional support. Traditionally, the largest amount of funding coming from this source arrives through the unsolicited, restricted avenue.

As campuses turn to more organized approaches to individuals and firms in the private sector, competition becomes keener not only among institutions but within the faculty. Individual avenues to funding become closed to faculty as granting agencies and individuals look to the deans and chancellors for coordinated approaches representing overall institutional needs. A planned and comprehensive space program fits the giving priorities of these groups and individuals better than haphazard, somewhat emotional approaches; hence, the need for more forward-looking space planning.

Whereas endowment funding primarily supports programmatic initiatives and continuing academic operations, gift funding is growing as a source of funding for space projects. The projects supported by private donors, though, tend to be highly visible projects that bring the donors recognition. One rarely finds gifts earmarked to improvements in infrastructure or removal of asbestos. These limitations of gift funding require leaders to select projects within the campus space plan that are attractive yet do not carry high expenses for infrastructure, site development, relocation, and retrofit--elements the campus might have to fund to capture a gift.

Compensation Plan (Professional Fees from Practice Income)

The volume, use, composition, and management of revenue from professional fees continue to evolve. Although compensation plans remain a mysterious and elusive funding source in the eyes of central administration, they represent a source of financial flexibility and, to some degree, leverage for the deans and faculty. In the 1960s, management of most of the professional fee income in medicine was brought under the umbrella of compensation arrangements. The objective was to dedicate revenue accruing from professional fees to faculty salaries and, if any was left over, to program enrichment. Since then several factors, including those that follow, have complicated the management of this revenue source:

- o Revenue from professional fees has been such a major component of funding for the health sciences that the health sciences have been portrayed by others as "rich" and well-funded. Allocations of resources have been skewed toward non-health-science schools in an effort to make up for this

perceived funding imbalance. This image of riches in the health sciences has also influenced the funding priorities of capital projects that compete for state and/or institutional resources.

- o The reality, little understood, is that the great majority of professional fee revenue returned to the schools is restricted to the academic departments that generated it. Although the overall sum of the funding for the annual compensation plan may approximate 20 percent of a school's funding, very little of it is available to the dean for discretionary funding. Further, an analysis of carry-forward balances will most likely disclose that these balances reside in department-managed accounts, not accounts under the dean's control. Both of these factors limit the degree to which the dean can fund schoolwide priorities for space from compensation-plan revenue.
- o Compensation plans now cover most of the health science schools. The rules and procedures that cover the plans have become more complex with each passing budget, adding to the costs associated with managing the plans and further restricting uncommitted revenue. This growing oversight also distorts the expenditure history of this source of revenue.
- o Policies concerning patient-care reimbursement have become more restrictive, competition has intensified, and specialized services have been narrowed to specific centers--all of which combine to decrease the amount of professional fees available to schools. At best, the growth of professional fees as a percentage of the complete school funding package has slowed; more realistically, it has probably decreased.
- o Revenue from professional fees, instead of being used only for salaries, has become the primary source of funding for many faculty for program enrichment and expansion. On many campuses it provides a substantial component of the funding for renovation of faculty space. To the extent that it gets built-in to the support of continuing programs, its availability to meet needs for space decreases.

One way that financial planners can help achieve objectives of the master plan is to dispel the myths and mysteries of compensation-plan revenue by reflecting accurately its limitations.

Commercial Ventures

Many institutions long ago surpassed the relatively confining boundaries of providing students with housing and books, and faculty and staff with parking. The spectrum of partially or fully "for-profit" ventures that campuses undertake is rapidly expanding. The constraints of competition with the community, unrelated business taxes, and site development have been overcome by the need to secure additional revenue.

This move from purely academic needs for support services to the commercial marketplace and private commercial sector is not without ramifications for space planners. Ventures such as hotels, conference centers, food services, travel agencies, laundries, medical laboratories, public parking, stores, theatres, and housing all bring with them the need for space. Along with space come profit-motivated management teams, the need for start-up capital, additional public exposure, and risk of financial loss. But revenue from these ventures--if sufficient to cover depreciation, servicing of debt, and reserves for improvements--can provide a source of capital for expansions and/or renovations of space.

Student Fees & Tuition

Revenues from student fees can help fund space needed to house some student activities. This is not usually a primary source of funding for acquisitions or improvements of space, though, because (1) there are so few health science students on the campus compared to the overall student body; (2) tuition is already so high in the health sciences; (3) and assessments for space for student programs have a hard time passing due to already high fees, little free time for students, and the reality that the space will most likely not be available until after the students leave.

Loans and Bonds

Three broad categories of loans can be used to finance shortfalls in revenue needed to fund capital projects: private sector loans, public sector loans, and loans internal to the campus. The alternative of securing loans to finance the space program has been made more attractive by a myriad of techniques, arrangements, mechanisms, and schemes. The fact remains, however, that loans have to be paid back. The payback must be carefully designed to rely on sound estimates of revenue that do not impinge upon the fiscal base needed to support continued quality of programs.

Packaging the Various Sources of Revenue to Fund the Capital Program

Whenever administrators rely on more than one source of funding to initiate a space acquisition and/or renovation project, they add complexity and, usually, time to the process. The further apart the funding sources are on the time pipeline described in the previous section, the greater the complexities and the more likely that the schedule will gravitate toward the longer completion date. Loans are often suggested as a way to bridge the complexities of multiple funding, but the loan approval process and its corresponding fiscal analysis also add time to the process.

Depending on the method used to accumulate a project's funding, financing costs will vary. No matter how inexpensive certain financing methods appear when considered in context with the current market, any costs of financing will have an impact on future projects and possible programs. The challenge in matching funding to projects over time is to determine if there are "down periods" in project scheduling, when the use of interest-bearing balances to bridge accruals of revenue will not hinder campus programs dependent upon those balances. Sometimes it proves cost-effective to defer a project for a set period of time--in anticipation of increased revenue--rather than to create a situation in which a project must be shelved due to the cost of indebtedness associated with a "fast-tracked" project.

Alternative Methods to Create Academic Space on Campus

Whether an institution is affluent or underfinanced, has a sufficiently large site or is landlocked, has and follows a master plan or not, it should continually analyze its current space environment to see if more academic, especially high-utility-intensive, space can be made available in the academic zones of the campus. Ways to release space for other uses include those that follow:

- o Relocate institutional support activities--e.g., campus accounting, personnel services, computer services, budget, material management--that are in or adjacent to academic zones. These programs can be grouped and moved to less expensive office space in less intensive infrastructure-dependent areas of the campus or off-campus into either owned or leased space.
- o Review the amount of space associated with support service activities--e.g., mechanical shops, audiovisual/television services, electronic servicing, and travel services--to see if the surrounding community can provide these services, thereby releasing campus space.
- o Review departmental administrative support services to determine if they can be combined with other departments' similar services to form quasi-centralized centers that serve more than one department. Locate these centers out of the immediate department core, thereby releasing space in high-intensity areas.
- o Move laundry, storehouse, mailing, and transportation-dependent services to inexpensive warehouse space off-campus.
- o Where more than one campus exists in a geographic region, explore centralization of shared or contract services (e.g., accounting, hospital finance, purchasing), thereby releasing space on the campus.
- o Inventory all meeting rooms and consider a centralized small and medium (6-16 person and 20-30 person capacity)

conference-room facility that provides computerized scheduling and logistical support services and, as a tradeoff, releases space, often adjacent to laboratories, to departments.

- o Place a "rent equivalent" value on all campus space. Tie this value to the space inventory. Generate not only periodic reports on the extent of the funds that theoretically would be required to rent equivalent space, but use this value in negotiations for new or released space. Highlight, on a department by department or faculty by faculty basis, low-value utilization in high-value space. An example of starting values follows:

Stores, open space = \$10.00 per square foot per year
Office = \$20.00 per square foot per year
Laboratory = \$30.00 per square foot per year

- o Encourage permanent and short-term (one- to five-year) loans or purchase of space between departments and/or schools, coupled to the incentive of permanent or annual transfers of operating funds to the releasing department to pay for the loan.
- o Determine the feasibility of converting dormitories to faculty offices and associated support-service space, freeing space adjacent to or in utility-intensive buildings (i.e., clinical and research). Relocate student and visitor housing in less intensive areas of the campus or community.

An institution's ability to develop and implement space-saving or space-generating alternatives depends on its ability to receive and analyze reliable information about the allocation and utilization of space. Looking at what the institution has--and determining ways it can be used better--is much more difficult for management than acting incrementally to acquire additional space. But in times of extended limited funding, data from a well-researched financial plan can encourage management to explore alternatives for releasing space before committing to the acquisition of additional space.

*Appendix*³
**Using Indirect Cost Recovery
For Debt-Financing of Capital Projects**

One of the revenue streams that has been more aggressively pursued in recent years as a source of funding for debt-financed capital projects is federal indirect cost recovery. Many state-funded universities and schools are becoming comfortable with indirect costs as a reimbursement mechanism. The result of this comfort level is that many institutions are turning to a practice often followed by private institutions: simultaneously negotiating higher indirect cost rates as a result of new buildings (which are higher in price due both to current construction costs and added financing costs) and justifying the debt-financing (to the institution and the lending agencies) for the new buildings based on the projected increase to the indirect cost rate.

To a capital planner, proposing these simultaneous acts seems reasonable and quite necessary. On the other hand, a person recently skilled in the art of indirect cost negotiation may consider it a physical impossibility to make these two acts anything close to "simultaneous." The negotiator will be quick to point out the areas of risk that may be responsible for an increase to indirect cost rates to be made within a reasonable time, if at all. These risks involve the following:

- o The timeline to convert increased costs into increased indirect cost rates can range from one to five years. Typically the range is three or more years.
- o The federal government is exerting very strong pressures to limit, if not lower, indirect cost rates. As a result, federal negotiators, especially those with Health and Human Services (HHS), have used tactics that make the negotiations take on the appearance of price-based as opposed to cost-based negotiations.
- o The current trend of limited federal contract and grant funding may mean that a given school or university will experience a decrease in its total amount of federal funding.

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Indirect Cost Recovery, continued

Since the amount of indirect cost dollars received by an institution is determined by the indirect cost rate times the direct award expenditures, an increase to the rate could be offset by a decrease in the total awards. Therefore, "new" funds, as justified by proposed construction, may be diverted to pay for exiting operating costs that the university has become comfortable in funding through indirect cost reimbursement.

- o Current pressures from the federal government to limit or reduce indirect cost rates may create some challenging situations for schools and universities. A possible situation may be a forced reduction of an existing rate with compensating increase for a proposed capital project. The challenge to the institution is that in order to use the "new" recovery for the capital project, it must first reduce expenditures or increase other revenues for those campus support services whose funding is being reduced through a lowering of the indirect cost rate.

On the other side of the equation, there are valid reasons why proposed debt-financed capital projects can and should be justified based on federal indirect cost recovery. Specific reasons for this include:

- o Recently, federal negotiators (especially those with HHS) have been openly interested in considering additional indirect cost rate components that are directly related to the capital and debt-financing costs of new research space.
- o Although there is an uncertain timeline associated with the flow of incremental indirect cost reimbursement, there is a similar timeline for construction projects. It is not uncommon for a capital project to take three to five years to reach completion. The issue then becomes how best to match the two timelines, and perhaps how to arrange interim financing.
- o If the eventual users of space (namely the federal government for federally-sponsored research) will not pay for the space,

Indirect Cost Recovery, continued

then, absent other specific funding sources, why should the school or university assume the cost? This is an argument that should be proffered during indirect cost rate negotiations. If necessary, the university may want to try to tie federal negotiators to granting agency administrators relative to this issue.

After assessing the potential benefits and risks of tapping the flow of indirect cost revenue to finance capital projects, it is necessary to lay out the financing scheme in a model or projection format. This will identify cash-flow issues such as different timelines and dollar variances. It is advisable prior to developing such a financial model to write down the basic assumptions and principles upon which the model will be made. The following assumptions could be adopted for use:

- o For new construction, assume that only 90 percent of the projected increase in indirect cost recovery will be available, and relate the increase in indirect cost rate only to the project being financed.
- o Assume that no more than 50 percent of the total indirect cost recovery related to building use allowance for the university will be committed to debt-finance payments.
- o Assume that no more than 20 percent of the total indirect cost recovery related to equipment use allowance for the university will be committed to the debt-finance payments.
- o When projecting indirect cost rates for new buildings, include a projection of increased total award levels for the university. This will lower the projected indirect cost rate; however, federal negotiators will require that new space be accompanied by a projection of expanded research.

When constructed properly, indirect cost reimbursement is prudent as a payment basis for debt-financing capital construction. A careful assessment of the risks of current rate negotiation practices must be brought into the scope of review, along with the normal cash-flow

Indirect Cost Recovery, continued

projection methodologies that accompany any major borrowing. It may even be helpful to meet with federal negotiators to learn their position on future proposals to increase the indirect cost rate as a result of new, debt-financed space.

An Indirect Cost Primer

Generally, colleges and universities are reimbursed by the federal government for contracts and grants for two types of costs: direct and indirect costs. Direct costs are those which can be specifically identified on the proposal and ensuing award. Indirect costs are those institutional expenditures that relate to a broader scope of activities, a portion of which can be allocated to federal contract and grant activity.

The federal indirect cost rate is determined by using general cost allocation principles contained in Office of Management and Budget Circular A-21. Circular A-21 identifies eight different categories (called cost pools) for indirect costs. The eight cost pools are: General Administration (GA), Sponsored Projects Administration (SPA), Departmental Administration (DA), Building Use (BU), Equipment Use (EU), Maintenance and Operation of Plant (MOP), Library (L), and Student Services (SS).

For costs to be reimbursed by the federal government as indirect costs, they must first be allocated into one of these categories, and then they must be further allocated to the contract and grant activity, such as sponsored research, using an acceptable and "fair" methodology. In Circular A-21 there are prescribed (default) cost-allocation methodologies and a general statement that alternate methodologies may be used if they better allocate costs.

In the quest to maximize indirect cost reimbursement, colleges and universities have developed many alternate methodologies. Examples are elaborate weighting coefficients for utility consumption, both simplistic and complex studies of library cost allocation, and divided cost pools (e.g., multiple GA pools).

Indirect Cost Recovery, continued

The government response has been both interesting and varied. Different granting agencies--HHS and the Office of Naval Research (ONR), for example--have taken markedly different responses to new cost-determination models proposed by colleges and universities. ONR has openly reviewed and accepted alternate cost-allocation methodologies. HHS, on the other hand, has remained skeptical about most proposals. Recent negotiation tactics include reviewing but not approving alternate methodologies, then taking the position that many of the alternate methodologies are not allowable because they are not "fair." (HHS has been successful in this approach because there is no administrative review or appeal mechanism to force a negotiation process to conclude. With new reimbursement mechanisms, it is possible for a university to suffer financial losses through a protracted negotiation that extends past a current rate year end.)

Other issues that should be considered in understanding indirect cost rates emanate from the fact that rates for federally-funded sponsored research vary widely from one university to another. In general, rates at private institutions are higher than at state-supported institutions. Other patterns are less obvious.

To help answer the question of why the rates are so different (from 38 percent to over 80 percent in major research campuses), a joint Association of American Universities-Council on Governmental Relations study was performed with 14 representative colleges and universities. Included were private and public as well as large and medium-sized institutions. In general, the major rate differences were related to costs of space. New, debt-financed space caused large differences, as did the compaction of many research dollars into small-research-related areas. Compounding this is the maintenance and operation of plant costs related to the heating and cooling of research space in nontemperate climates. Non-space-related issues also affected rates. For example, different federal agencies take different positions on costing alternatives, costing expertise varies at different institutions, and some institutions have more internal pressure not to raise indirect cost rates past certain levels.

Additional Sources of Information

1. Those interested in more information about indirect costs may wish to consult the following references:
 - a. *Indirect costs associated with federal support of research on university campuses: Some suggestions for change.* 1988. Association of American Universities (AAU), One Dupont Circle, Suite 730, Washington, D.C. 20036. Telephone (202) 466-5030.
 - b. *Indirect cost rates at research universities: What accounts for the differences.* 1987. Council on Governmental Relations (COGR), One Dupont Circle, Suite 670, Washington, D.C. 20036. Telephone (202) 861-2595.
 - c. "Model for Determining Utility Cost Allocations Associated with Conducting Research," (1987), University of Vermont College of Medicine (see abstract, page 184).
2. The Government-University-Industry Research Roundtable recently released a paper entitled "Research Facility Financing: Near Term Options." The document outlines options for changes in policies for financing science and engineering research facilities. It is considered "a working draft and a vehicle for facilitating dialogue necessary for the development of specific policy proposals by the stake holders in the research enterprise." For more information, contact D. Anne Scanley, Senior Program Officer, Government-University-Industry Research Roundtable, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. Telephone (202) 334-3486.
3. The following bibliography may also be of interest:

Dunn, J. A. 1989. Financial planning for plant assets. In *Planning and managing higher education facilities*, ed. H. H. Kaiser. 61 (Spring):89-101.

Government-University-Industry Roundtable. 1989. *Perspectives on financing academic research facilities: A resource for policy formulation.* Washington, D.C.: National Academy of Sciences.

Saunders, L. E. 1989. The politics of budgeting for deferred maintenance. In *Planning and managing higher education facilities*, ed. H. H. Kaiser. 61 (Spring):77-88.

Society for College and University Planning. 1989. *Financial planning guidelines for facility renewal and adaption*. Ann Arbor, Michigan. A joint project of the Society for College and University Planning, the National Association of College and University Business Officers, the Association of Physical Plant Administrators of Universities and Colleges, and Coopers and Lybrand.

Space Management

Allocation and Reallocation of Space: The Use of Standards and Utilization Measures

When circumstances result in newly available space or a need for more space, administrators must make difficult decisions about the reallocation of space. Situations that make space available include program termination or retrenchment; faculty retirement; gifts; and the rental, lease, or acquisition of new space. More frequent and more urgent are the situations that require more space. The need to upgrade facilities is one such pressing demand. Another is the recruitment of faculty and department chairs. New recruits, often more research-productive than outgoing faculty, may bring with them grants that create a need for more space. In order to provide enticements for new recruits, it is often necessary to reallocate from existing space assignments. Another situation resulting in a need for more space is any change in space usage--for example, increases in use of space for research because of changing priorities. A shift toward research often requires more total space, since usage standards for research are usually higher than for other functions.

Some of the most troubling questions of space management arise in connection with decisions about space allocation and reallocation: Are there generally accepted procedures for the fair assignment and reassignment of space? Are there any standards or numerical guidelines that can aid decision-making? How do they apply? Are there ways to assess how well space is being utilized? To validate allocation and reallocation decisions? Who should participate in such decisions? Before addressing these concerns, we need to clarify the terms to be used in the remainder of the chapter.

Allocation is a process that assigns space to an academic unit, either a department or a program. The process occurs in an "expanding space envelope"--i.e., it is a way of using newly available space (usually a new building or vacated space in an old building). Allocation does not involve taking space away from others. In making allocation decisions, administrators generally depend on institutional priorities and goals. They use priority reviews and standards to determine how much space is needed to accommodate the personnel and equipment for the desired activities.

Reallocation is a process that reassigns space from one academic unit to another. It occurs in a "closed space envelope," where expansion in one area can come only at the expense of another. Reallocation commonly occurs in a land-locked campus and in times of shifts in program direction. In making reallocation decisions, administrators need to determine not only who will receive space but also who will lose the space that is being

reassigned. They need to decide how well currently assigned space is being used, who needs more space, and how much they need. The tools available to help answer these questions are utilization reviews, utilization measures, and standards.

Standards is a term with many meanings and interpretations. It often refers to design standards, used primarily by architects and engineers to regulate technical aspects of site design such as lot area, height limits, frontage, infrastructure, and floor area ratio. **Design standards** are numbers that relate space to technical and support considerations such as number of electrical outlets per lab, volume of air circulation per square foot, and so forth. In this chapter, the term "standards" will refer to allocation standards, which are not as rigidly determined as design standards.

Allocation standards relate space to people and activities in a specific and concrete way, and are used in making decisions about allocation and reallocation. They can be defined as the number of assignable square feet necessary per person (e.g., faculty, student, or staff) or per other defined unit, such as research grant or research dollars. The standards vary by type of occupant, type of space (e.g., labs, offices, classrooms, or libraries), function (e.g., research, teaching, administration, or patient care), academic discipline (e.g., clinical or basic sciences), and other factors.

Guidelines are more flexible and not as specific as standards. They are statements of general parameters to be considered or steps to be taken in the decision-making process. They can also represent a range of acceptable standards or measures that provide a baseline for allocation and reallocation.

Utilization reviews are routine systematic analyses that compare use of space to an institution's utilization goal. The goal is the limiting criterion of the utilization measure. Utilization reviews help administrators determine how productively and efficiently a department is using its assigned space.

Utilization measures are numerical assessments of space efficiency and productivity. For classrooms or class labs, utilization is generally measured in weekly student contact hours and percent occupancy. For research space these measures are more likely to evaluate productivity,

which may be determined by the number of grants and research dollars per square foot. The term "standard" is sometimes applied to a utilization measure. To avoid confusion in this chapter, the term "utilization measure"--rather than "standard"--will be used to refer to a measure of productivity or efficiency. Utilization measures can be further categorized as described below. Utilization reviews may involve all or any combination of these elements:

Productivity Criteria--a measure of results or benefits. For research space, these can measure research dollars per square foot, number of grants per department, amount of overhead recovery, and/or number of publications.

Efficiency Criteria--a measure that compares use and availability of space. These measures are usually applied to teaching space, in the form of weekly student contact hours and percent occupancy of classrooms and class labs.

Priority Criteria--a measure that ranks the use of different types of space by function and occupant. The determination of space needs must take into account institutional priorities and the people and activities that require space. The use of priority criteria is one way to assure that institutional goals are considered in the review process. For instance, the first-priority use of a nonclass lab would be research; using it solely as an office would be inappropriate. Adding a productivity factor, funded research would have priority over nonfunded research.

National Criteria--a comparative measure that ranks an institution against other institutions in the country in terms of whatever data are available, i.e., research dollars, research faculty, enrollment, etc. These comparisons are interesting, but they usually do not relate directly to problems of space management. They can, however, provide support for an institutional image and program direction that will encourage facilities development.

Time Criteria--a comparative measure that looks at forecasted growth compared to the past history of programs, departments, or other institutions. These measures provide a way to determine if space utilization policies have an effect over time.

Intuitive measures assess more aesthetic elements of space, such as appearance, location, and quality. This dimension is one of the factors that are not usually measured quantifiably but that do enter into the allocation/reallocation process. Intuitive factors are often very important in allocating space at multisite campuses.

A Context for the Use of Allocation Standards and Utilization Measures

Administrators who create and apply standards and utilization measures operate on a basic set of assumptions. They assume that there is an objective relationship between certain factors and the need for space, that standards and utilization measures provide a valid comparative gauge to assess need for and/or use of space, that the standards themselves represent a minimum level of quality and have been created objectively and applied fairly, that the standards and measures are in accordance with the institutional goals and mission, and that the institution will be able to meet the standards it has defined. If these implied assumptions are not met, the standards will not only be useless but may cause harm by creating unmet expectations or by being applied when they do not truly represent the correct and critical relationships.

Standards and utilization measures cannot be applied in a vacuum. The institution's political environment exerts a major influence on the timing and feasibility of certain methods of space allocation and reallocation. Strong leadership and good communication are essential to the process. In particular, administrators applying standards and measures must keep in mind

- o Future trends in education and research. How these fit into institutional priorities will vary, but there should be an awareness of how these trends will affect needs for space. Tradeoffs between immediate needs and long-term needs should be evaluated.
- o The broad institutional context. For instance, the degree of centralization of facilities affects space utilization. Decentralization, a fact of life at many multisite campuses, requires more redundancy in facilities and thus is likely to create less efficient utilization scores.

- o The campus's utilization plan. Utilization zones--which dedicate certain areas of the campus to activities such as research, teaching, or housing--can form real or implied boundaries to options for reallocation.
- o The relationship between space utilization and the institution's overhead rate. Because indirect cost recovery is based on the total amount of organized research space, it is desirable to have a large volume of research space. But utilization measures can punish departments for using too much space. These appear to be opposing forces. In actuality, though, if we assume continued growth in funding, the efficient and productive use of space may bring in more grants, each with additional indirect recovery.
- o The need for flexibility in the development and application of utilization measures. Excessive utilization (i.e., greater efficiency and productivity) may tax facilities to the point of counterproductivity and reduced cost-effectiveness. During times of program retrenchment, standards and measures should not be allowed to stifle new initiatives that may not be measurable by existing utilization measures. Standards and measures should be tools in the decision process, not dictators of space allocation.

What are the consequences of having no standards or utilization measures? Whether defined or not, standards are implied whenever space is assigned. If standards are not clearly defined and faculty do not feel that there is any method to decisions about space allocation and reallocation, there will be much dissatisfaction and contention between or within departments. Space is a valuable commodity, and the faculty need to know that careful thought and accurate information go into managing and planning for space. On the other hand, faculty may resist the idea of written standards and utilization measures because of legitimate concerns that productivity criteria measure quantity rather than quality of performance.

Who is Responsible for Decisions About Allocation and Reallocation?

At most medical schools associated with a university, the university maintains a space database and takes responsibility for general decisions about allocation and building. University- and/or state-mandated standards may apply to the allocation and building of space, and university or state utilization reviews may employ their own utilization measures. Such university reviews usually apply to educational and library space. Medical school administrators, however, typically find that their space needs--particularly for research--differ from those of the general campus. They become very involved therefore in the management, allocation, and planning of space.

The dean or vice-president for health affairs (depending on the institution's organizational structure) should make decisions about space allocation and planning for the medical school. The setting and application of space standards is best accomplished at this level. This is also where utilization reviews and measures are initiated. The dean or vice-president must establish good communication with the university and/or the state to insure cooperation, compatibility, and the reduction of redundant effort.

Flexibility in the implementation of allocation standards allows for local decision-making. For example, even though the dean may make the general space allotment to a department, the department chair should be able to make specific faculty assignments. Contention can arise if there is a separation of decision-making authority and financial support; the decision-maker should have authority to draw on financial resources to implement the space allocation.

While the use of standards and utilization reviews must be supported at the highest organizational level possible in order to be effective, faculty must also accept the criteria and the review process. This is best accomplished through inviting faculty participation--for instance, on a standing space review committee--and through developing consensus on the fairness and objectivity of the standards.

There are a variety of ways to organize the tasks and responsibilities for allocation/reallocation decisions and utilization reviews. Any selected structure should provide the decision-maker with appropriate and valid data and should allow input from faculty. A committee structure may incorporate any or all of the functions described below:

Advisory Committee: a group of faculty and administrators, appointed by the dean or vice-president for health affairs, whose major task is to identify issues and concerns about space. The committee should represent basic and clinical sciences as well as educational and research interests, and probably should include an administrator. Its role is to alert the decision-maker to potential problems in dealing with space, such as demands associated with changing science, lack of faculty acceptance of standards, and conformance of the review process with perceived institutional goals. The committee may also propose allocation standards and utilization measures, or at least participate in the process.

An advisory group is probably the most common and perhaps the most workable type of space committee. Allocation decisions and their incumbent responsibility rest with one person (the dean or vice-president) but incorporate the opinions of the faculty. For this process to be effective, however, the faculty must believe that decision-makers will attend to their concerns.

Judiciary Committee: a group of faculty and administrators, appointed by the dean, whose major task is to review requests for space and make recommendations to the decision-maker. As with the advisory committee, membership should include research and educational interests as well as a mix of basic and clinical sciences. The judiciary committee uses existing standards and utilization reviews to evaluate requests. Members do not make actual allocation and reallocation decisions, but their recommendation carries much weight.

Executive Committee: a group of faculty and administrators, appointed by the dean, whose major task is to review and decide on requests for allocation and reallocation. This group should be composed in a similar fashion to the other two, but it has decision-making authority. This is not a typical arrangement and may have inherent problems of responsibility and accountability. Frequent changes in membership could be disruptive, and infrequent changes could create very powerful committee members.

Evaluation of Organizational Structure

One of the most difficult aspects of developing an organizational structure is the assessment of how well it is working. If there are no major complaints about the space allocation process, administrators might assume that their structure is operating well. But neglecting to evaluate the process formally may hide underlying problems until a major incident occurs. Ideally, the organizational structure supporting space allocation and reallocation should be reviewed whenever there is a turnover in top management or every five years. This evaluation can be done by a specially-formed faculty committee, which might examine criteria including those listed below. Although not comprehensive or exhaustive, this list identifies some characteristics indicative of organizational health, particularly in the area of space management:

Meaning and Role of the Organization: An important success factor in any management structure is a clearcut definition of its inherent functions, responsibilities, and relationships. Is there internal agreement on the character and purpose of the organization? If there is much conflict over basic issues, the organization cannot perform adequately and may be in real danger. Is authority commensurate with the responsibilities of any management position? If not, the manager will not have the power necessary to get the job done.

Communication: Are the lines of authority and communication clear? Are all parties aware of and in agreement with who is responsible for the review of space allocation and utilization? Do they know how to initiate requests for space or for information about space? Do they know when and how decisions are made? Lack of communication or understanding of lines of authority can lead to confusion and resentment.

Responsiveness: Is the organization responsive to faculty concerns about space, to departmental requests for space, and to community concerns about building? Is there a process for grievance and feedback? Is there good coordination between operations and maintenance and the university architects and managers who implement reallocation decisions? How long does it take for renovations? What is the reason for delays in renovation? Do involved parties know these reasons? Absence of good answers to

these questions will cause the organization and its management structure to be perceived as unconcerned with important needs and will thus engender a lack of cooperation.

Continuity of Policy: Are the rationales for decisions constantly changing? Are decisions revoked or modified frequently? Arbitrary or unpredictable changes in policy will undermine decisions. Forces within the organization will want to move towards more stability.

Stability of the Informal Structure: Does the organizational structure threaten the informal ties of sentiment and self-interest? These ties are the day-to-day working relationships that sustain formal authority and widen communication. Upsetting the informal structure often will be met with considerable direct or indirect resistance.

The Allocation and Reallocation Process

The sequence of steps involved in the process of allocating and reallocating space may be summarized as follows:

1. Identify Who Needs Space

Decision-makers can use institutional priorities to identify those needing space when they determine that institutional goals require the provision of more space to certain departments or programs. For example, a dean may plan to recruit new chairs with hopes of expanding research activity or establishing new multidisciplinary programs. Administrators can also use utilization reviews, which compare used space to allowable standards, to identify departments with substandard space as those that need more space.

2. Determine How Much Space is Needed

Administrators can use standards to calculate the amount of square feet necessary to meet needs for space. If a department is 500 square feet below standard allowances for its nonclass labs, for example, it is identified as needing 500 square feet of lab space. If a new chair being recruited plans on bringing three new faculty and

\$2 million dollars in additional grants, space needed will be calculated according to institutional standards for offices and nonclass labs.

3. Identify Available Space

In a nonexpanding environment, utilization reviews can determine who is not using their space to capacity. If the reviews reveal that some departments do not meet criteria for efficiency, productivity, or priority, this space may be available for reassignment. Usually the dean tells the chair that a certain amount of space (by type) will be lost, and the chair chooses the specific rooms to be reassigned.

In an expanding environment, new space is identified through site selection and the building process (see the chapter on construction and renovation). A discussion of special concerns surrounding the use of off-campus space appears in the chapter on multisite space management.

An important part of this step is finding space suited to the activity it will house. Space that is underutilized or misutilized may be reallocated to others in need, but extensive renovations may be necessary if the space is not of the appropriate type.

4. Decide Who Will Move

The general decision as to who will move can usually be made through the utilization review--which identifies departments that are underutilizing and productively using space--and by the application of institutional priorities. Specific individual and room reassignments are best left to department chairs.

5. Determine the Costs of the Move

Administrators managing the reassignment of space must consider the costs of renovation required to adapt space to new uses. They must keep in mind long-term needs to avoid, for example, spending large sums for lab renovation when in a few years more offices may be needed. Administrators may face additional costs when the available space is a considerable distance from the department that needs it. Sometimes it is worth planning a "domino move," which

involves moving more than the original parties in order to create contiguous space, but the costs of such a move must be identified and distributed.

6. Manage the Move

This aspect of the allocation or reallocation process requires working with architects and with operations and maintenance staff to design and support the renovations. All infrastructure issues must be resolved before a move is begun. Administrators must also provide for coordination in moving individuals and equipment and for any "domino" effects of moving to contiguous space, including the use of surge or swing space if available.

7. Update the Space Inventory

After all personnel are relocated, the space inventory must be revised. Updating is often done on a routine timetable, but a structured reallocation and renovation process can include a mechanism for immediate update as soon as the move takes place. Such a process assures current and accurate data.

Standards and Utilization Measures

Standards and utilization measures are usually created out of a need for better control of the allocation and uses of space. When times are good and the space resource is plentiful, there is not a great demand for standards. But when space is scarce and administrators need to manage it better, they try to find some objective means of evaluating space comparatively. Thus the development of standards often occurs under political and time pressures that require consensus and approval within a limited time. This scenario can be avoided by developing standards and management processes before a crisis occurs. During times of plenty, it may be too easy to make overcommitments that cannot be kept.

The development and use of allocation standards and utilization measures can be a critical part of the overall scheme of space planning and management. All other planning (e.g., master planning, financial planning, and decisions about renovation and construction) relies to some degree on

utilization measures and allocation standards, whether these are explicit or implicit. It is important, therefore, to consider in some detail the processes of developing and applying standards and utilization measures.

Development of Standards

The development of standards requires an analysis of current in-house utilization: What are the *de facto* standards? Are there large variations from the average? What numbers are acceptable at the institution? It is often useful to review other institutions' standards for space. The dean's office staff or consultants can do this analysis, but it requires the authority and support of the dean or other individual responsible for allocation and reallocation of space.

Because there must be feedback from faculty and department chairs to test the acceptability and fairness of the standards, a committee structure is useful during the development stage and for periodic review of the standards and changing needs. The committee should represent research as well as teaching interests, but it is not wise to let it be controlled by powerful special interests.

In order to be effective, standards and utilization measures for medical school space should be

- o Acceptable within any existing university and state frameworks. Standards developed purely as an academic exercise will probably not be used effectively.
- o Perceived as fair by the faculty. Do the standards and measures support the institution's goals? Are they fairly enforced across all departments? Problems can arise when standards or measures reveal unwarranted favoritism to certain departments or when standards for lower-priority functions (e.g., administration) are unjustifiably higher than those for priority functions (e.g., research and teaching).
- o Designed to allow for flexibility under certain circumstances. For example, standards should contain provisions for programs or departments that are experiencing temporary difficulty but are an important part of the institution's goals.

When space is used as a recruiting tool, standards may also be stretched for limited periods of time when this is in line with the institution's mission.

Application of Standards and Utilization Measures

Once they are created, space standards can be used to plan for new space and to manage existing space through utilization reviews. A comprehensive allocation methodology uses standards to determine need and to validate allocation decisions. Examples of the application of space standards and utilization measures appear at the end of this chapter.

Utilization reviews can be done as often as the space inventory is updated. They should be done annually as a part of the routine departmental review process. An important factor to keep in mind when applying standards and measures is the timeliness of the data used for analysis. Institutional administrators often work with historical data, which means that allocations sometimes are based on what happened last year rather than what is expected next year. Accordingly, administrators are well-advised to use standards and utilization measures not as rigid rules but as guides in the decision-making process.

Review of Standards and Utilization Measures

Standards and utilization measures that have been established are hard to discard. Therefore, they should be reviewed periodically--especially in these times of changing technology and multiprogrammatic use of space. Reviewers need to ask: Do the standards and utilization measures reflect current institutional goals? Are they still acceptable to the faculty? Do they correspond with existing technology and the institution's needs for infrastructure? Do some types of research require equipment that uses more space than usual or perhaps less than usual? With the proliferation of multiprogrammatic research, can more support space be shared through the use of core equipment and facilities or shared resources, or through the diminution of departmental boundaries?

Resources Needed for Space Allocation and Reallocation

As previously discussed, the space allocation and reallocation process requires standards and utilization measures--tools that aid decision-making--and an effective organizational structure. Another important resource is adequate staff support. The dean's office (or other organizational entity responsible for space standards) should assign at least one or two people with responsibility for developing and/or applying standards through utilization reviews. This task does not necessarily require full-time dedication. It can be incorporated into the duties of the planning or facilities staff already in place at most institutions.

Institutions may also need outside help when developing a working system for allocation and reallocation. Consultants may be useful if total design of the utilization review or allocation methodology is needed, but in-house involvement in the process is important. Even if a system of utilization review is in place, administrators may require technical assistance from consultants or other university staff when, for example, developing data links between space information and other sources. Institutions often find it useful to assign a primary contact person to coordinate the work of an outside consultant. This contact person--a staff member knowledgeable in the relevant areas of data needs, academic concerns, and administrative systems--provides institutional data for analysis, reviews the consultant's responses to institutional concerns, and serves as the primary interface between institution and consultant.

Another major resource necessary to develop and implement standards is good data. An accurate and timely database that contains the relevant information is essential. As mentioned earlier, many schools have university support for the database function. The chapter on data management systems for space and facilities provides an in-depth discussion of data definitions, database structures, and staffing requirements. It is important to note here, however, that users should understand clearly what their data represents. Sometimes decision-makers (e.g., chairs, deans, and chancellors) use working definitions that are different from those prescribed by their databases. These individuals should know, for example, whether the total square footage of lab space includes support rooms, and whether "research space" includes offices used entirely for research as well as labs.

Last but not least, funds are needed for the moving expenses and possible renovations necessary to actualize reallocation.

Special Concerns for Multidisciplinary Research Programs

There continue to be significant opportunities for multidisciplinary approaches in science. Multidisciplinary research has an apparent edge in competition for funding, and there is a general belief that the use of shared equipment and core facilities can make multidisciplinary activities cost-effective. The many complex issues faced by administrators when dealing with multidisciplinary programs are beyond the scope of this book. We will consider briefly, however, the effect of these programs on the planning, management, and control of space.

In general, organizational structures and methods of space allocation must be flexible enough to respond to the dynamic nature of multidisciplinary programs. Multidisciplinary entities do not usually have a traditional administrative structure. They are often loosely organized, without department or program status. There are no tenure-line positions. Leadership comes from individuals who have responsibility to other organizational units. The purpose of the multidisciplinary program is to share resources, that are usually not integrated, in pursuit of a goal that will benefit from this new arrangement. This means that deployment of resources is out of the hands of traditional decision-makers (usually department chairs). Allocation decisions are usually made by the program director, but decisions on who pays and who determines the allotment to the multidisciplinary program vary according to the program's organizational structure.

Space can be assigned to a multidisciplinary program, if it has an organizational structure (e.g., cancer center), or to a department that will house the program. Space probably should be allocated to multidisciplinary programs on a short-term basis (e.g., for three to five years), and the space should be included in utilization reviews. To ensure productivity, some institutions set "destruct" dates on the allocation of this type of space. Multidisciplinary programs need to maintain academic and administrative flexibility in order to adapt quickly to changing needs. If a multidisciplinary program obtains permanent organizational stature, it will usually strive to maintain itself beyond defensible purposes and may thus outlive its usefulness in terms of its original mission.

The organizational options for multidisciplinary research units are outlined below.

How structured?	Pros	Cons
Separate organizational entity (stand-alone)	Easier administrative channels. More direct control, management, responsibility. Easier to classify space in facilities database.	Loss of flexibility in restructuring to keep up with changing needs. Tendency to maintain life beyond original mission. Duplication of administrative staff and support.
Within departmental space	Reasonable administrative channels. Space remains in department and can be reassigned when funding is over or if mission changes.	Potential friction between chair and director. May cause cramping in remaining department space. If classified with departmental space, may be misleading in utilization reviews.
At level above department (report to deans or chancellors)	Space can be on loan from surge/swing pool and controlled by director, but can easily be reassigned when needed. Space might be classified under dean's office or under temporary organizational title. Good administrative channels.	Surge space is not always available and may not be located in contiguous configuration. Expensive to maintain large pools of surge space. Potential duplication of staff support for administration.

Administrators should have specific understandings about funds for multidisciplinary research space. This type of space usually depends directly on outside funding. When that dries up, the need for space can also disappear. Multidisciplinary research projects have done well in garnering external funding. But because this type of activity is not easily justified, hard funding (i.e., public and/or permanent endowment) tends to be either continually under attack, difficult to come by, or time-limited.

Institutional Examples

EXAMPLES OF ORGANIZATIONAL STRUCTURE AND THE USE OF COMMITTEES

**University of
Maryland School
of Medicine**

A standing committee appointed by the dean advises him on research space in the School of Medicine. The committee is composed of five senior faculty--two from the basic sciences, two from the clinical sciences, one basic science chair, and one clinical science chair. No more than one member per department is allowed. Members may not be reappointed, and each serves a staggered four-year term. (See abstract of "School of Medicine Guidelines for Managing Research Space," page 173.)

**Oregon Health
Sciences
University**

The School of Medicine uses a peer-review process to conduct utilization reviews of research space. The Research Space Committee evaluates requests for new research space and assigns a priority rating to each room after an onsite inspection. The committee recommendations are submitted to the dean, who makes the decision. Most reallocations occur within departmental space and are reassigned by the department chair. (See abstract of "School of Medicine Space Policy," page 180.)

**University of
Texas Health
Science Center at
San Antonio**

The institution places responsibility for space allocation and reallocation in the hands of its Health Science Center Executive Committee. The committee deals with these parameters in assigning space: mission and goals of the various schools and departments, type and nature of extramural funding, and actual needs. (See abstract of "Space Allocation Guidelines for Academic Departments," page 183.)

**University of
Vermont College
of Medicine**

The College of Medicine used a Space Review Committee to aid in the definition of space issues and development of standards. Committee members' judgements on minimal space requirements and their opinions on areas of concern--such as a need to identify misused or underutilized space--were considered. Staff developed the standards and review mechanisms and provided a forum for reaction. Using the approved methodology of an annual priority utilization review of space, the dean became responsible for allocation and reallocation decisions. (See abstract of "Space Management at the University of Vermont College of Medicine," page 185.)

SAMPLE ALLOCATION STANDARDS/GUIDELINES

I. Research Space

Health Sciences Space Planning Model¹	Model assumes wet laboratory space needs of 900 to 1,220 assignable square feet (asf) per principal investigator (PI)-level faculty and 780 asf-900 asf for other faculty, 50 asf-100 asf per professional researcher, and 20 asf-50 asf per lab worker and graduate student. Dry laboratory space is planned using standards of 600 asf-820 asf for PI-equivalent faculty, 580-650 for other faculty, 50-100 for professional researcher, and 20-30 for lab workers and graduate students. Provision for support space, e.g., cold rooms and equipment rooms, is included in these ranges. However, in addition, 20 asf-50 asf per PI-equivalent faculty is allocated for shared laboratory support space. In this guideline methodology, the planner can enter numbers for people and dollars and the model will project a range of different types of space needed. (See abstract, page 170.)
University of Cincinnati College of Medicine	Wet laboratory space needs are calculated at 120 asf for each FTE of faculty, fellows, post docs, graduate students, and technicians, with a 25-percent additional increment for laboratory service space. Total laboratory space is rounded up to 440 asf modules.
University of Maryland School of Medicine	No specific standards, but guidelines require that each department's total research space, which includes office space for researchers as well as laboratory and laboratory support space, should not be greater than 325 asf per occupant. Occupants include investigators, postdoctoral fellows, graduate students, fellows, and technicians. (See abstract, page 173.)
McMaster University Faculty of Health Sciences	Faculty holding research grants are allocated 250 asf for wet laboratory research. Other occupants and faculty without grants, research assistants or associates, postdoctoral fellows, graduate students, and technicians each may be assigned research space of 125 asf. (See abstract, page 188.)
University of Minnesota	A guideline of 220 asf per researcher is used for most medical school departments. (See abstract, page 175.)

¹ This model was developed by administrators at the University of California, San Francisco, in collaboration with a number of other institutions.

University of Oklahoma Health Sciences Center	Space planning guidelines are designed to estimate total department research laboratory and laboratory support space requirements using space allowances by HEGIS discipline. For the College of Medicine, 300 asf is used for each FTE faculty, staff, fellow, and graduate student. For other health science colleges, 10 asf-300 asf is used, depending on the HEGIS discipline and the type of faculty and graduate students. (See abstracts, pages 178-179.)
Southern Illinois University School of Medicine, Carbondale	Two research modules, or 550 asf, are provided to unit chairs for each state-funded, FTE faculty. The availability of outside research funds qualifies the unit for additional space at the rate of one module, or 225 asf, per \$25,000 in grant-related, direct research costs. (See abstract, page 171.)
University of Texas Health Science Center at San Antonio	A laboratory module of 300 asf is allocated for each \$40,000 of research funding (wet research). The dollar figure represents direct costs only and excludes faculty salary support. Bonus space is awarded to departments on the basis of number of FTE faculty involved in research according to formula, from 12.5 percent for less than 25 FTE to 50 percent for greater than 75. Fellows and graduate students requiring laboratory work for their degree are allocated 100 asf each. For other grants and contracts involving dry research, one 300 asf module, the equivalent of three offices, is allocated for every \$100,000 of research funding. (See abstract, page 183.)
Texas Tech University Health Sciences Center	Laboratory space guidelines are 500 asf plus 100 asf support space per basic science FTE faculty, and 250 asf plus 100 asf support space per clinical FTE faculty.
University of Toronto Faculty of Medicine	Estimates of laboratory and laboratory support space needs are based on a formula that, for most of the basic sciences, assigns 484 asf per FTE faculty and 242 asf per non-faculty researcher and FTE graduate student. The standards vary according to discipline. (See abstracts, pages 189-190.)
University of Vermont College of Medicine	Research space to support "strong" grants is generally allocated according to the guideline of four space units or 400 asf. The strength of a grant is defined by the level of salary support and indirect cost recovery. "Weak" grants may be allocated just two units or 200 asf. Support and service space is in addition and is allocated at 30 percent of assigned space. (See abstract, page 185.)

II. Office Space

- Health Sciences Space Planning Model²** Guideline of 140 asf-190 asf per FTE faculty includes space for conference rooms, library, and office equipment. (See abstract, page 170.)
- University of Cincinnati College of Medicine** Office space is allocated as follows: chair--200 asf; division head--140 asf; faculty--110 asf; senior administrative staff--120 asf; administrative staff--60 asf; chief resident--90 asf; fellow/postdoc--60 asf.
- Support space is allocated as follows: conference/ library--140 asf + 18 asf per FTE faculty greater than five; workroom space--100 asf for less than 10 FTE faculty, to 200 asf for greater than 20 FTE faculty; computer room--80 asf per five or greater FTE faculty; audiovisual/storage room--30 asf per department; waiting/reception--80 asf for less than 11 FTE faculty, to 160 asf for greater than 20 FTE faculty.
- University of Minnesota** Each FTE faculty and staff is allotted 120 asf, plus 30 asf support space, per office. (See abstract, page 175.)
- Southern Illinois University School of Medicine, Carbondale** Unit chairs are allotted one office module (approximately 100 asf) per state-supported FTE faculty or staff, two office modules (approximately 200 asf) for the unit administrator, and two office modules for support purposes. (See abstract, page 171.)
- Texas Tech University Health Sciences Center** Office space is assigned as follows: chair/director--187.5 asf, faculty/professional staff--125 asf, secretary/clerical--80 asf + 40 asf for files, department-level administrative assistant--125 asf. Students and residents are assigned space at four per 125 asf room.
- Department conference/library space is assigned 200 asf minimum, waiting areas 15 asf-20 asf per seat.

² This model was developed by administrators at the University of California, San Francisco, in collaboration with a number of other institutions.

**University of
Texas Health
Science Center at
San Antonio**

Space is calculated in terms of 100 asf modules. The chair is assigned two modules; faculty and staff one module each; conference/library four modules; and storage, filing, and office equipment two modules.

Larger departments receive additional space for administrative needs on a sliding scale that ranges from 300 asf for a department with five to nine faculty, to 4,500 asf for a department with more than 90 faculty. (See abstract, page 183.)

**University of
Toronto Faculty of
Medicine**

The formula for faculty offices is: #FTE faculty X 1.15 X 140 asf. (The 15-percent increase allows for cross-appointments, visitors, etc., not represented in FTE count.) Standard faculty offices are 129 asf. The remaining asf in the formula becomes part of a pool for offices that are required to be larger than standard, e.g., for department chairs.

The formula for nonacademic staff is the same without the 15 percent increment. The staff count does not include lab technicians or library staff.

Graduate student needs are calculated similarly using a standard of 43 asf.

Office support space needs are calculated as 30 percent of the total office space requirements of faculty, staff, and graduate students. (See abstracts, pages 189-190.)

**University of
Vermont College
of Medicine**

Office space is allocated as follows: chair--150 asf; faculty/staff--100 asf; graduate student--50 asf.

Support space is allocated at 12 asf per office, with 200 asf per department for administrative core space. (See abstract, page 185.)

III. Instructional Space

**Health Sciences
Space Planning
Model³**

The general guideline used for instructional space is 50 asf per student plus 25 asf for students engaged in clinical activities.

³ This model was developed by administrators at the University of California, San Francisco, in collaboration with a number of other institutions.

Space Management

- University of Minnesota** For classrooms, the standard is 16 asf per FTE student. Room utilization goals are set at 60-percent occupancy for 30 hours per week, or 18 weekly student contact hours (WSCH). The ratio of asf to WSCH therefore is .89. Class labs are set at 40 asf per station, with room utilization goals of 20 hours per week, 80 percent occupancy (asf/WSCH = 2.5).
- University of Oklahoma Health Sciences Center** Space planning guideline for classroom space is 15 asf per FTE student, with room use of 30 hours per week at 62.5% occupancy (asf/wsch = .80). For lecture halls, space is 12 asf per FTE student, with room use of 30 hours per week at 65% occupancy (asf/wsch = .615). For seminar rooms, space is 20 asf per FTE student, with room use of 30 hours per week at 62.5% occupancy (asf/wsch = 1.067). For class labs, the range is 65-120 asf per station, with utilization goals of 22.5 hours per week at 80% occupancy (asf/wsch = 3.6-6.6).
- University of Texas Health Science Center at San Antonio** Total classroom and instructional lab space needs are estimated at 72 asf per student (based on a fall headcount).
- University of Toronto Faculty of Medicine** For classrooms, the standard is 15 asf per station, with room utilization goals of 25 to 30 hours per week at 62 percent to 74 percent occupancy (asf/WSCH = .81). For class labs, the calculation is essentially the same with two exceptions: (1) the average station size varies with different academic program groups, and (2) weekly student contact hours are used as the input measure instead of FTE students. (See abstract, page 190.)
- University of Vermont College of Medicine** Classroom space is planned at 12 asf per FTE student, 35 asf per first-year student. Class labs for first-year students allow 70 asf per student.

IV. Library Space

University of Minnesota	Library space requirements are the total of requirements for reading/study space, stack space, and service space, including processing rooms, reference space, and administrative offices. The average reading-station size is 30 asf. The number of stations required is arrived at by adding 20 percent of FTE students and 10 percent of regular faculty. Stack space is assessed at 12 volumes per asf for central stacks and 10 volumes for satellite stacks. The service requirement is estimated at 20 percent of reading/study and stack space.
University of Oklahoma Health Sciences Center	Library space requirements are determined using a formula similar to that used at the University of Minnesota, with the following exceptions: 1) the number of reading/study stations is determined by adding 30 percent FTE student to 10 percent FTE faculty; 2) stack space is determined uniformly at 10 volumes per asf; and 3) the service space requirement is 25 percent of the reading/study and stack space.
University of Toronto Faculty of Medicine	Reading/study space requirements are estimated at 5.3 asf per FTE undergraduate student, 10.7 asf per FTE professional undergraduate student, and 7.5 asf per FTE graduate student. Stack space needs are determined by a sliding scale formula that allows for .04 asf- .07 asf per volume. Service requirements are set at 25 percent of reading/study and stack space.

SAMPLE UTILIZATION MEASURES AND UTILIZATION REVIEWS

**Oregon Health
Sciences
University**

The School of Medicine uses a peer review process to conduct utilization reviews of research space. A research space committee evaluates requests for new research space and assigns a priority rating to each room after an onsite inspection. The criteria used for research productivity are number of quality publications and continuing financial support. The committee recommendations are submitted to the dean, who makes the decision. Most reallocations occur within departmental space and are reassigned by the department chair. Core space is not subject to reallocation and includes offices for faculty and administration, department conference rooms and libraries, and space for residents, postdoctorates, and graduate students. Any rooms fitted for research and used as offices, however, will be critically reviewed. (See abstract, page 180.)

**University of
Pennsylvania
School of
Medicine**

The School of Medicine uses a research productivity measure as a tool in reassigning space. The measure is total peer-reviewed research dollars divided by total department research space (\$/asf). The acceptable productivity criterion for the ratio is 50 percent of the institutional mean. Space may be taken from a department with a lower ratio. (See abstract, page 181.)

**Southern Illinois
University School
of Medicine,
Carbondale**

The School of Medicine uses utilization priorities. The categories of space are instructional (classrooms, etc.), research (nonclass labs, etc.), and offices. Priorities in rank order for research space are graduate instruction, sponsored research, unsponsored new research, unsponsored old research, and other uses. (See abstract, page 171.)

**University of
Texas Health
Science Center at
San Antonio**

Research space utilization and allocation are determined by a dollar measure. Direct costs minus faculty salary support is the total dollar amount used. A wet lab module of 300 asf is allocated for each \$40,000 of funding. Dry labs are allocated at 300 square feet per \$100,000. There are bonus incentives for departments with higher percentages of wet researchers. Overall, a figure of 12,000 asf of research lab space (including essential support space) is recommended per million dollars of research expenditures. (See abstract, page 183.)

**University of
Vermont College
of Medicine**

College of Medicine standards are incorporated into a structured method of priority utilization review, which categorizes use of different room types into priority categories. For instance, office space is used by different people; the priority category for faculty will be higher than the priority for graduate students. For nonclass labs, the priority for peer-reviewed and externally-funded research with high overhead recovery is greater than the priority for internally-funded associates research with no overhead recovery. The lowest priority for lab space is old (more than three years) nonfunded research, except for new faculty, who are allowed four units of lab space for three years without funding. (See abstract, page 185.)

**University of
Washington
Health Sciences
Center**

An interactive computerized space profile system monitors faculty activity and its relationship to space. A profile of space utilization (number of personnel by title, amount of funding, and assigned square feet) is determined for each faculty member and for each academic unit. (See abstract, page 187.)

**Washington
University School
of Medicine**

A Resource Allocation Model (RAM) analyzes departmental requests for additional space as well as requests for general fund allotments. The model also assists in the analysis of departments for the purpose of recruiting department chairs. The method, an example of a mathematical and deterministic model, integrates financial, space, and personnel data in ratios that are used to measure effective utilization of resources. (See abstract, page 177.)

Additional Sources of Information

1. The state of California has had space standards for many years. In 1989, MGT Consultants released their *Survey of Utilization Standards and Guidelines in the Fifty States*, conducted under the sponsorship of the California Postsecondary Education Commission (CPEC). The survey resulted in a review of California's standards and a 1990 report entitled *A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education*. For a copy of the report, call the CPEC publications office at (916) 324-4991. For more information, call William L. Storey, CPEC assistant director for finance and facilities, at (916) 322-8018.
2. In 1985, the Council of Educational Facility Planners, International, published *Space Planning Guidelines for Institutions of Higher Education*, "to be used as aids in determining space needs for an institution's organizational units and group of units for the allocation and reallocation of existing space and/or the acquisition and construction of new space." The document includes guidelines for classrooms, teaching and research laboratories (excludes medicine), offices, libraries, recreational/physical education/athletics facilities, audiovisual/television facilities, animal quarters, and general-use facilities. Health professions disciplines included are nursing, dentistry, optometry, pharmacy, and veterinary medicine. Contact Council of Educational Facility Planners, International, 941 Chatham Lane, Suite 217, Columbus, Ohio, 43221, (614) 442-1811.
3. A detailed description of standards is available in a handbook for space developed at the University of Minnesota. Although it does not focus on medical schools, it provides a good example of standards development and presents a systematic method for evaluating need, condition, and use of space for individual disciplines. It also addresses issues of quality of space and provides standards for research, teaching, and library space. (See abstract of "Minnesota Facilities Model," page 175.)
4. The University of Texas System has developed general rules and standards for evaluating the space needs of the state's health sciences institutions. Texas undertook a national survey of similarly structured institutions while developing their standards. (See abstract of "Final Report of Standards Committee," page 182.)

5. Readers interested in space allocation at multidisciplinary centers may wish to consult the University of Michigan Cancer Center's "Guidelines for Space Allocation and Review." For a copy, contact Horace Bomar, director, facilities management and planning, University of Michigan, 1150 West Medical Center Drive, 1590 MSRB II, Ann Arbor, Michigan 48109-0670. Telephone (313) 747-2788.
6. Readers interested in library space may wish to consult the volume *Annual Statistics of Medical School Libraries in the United States and Canada 1988-89*, published by the Association of Academic Health Sciences Library Directors. Tables rank academic medical center libraries by total square feet per academic client, by total net assignable square feet, and by amount of seating for study.
7. Georgetown University Medical Center has recently completed the second edition of a document that catalogues space needs and deficiencies and identifies spaces that could be put to alternative use. Readers interested in an example of a space needs analysis may wish to contact John L. Greenbaum, associate vice-president for the health sciences and chief operations officer, Georgetown University Medical Center, Washington, D.C. 20007-2197. Telephone (202) 687-4600.
8. The following bibliography may also be of interest:

Bareither, H. D. 1987. Projection of physical facilities for research activity. In *Planning for higher education* 15 (2):30-37.

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Multisite Space Management

Almost all of the nation's academic medical centers conduct activities at more than one site. "Off-campus" activity is a necessity for a number of reasons, including legislative requirements to provide teaching opportunities in diverse locations, affiliations for specific research or clinical requirements, rural programs, major VA programs, and the need for off-site hospitals for basic teaching. But the movement to multiple campus sites is accelerating for another reason: core campus space at many academic medical centers is becoming saturated and landlocked. This chapter will focus on management considerations involved when opening a new site to relieve congestion at the primary campus site.

Multisite space management involves all the elements associated with managing a single-site campus. But additional concerns arise. For example: Who will own or control the new space? Will the university own it? Will it be an affiliated but separate corporate entity? Should the main campus's standards and methods for utilization and allocation be applied at the remote site? Who will be responsible for making decisions about space management and allocation at the new site? Who will pay for the space? Does it make a difference? What if extramural funding ends?

Decisions about the management of space at multiple sites depend in great part on the local situation, but some general rules apply. In deciding which program to move off the main campus, administrators must consider the relative ease with which a program can be separated from the main campus. How dependent is the program on shared services? Self-contained research programs are often good candidates, whereas programs with heavy teaching components--especially at the undergraduate level--are usually poor choices. Transportation of students alone can be an overwhelming problem.

Funding is another important consideration in deciding who will move. It may be better to move activities that are fund-generating, such as research programs and patient-care activities, because they are more likely to support the overhead costs. How will the new space be paid for? If federal funds are involved, administrators need to consider government funding agencies' parameters concerning off-site facilities.

Allocation and Reallocation Issues

When utilization reviews have determined that the main site is saturated, administrators must use some allocation method to determine

who will move to the remote site. Traditional criteria for allocation and reallocation are still valid, but special attention should be paid to maintaining unit integrity. Usually the new (bigger and better) space will be allocated to the researchers or departments doing the most extramurally-funded research. Research programs and researchers who need to work together should be kept intact. Activities that do not require excessive duplication of support services are good candidates for moving.

Administrators must also attend to space vacated on the main campus. If an overflow situation has created the need for multiple sites, there will not usually be vacant space available. The remaining space will merely provide adequate facilities for the remaining faculty and will stay under the control of existing departments. If researchers are moving and the remaining space will still be used for research, renovations will probably be minimal and the researchers who remain will have a little more space per faculty member.

If vacated space is available, allocation usually follows standard methods in place at the institution, such as utilization review and the use of standards. There should be a plan for use of the vacated space. Such a plan may involve renovation decisions and review of institutional goals and academic plans. For example, if all or most of the research or administrative function is being moved off the main campus, the remaining space may need to be reconfigured to accommodate different functions such as teaching. Administrators should review curriculum and administrative procedures, as well as all space variables, to determine any effect on academic plans or administrative methods.

Who is Responsible for Management?

Central management of facilities is probably the best management option for a multisite academic medical center, especially if it is a university entity. Management strategy should reflect the fact that the "satellite" program is still part of the university. If the new site is a separate corporate entity (for example, a Howard Hughes research facility or a research/patient-care facility supported by a practice group), specific written agreements on such issues as management responsibility and commitments of allocation must be executed.

Decisions and ongoing support for multisite management should come from senior-level administrators--i.e., associate deans or above--in order to demonstrate strong institutional commitment. Implementation can occur at lower staff levels, e.g., managers or directors.

A high level of administration probably should oversee the general management, but direct management can be done on the level of the project manager. At the university level, the architectural and engineering office and physical plant may be involved depending on what services or programs exist on-site.

To Lease, Purchase, or Build?

A primary concern in multisite space management is the option to lease, purchase, or build. **Leasing** provides existing space with services and typically has the advantages of quicker availability and ease in negotiation of price. There may be additional costs for site improvement if the space is not exactly suitable. In the long term, leasing is often more expensive because of minimal payback while "rent" is paid out and the danger of rents increasing faster than income. Leasing places the cost on a variable basis and loses the potential savings of any fixed-cost assets. On the whole, this option is probably best suited for short-term needs. It can be a way of providing surge or swing space while building plans are proceeding.

Purchasing can be more profitable and brings with it the possibility of renting out excess or vacated space as desired. Most institutions have policies or guidelines that dictate what kind of agreements can be negotiated.

Building provides the best custom fit of space needs but will take the most time. (The chapter on planning for construction and renovation addresses many of the management issues associated with building.)

Timing of Moves

The timeframe for planning, acquiring, and occupying a site depends on whether the site is new or existing, leased or purchased, and on what activity will be housed there. Renovating a facility for research use may require extensive improvements to infrastructure and materials-handling

systems, whereas office space can be prepared much more quickly and easily. Timing also depends on local and state government regulations. For example, what is the permit process? How does the project fit into the local town plans? Public perception and community problems can hold up the process at various stages.

Taking a project from the initial planning process to occupation can take many years. Major construction alone can take two to three years. The average timeline is probably 5 to 10 years, depending on the scope of the project.

A Checklist for Administrators

Many of the problems associated with management of multisite sites can be handled in the same way as on the core campus. Administrators must give special attention, however, to certain details:

Personnel Relations

Administrators' relations with personnel are critical in making allocation decisions for multiple sites. How do you decide who will move from the main campus? What "perks" might be needed to attract people to a site remote from the main campus? How can you make those who move feel they are still part of the main campus?

If administrators can entice people to move voluntarily to the auxiliary site, they can avoid the feeling that certain people are being forced to go. Some of the most attractive inducements include

- o Larger labs and offices
- o A "state-of-the-art" facility
- o More aesthetic space--e.g., offices with big windows, amenities such as lounges
- o Campus-type services--e.g., cafeterias and bookstores
- o Better parking conditions

- o Transportation and communication links to the core campus, including computer networks
- o A building manager for maintenance and security
- o Support services

Once personnel have been moved to an auxiliary site, administrators must work to avoid the "second-class citizen" syndrome that may develop among those at the remote site. Elements that help people feel they are still a part of the main campus include good communication and transportation systems; easy access to administrators, including one-on-one meetings as necessary; and the provision of services to which personnel have become accustomed--e.g. mail, office machines and services, computer hookups and services, library services or facilities, and building maintenance.

Transportation

Reliable transportation between the main campus and auxiliary site must be made available. Options include:

- o Campuswide shuttles. This is an expensive option. One existing system at a major urban campus costs almost \$1.5 million per year.
- o Public transportation (if available).
- o Site-dedicated vehicle(s) and personnel to operate.
- o Security escort service.
- o Local taxi service. This is an economical and reliable alternative, according to one Northeastern institution considering an on-call taxi service for faculty.
- o Private vehicles.

Ideally, a secondary site should be located within a reasonable commute from the main campus (less than 20 minutes).

Communication

Another critical element of successful multisite space management is an effective communication network. The auxiliary location should have as direct an access to the main campus as is technologically and financially possible. If the auxiliary space is a permanent site, planners should make provisions for future expansion and technological advances. A communication network can include the following elements:

- o Phone lines--simultaneous voice and data
- o Computer modems--for access to campus networks
- o Wide area networks--especially library and database networks
- o Local area networks (LANs)--currently more expensive, but the technology is headed in this direction
- o Satellite dish or microwave hookups

Other Services

Most institutions' security systems are adequate to cover secondary sites. More security personnel may need to be hired, depending on the size of the new site and its distance from the main campus. Local fire and police jurisdictions usually supersede an institution's ability to provide its own security.

Duplication of other services--e.g., parking, support staff, and equipment--will be necessary. Many services such as mail delivery can be added to the existing service structure with little impact.

Community Relations

Whenever an institution moves into a new community, it must be aware of local concerns and restrictions. The institution has a social responsibility to address its potential impacts on the community and to be a good neighbor. Questions to be asked include: Will your new community be disturbed by what you are planning to do? Will there be research activities? What kinds? Will the research require special handling facilities? Will there be patient-care activities? How many people will be housed there? What will be the effects on city services, e.g., water supply, waste disposal, electricity, police, fire department, traffic control and parking? What will be the effects on the environment, e.g., hazardous waste, water runoff, infectious material, air pollution produced by traffic and research? Will taxes be paid? Does a nonprofit status apply? Will the institutional presence in the new neighborhood be short-lived or long-lasting?

Community relations can be established by assigning an individual to do an impact analysis and by holding meetings with local officials and the general public when appropriate. Senior-level administrators must support the effort and must be willing to meet with concerned parties if necessary.

Moving to another site also affects the home community. If the institution is paying taxes, there may be a tax base loss to the home community or a loss to local businesses. If patient-care facilities are being moved, the impact of their loss will be even greater. The institution must not ignore these issues. Being open and listening to community concerns is a good policy. It is also important to plan for community issues before they become problems.

Resources Required for Multisite Space Management

During planning for an auxiliary site, staff must be dedicated who will organize and coordinate the project. The tasks involved can be time-consuming. Expertise is needed in a variety of areas including community relations, lab design (if research is moving), financing, legal issues, and space utilization. Depending on the strengths of the local staff, the institution may use consultants to handle some of the responsibilities. After occupation, a building manager may be required. This may be a university position rather than a college of medicine responsibility. The new space

should be included in ongoing utilization reviews and in the space inventory, and will therefore add to the jobs of existing staff. Someone should also be assigned to oversee personnel issues; depending on the magnitude of the new space and numbers of people involved, this may require additional staff.

The funds needed for multisite space acquisition, construction, and management are substantial. Costs include rental fees or purchase of land, legal and banking fees, consultants, equipment, maintenance and support staff, and costs of construction and/or renovation. It is important to emphasize here that escalating costs can result when institutions move programs to sites or structures that are not designed, built, or outfitted to handle the programs being moved. For example, moving research programs dependent on wet labs into an office building will require extensive and costly retrofit. All space is not equal for all programs, and the resulting renovation and operating costs can quickly get out of hand.

Remote sites generate additional operating costs--e.g., transportation, communication (including computer networks and added telephone costs), satellite mail, accounting, security, personnel functions, additional storage requirements, and added conference and meeting requirements. Some administrators estimate additional operating costs at up to 20 percent of base. Administrators usually want auxiliary space, especially if it houses research or patient care, to generate enough overhead recovery to offset most of the operating costs of the building.

The data needs for managing multiple sites are similar to those for the management of core campus space. Data are needed for utilization reviews, for allocation and reallocation methodologies, and for the application of standards to determine how much space will be needed or desired at the new facility.

Space Data

Space and Facilities Data Management Systems

In the last decade, space has moved to the forefront of the daily thinking of administrators at academic medical centers. Some institutional planners argue that this is solely because we now know more about our space. We have more data, which presents a clearer understanding of the condition of space, its location, what and whom it houses, and what it costs. Other planners contend that our preoccupation with space is due to the fact that our facilities are deteriorating. Or to the fact that space now costs so much more. In any case, effective planning for and management of space and facilities require a solid foundation of appropriate data. The primary management tool used to collect and maintain data is an accurate, consistent, and effective space and facility inventory system.

Space inventory systems used in academic medical centers range from manual listings of square footage and occupancy information to fully computerized systems that are capable of interfacing with other financial and personnel data systems. This chapter will discuss features of space inventory systems currently in use and will identify factors important in selecting, creating, or refining a system based on the specific needs of the user. Space is as valuable a resource as money. Accordingly, a system that accounts for space should be at least as sophisticated, and should be managed with equal attention, as the institution's financial system. The number of health science centers with computerized systems appears to be increasing. Although their size, scope, and capabilities differ from institution to institution, computerized systems have become a *sine qua non* for effective management and planning.

When developing, refining, or selecting a computerized space inventory system, planners should look for systems that are multidimensional, secure, capable of handling a large amount of data, capable of being networked and linked to the institution's financial and personnel systems, and (preferably) CAD-compatible. The development of an appropriate system requires a thorough understanding of the institution's existing resources and capabilities. Most institutions already have the necessary expertise and much of the computer hardware necessary for a space and facility inventory.

Data Collection and Maintenance

Who is Responsible?

The responsibility for creating and maintaining a space inventory system rests at various levels throughout the institution. There *must* be *one* official source for institutional space data, and only that source can have the formal authority to modify and issue the data. Otherwise, inconsistencies develop when reporting to government and funding agencies. This does not mean, of course, that other sectors of the institutional community should not have easy access to such data.

Most institutions of higher education have a central administrative office that is officially responsible for maintaining the institution's data on space and facilities, and for issuing various reports using the data. Responsibility might reside, for example, with an office of space analysis, a plant accounting office, or an office of space programming and management.

Depending on the university's organizational structure (private, public, multiple campus, etc.), other units will have varying levels of official responsibilities for input to the official source of space data. This hierarchy of responsibility typically filters down through the institution's organization (e.g., central administration to schools or colleges, to departments, to divisions or sections). The management of space and the data collection for space inventories will be adjusted according to the degree of centralization of an institution's administration.

How Does the Process Work?

Like data in other resource accounting systems, space information must be accurate and reliable. This requires procedures for the collection and updating of information, assignment of responsibility at various levels within the institution for accuracy of data, and adequate staffing. The most frequently observed method of collecting and updating space information is by way of space data lists and forms provided to responsible schools, departments, and divisions on an annual or biannual basis. These lists and forms are reviewed and revised by the responsible unit--typically the dean's office, chairman's office, and/or division head's office. Each of the offices should assign an individual to be responsible for reviewing and completing the forms.

Field audits are a necessary supplement to these forms. They serve as a check on the accuracy of data submitted. Field audits are extremely important in order to maintain data on space changes occurring because of renovation projects.

When Should Surveys Take Place?

Most institutions strive for annual space surveys. Recommendations vary by size of the institution. One source recommends that large institutions (those with over 2,000,000 gross square feet) conduct a physical inventory twice a year, requiring a staff dedicated to maintaining the database and a computer with large storage capacity. For mid-size institutions (500,000 to 2,000,000 gross square feet), an annual inventory is recommended, requiring modest staff commitment and access to computer facilities with moderate data storage capacity. For small institutions (those with less than 500,000 gross square feet), a physical inventory conducted every two years is sufficient; these institutions require part-time staff to handle the responsibilities of recording and maintaining data.

What Are the Data Elements? Space Inventory Systems

At the core of a space inventory system is an alphanumeric text database that includes a detailed record of all essential information on each space unit, typically a room. The data elements vary but will almost always include the asterisked elements in the chart on the following page.

Most institutions use the Federal Inventory and Classification Manual (FICM) published by DHEW in 1974.¹ This manual, a must for those responding to federal requests for reports, defines and classifies building space. Many health science centers have expanded the room-type codes to suit their needs; many have also developed additional fields in their database to track data on room characteristics. The use of function codes in the space inventory allows for the accounting of activity in a given space--for example, the amount of time spent on organized research, administration, and instruction. Using a space classification system similar to and compatible with that of the parent institution and other institutions allows for the reporting of data in a timely manner and for more meaningful comparison of data with that of other institutions.

¹ The manual is in the process of being revised by a national committee. See "Additional Sources of Information" at the end of this chapter.

COMMON DATA ELEMENTS OF A SPACE INVENTORY SYSTEM	
<p>ROOM DATA (can be separate database)</p> <p>* Space inventory databases almost always include these elements.</p>	* Building name or identification number
	Planning or development zone
	* Room number
	* Room type (i.e., lab, office) (federal code)
	* Assigned organizational unit (i.e., department, division, center, program)
	* Occupant
	* Occupying organizational unit
	Program use (i.e., medical education, graduate education, research)
	* Floor area (net assignable square feet)
	Room function (administrative classification--i.e., research, instruction)
	Number of work stations
	Utilities available (e.g., domestic water, pure water, gas, air, vacuum)
	Number of fume hoods
	Number of sinks
	Equipment
	Grant account information (may be provided with a linkage to a financial database)
	Indirect cost percentages (may be provided with a linkage to a financial database)
	Hazardous materials
	Type of research
	<p>BUILDING DATA (can be separate database)</p>
Building number	
Street address	
Number of occupied levels	
Year of construction (occupancy)	
Planning or development zone location	
Construction/project cost	
Year of latest major improvements	
Gross area	
Net area	
Assignable area	
Type of construction	
Major building use	
Handicapped accessible (yes/no)	
Building infrastructure information (may link to plant operations or planning database)	

Two principles should be kept in mind when designing a text database to account for space:

- o The content of the database should be determined primarily by the management and planning uses to which the data are to be put.
- o The degree to which the database is integrated with other institutional databases reduces the need to include extensive information in the inventory system database itself.

Database integration is the key to whether space inventory and facility data systems are used as decision-making and management tools or are merely archival repositories of information. The essential links are those to financial and personnel data systems. Other possibilities in use at academic medical centers include links with equipment inventories and class scheduling systems. Integration requires that standard data elements be used within the institution's various databases. For example, social security numbers might be used to link occupants of a particular space with grant and salary data.

The text databases of space inventory systems sometimes include information about building infrastructure or architecture and engineering, e.g., building materials, plumbing, wiring, floor finish. They also may include information related to the condition of the space, the scheduling of maintenance, and security (i.e., lock and key tracking), etc. Finally, the space inventory system may incorporate an institution's data on environmental factors and its "campus character."

What Are the Data Elements? Campus Character Database

Data reflecting the campus character or "image"--i.e., information about geography, access to transportation, and affected communities--is usually maintained by a campus planning or plant operations department. If this information is maintained as a computer database, a school or center should be able to access or transfer relevant data electronically or by magnetic media. Otherwise, relevant data will have to be input manually into an electronic database.

Campus character data generally changes due to major construction projects, land acquisition, environmental impact studies, and the like. Ideally, it should be updated continually or, at a minimum, once a year.

The elements that should be in a campus character database appear below.

COMMON ELEMENTS OF A CAMPUS CHARACTER DATABASE
Building name or identification numbers
Planning or development zones
Designated environmental zones
Total land area (acreage or square feet)
Total built area (gross square feet)
Building height data (by building/zone)
Total number of students and staff housed on campus (by zone)
Total number of transient faculty, staff, and students
Campus boundary data (street names)
Community services, vendors, and agencies used and location *
Multiple campus site locations
Building type/aesthetic data--age, materials, structural type, etc. *

* may be provided by linkage with other databases.

N.B.--Separate databases usually require at least one data element or field that is common to other databases--e.g., building name, number, or address--to create linkages.

What Are the Data Elements? Campus Infrastructure

The campus infrastructure database provides information about campus utility systems and support services. This data is the foundation for the campus planning processes that comprise master planning. It should address the existing capacities of the various utility systems and support services, how much of the existing capacity is in use at various times and what amount remains available, and the extent to which the capacity of

these systems and services can be expanded. The data should enable planners to determine at any point in time the limitations and potentials of the campus infrastructure system. Elements commonly found in a campus infrastructure database appear in the chart below.

COMMON ELEMENTS OF A CAMPUS INFRASTRUCTURE SYSTEM DATABASE
Building names and identification numbers, square footages, volumes, etc.
Campus land use and planning zones, their areas, boundaries, restrictions, etc.
Campus central utility systems data, capacities, locations, limitations, conditions, etc.--electrical power, central steam, condensate, chilled water, domestic water, sanitary and storm sewage, heating/hot water, voice/data communications, power plant locations and capacities, tunnel and conduit locations, supply air intake and exhaust locations, etc. *
Campus "logistical" capacities, which include campus storage areas by type, size, availability, etc.; construction staging areas; elevator locations and capacities; loading docks and service entry locations.
Vehicular and pedestrian circulation data indicating roadway capacities, problem areas, high-use areas, major interference areas and intersections, etc.
Parking and access data indicating parking lots/decks, capacities, types, access points, handicapped entries, etc.
Emergency/disaster plan data indicating locations of emergency vehicle access, hazardous materials, emergency utilities, emergency equipment, fire exits, fire water, etc.

* Both the alphanumeric text database and the graphic databases should have data indicating peak capacities, reserve capacities, system condition, age, location, planned and potential expansions, etc.

Whether maintained manually or electronically, the campus infrastructure database is usually the responsibility of a plant operations or planning department. Accessibility, use, and maintenance of this data by the medical school or center depends upon the organization of the institution and where the plant operations or planning group resides. Like other databases, this one should be accessible by those who need the data for planning and management purposes. The data should be maintained continually by the plant operations or planning group as changes are made to the various infrastructure system components.

Like building space databases, infrastructure system databases have large quantities of alphanumeric text data. They also need graphic data in the form of utility system diagrams, transportation circulation plans, land use plans/zones, and so forth.

Hardware: PC or Mainframe?

One often hears discussions about the use of mainframe computers versus personal computers (PCs). Most institutions of higher education run their space database systems, along with their other institutional databases (e.g., financial, personnel), on central mainframe or minicomputer systems. Health science centers and medical schools typically need to interface with such existing systems. Depending on the size of the institution, "local" space inventory systems reside on a mainframe, mini, or personal computer system or a combination of all of these. PCs are more accessible and easier to use than mainframe systems, but extremely large database systems run faster on mini or mainframe computers. Thus, many institutions today maintain large databases on mini or mainframe computers but can "download" the data to PCs. This satisfies requirements for linkage with other institutional databases and for centralized control and maintenance of the data, as well as needs for access and ease of use.

A variety of standard software for database management is available for users to customize for their particular needs. This permits production of customized reports and greater access to the data by end-users.

Alternatives to In-house Development

The alternatives to creating an in-house space inventory and facility data system are limited. There are database software packages, available for mainframe computers and PCs, that can be used to create space databases without actually having to write database programs. To be useful, though, these software packages still require adept computer personnel and programmers. Software packages created for the commercial real estate market typically are not useful for academic institutions' space inventories and management.

One alternative is a sharing arrangement among institutions with similar needs. A number of academic medical centers participate in a consortium arrangement with the Massachusetts Institute of Technology's INSITE 3TM. INSITE is a database management system originally created for the storage, manipulation, analysis, and reporting of M.I.T. facilities data but now available to members of the M.I.T. INSITE Consortium. As of September 1989, there were 23 colleges and universities and eight health care institutions participating in the consortium. The INSITE program can

be applied to a number of different applications, designed and implemented by the user with the assistance of M.I.T. Each user can customize it according to their own needs, data, and output requirements.

Floor Plans, Graphic Space Databases, and "CADD"

State-of-the-art inventory systems now include digitized floor plans and graphic interface. The decision-making support provided by inventory systems is aided by the graphic image--for example, by conveying pictorially the adjacency of related departments. Beyond improved communication, graphic data can yield more accurate calculation of spatial area. Computer-Aided Drafting and Design (CADD) programs, now available for PCs, can maintain not only the image of a floor plan but also the coordinates necessary to calculate room areas. The high degree of accuracy of this method of calculation results in consistent and reliable area figures within the space accounting system. Graphic representation of space data in both two and three dimensions provides an indispensable planning and management tool.

The first step in developing a graphic capability is converting paper or mylar floor plans into digital form. If the original drawings are reasonably accurate, the image can be scanned to replicate the original without deviation. The scanned image can then serve as the basis for tracing to the "vector" format, used by most CADD systems. Another method, which can be more costly, involves tracing the original drawings manually using a digitizer. Documents can also be redrawn using a manual CADD drafting process based on dimensioned floor plans. If the original plans are out of scale or in a poor state of preservation, conversion can represent a major investment on the part of an institution.

Ideally, changes introduced in the graphic database should be updated automatically in the alphanumeric text database. Interfacing CADD with alphanumeric database software packages, once difficult to achieve, is no longer a serious problem if users can articulate their needs. Customized linkage programs can be written at nominal cost. Costs of such programs depend on the complexity of the databases requiring linkage, but are usually less than \$5,000. For institutions using M.I.T.'s graphic system, INSITE-CADTM, drawing changes in the graphic system that affect room number, size, function, or assignment automatically update the INSITE database. INSITE-CAD operates on an IBM-AT Model 99 with a math

co-processor chip, color graphics adaptor and monitor, high-resolution monitor with color display controller, and digitizer with 16-button cursor.

Institutions may also obtain interface between graphics and text by using commercial software programs. ARCHIBUS/FM™--Jung-Brannon's series of software modules that use well-known "off-the-shelf" software packages such as AutoCAD, Lotus, and dBase--operates on IBM-compatible PCs. Aperture™, produced by Aperture Technologies in Stamford, Connecticut, will run on any Macintosh with one megabyte of RAM and a hard disk. MicroStation™, from the Intergraph Corporation in Huntsville, Alabama, is a powerful system that runs on IBM-compatible PCs and on the Apple Macintosh SE/30 and Mac II family.

Administrators should remember that the effectiveness of a commercial program depends on its compatibility with the user's needs. Because each academic medical center has its own requirements, planners should explore their needs carefully with in-house professionals or consultants before settling on a space inventory system.

Resources Required

Space inventory systems must have the support and financial backing of the institution's leadership, whether the president or chancellor for a central administrative space accounting system, or the dean or chairman at the institutional level of school or department. Space is an extremely valuable and finite resource and is perceived by many to be more valuable than money.

The institution's initial investment in hardware, software, and the consultant time to develop a database and utilization criteria is not insignificant. Continuing costs involve primarily staff and occasional consultant time. Staffing requirements for the operation of a space inventory system vary according to the size and organization of the institution. Individual departments and divisions typically include an individual who has primary responsibility for space data as a part of his or her other responsibilities. At the level of the health science center and school, full-time staff usually have sole responsibility for maintaining data on space and facilities. This staff is often part of a facilities planning and/or design group.

Sample Space Accounting Systems

Bowman Gray School of Medicine Space Accounting System

Bowman Gray is implementing a two-stage project to design and program a facilities management software package that will integrate text and graphics information about current and future facilities. The first phase, the development of a text database, has been completed. The second phase, targeted for completion in 1991, will link the text database and computer-aided drafting (CAD) software.

System designers decided to use a combination PC/mainframe format so that space data can be linked with other institutional databases in the mainframe. Data are downloaded from the mainframe to PCs, where they can be manipulated and used to generate reports.

Text database

Software: McCormack & Dodge's Millenium and Borland's Paradox (for download to PC)

Hardware: IBM 3090 mainframe
IBM compatible and Apple PCs

Elements: room #, building location, room type, size, architectural room name, faculty assigned, type of research, lab equipment, indirect cost percentages, etc. (69 total fields--most remaining fields, e.g., plumbing features, wiring, floor finish, etc., used by engineers)

Graphic functions

Software: AutoCAD

Hardware: microcomputer systems including IBM compatible, Apple MacIntosh and Sun Sparc and other UNIX-based workstations

To expand the power of the system, designers plan to integrate the CAD floor plans tightly with the text data. A user will be able to change an electronic floor plan in AutoCAD and then update the appropriate text information automatically; to create color-coded floor plans showing location of departmental space, hazardous materials, escape routes, etc; and to view floor plans in two and three dimensions.

The AutoCAD system eventually will be networked campuswide and will have a capacity for 99 layers--i.e., the bottom level will be a block floor plan, and other departments can add their own layer of graphic data. E.g., engineering can add wiring information, hazardous materials experts can layer on their own information, etc.

Data collection

As currently planned, one staff person--a facilities information system coordinator--will be responsible for maintaining the system. Whenever a dean reassigns space or engineers make a change in space, they will be required to inform the coordinator by way of a standard form and procedure. In addition to updating data as changes occur, the coordinator will conduct an annual survey of each department.

Applications

System designers plan to integrate space data with other institutional databases, including fixed assets and grants: "Our plan is to link research grant information to research space so that we can insure that we are making the most efficient use of our facilities."

Data will be used not only by facilities staff, but also by department deans and assistant deans, who will be able to do quick queries and report printouts on their PCs. Quarterly reports prepared by the facilities staff and kept in that office for review include: 1) space information sorted by department and faculty member; and 2) space information sorted by building and floor.

Staff anticipates that the system will be used for management (e.g., evaluating space productivity); cost studies (e.g., indirect cost recovery); strategic planning; and operations (e.g., scheduling maintenance and tracking hazardous materials).

For further information, contact:

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Duke University Space Accounting System

The origins of Duke's university-wide space accounting system, housed in the plant accounting office, date back 20 to 25 years. It is primarily a mainframe system. PCs function as "intelligent terminals"; information can be downloaded to them for corrections or report generation, then returned to the mainframe for editing. The medical center is adding a computerized graphic component to the system through the introduction of AutoCAD.

Text database

Software: primarily COBOL in mainframe standard software packages in PC--mostly Lotus 1-2-3 and DBase III+

Hardware: IBM 3083 mainframe
IBM PC/AT and /XT

Elements: building, floor and room #; component code (equivalent to a department code); room use (HEGIS); function (e.g., instruction, research, or administration); square footage; primary responsible person (i.e., principal investigator). Other elements remain from earlier needs but are no longer used.

Graphic functions

Software: AutoCAD

Hardware: IBM PC/386 and /486

The medical center design office is putting all its buildings on AutoCAD. The university plant accounting staff is comparing the information manually with its own database. At present no computer link exists between the graphic information and the university database, but there are plans to integrate the two systems.

Data collection

Two employees in the plant accounting office--one staff, one clerical--maintain the system. They conduct space inventories by meeting with department heads, showing them their data, updating it, and posting it to their master file. Inventories are done cyclically; each department typically gets reviewed once every two years. New data are also input following major renovations. The staff does periodic spot checks, but mostly rely for their field audits on equipment auditors, who report

changes in room configuration, etc., to the plant accounting office.

Applications

The plant accounting staff has integrated space data with two other institutional databases: 1) equipment inventories (any equipment over \$500 is assigned a location, used to link it to space data for purposes of calculating indirect costs, hospital depreciation, etc.); and 2) fixed assets file (building costs can be linked with department codes to determine departmental operating costs).

Campus staff can request reports from the plant accounting office. Some reports are delivered yearly or quarterly and some are provided on an as-needed basis. Many are used by facilities management and planning staff. The system has a flexible reporting capability, but the most common are 1) room information by building and 2) room information sorted by department.

The system was originally established primarily as a tool for cost accounting, indirect cost distribution, and capital equipment inventories. Now the data are also used for reporting to outside agencies and for planning and analysis. With the addition of a data field for primary investigator, for example, senior campus administrators have begun using the system to evaluate faculty productivity.

For further information, contact:

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The Johns Hopkins University School of Medicine Space Accounting System

The Johns Hopkins University School of Medicine has developed FIND, the Facilities Inventory Network Database, as an integrated facilities knowledge base that incorporates a relational database of occupancy data and graphic functions. The system, housed in the facilities planning and design office, operates primarily on PCs and uses off-the-shelf industry standard software.

Text database

Software: Clipper

Hardware: IBM PC/AT compatible

Elements: room number, type, area, function, department, usage

Graphic functions

Software: AutoCAD--computer-aided design
Grasp--for animation function (menuing system)

Hardware: IBM PC/AT compatible hardware platforms with VGA color monitor, 640K RAM, Microsoft compatible mouse, and math coprocessor

Custom programs allow two-way communication between AutoCAD drawings and Clipper alphanumeric databases. The system thus allows for text and graphic output of occupancy information reports. Graphic reports include, e.g., an area map of the surrounding city, a site plan of the local neighborhood, a university lot plan, a vertical representation of building floors, and a color-coded "intelligent" floor plan. A "point and shoot" mouse-driven animation interface allows the user to select the site, lot, building, and floor he/she wishes to view.

Data collection

One staff person in the facilities planning and design office has primary responsibility for maintaining the system. This facilities inventory coordinator updates data in three ways:

- 1) He/she asks administrators to mark up and return a quarterly space report ("honor system").
- 2) He/she receives a report whenever any renovation work is done. This flags the need for a field audit and serves as a

backup to the first updating method. (In addition, architects doing work costing over \$20,000 must provide a CAD file to the facilities office.)

- 3) He/she does periodic field audits.

Applications

Space data are not now integrated with other institutional databases, also on PC. One of the staff's goals in implementing a local area network is to cross over into the grant approval process.

System editing is done only by facilities planning office staff members, who prepare reports needed by campus administrators. The two major categories of reports are: 1) a quarterly report listing space information on a room-by-room basis and in totals per floor and building; and 2) management queries to the database, which allow for approximately 200 different outputs depending on the specified coordinates. Most requests come from inside the facilities office.

The school uses the inventory for management (e.g., negotiating leases, allocating and reallocating space); cost studies (e.g., indirect cost recovery); and short- and long-range planning (e.g., a recent feasibility study to determine the effect of demolishing two campus buildings benefitted from graphic capability). Operational functions are centralized at the university level and therefore are not covered by the school's space inventory system.

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University of Kansas Medical Center Space Accounting System

The executive vice-chancellor's office at the University of Kansas Medical Center maintains a PC-based space accounting system. The text database was written and is operated using a customized version of DBase III+. The system features a local area network that allows users in other offices to have access to space information.

Text database

Software: DBase III+ (programming language allows users to write customized screens, prepare special reports, etc.)

Hardware: IBM PC/AT and /XT compatible

Elements: square footage, area, department assigned, current use, breakdown by functional use percentage, administrative unit, responsible key person

Graphic functions

The medical center has considered the possibilities of computerized graphics, but the current system has no such component.

Data collection

The assistant to the vice-chancellor for administration maintains the system. Every year to year and a half, this staff person sends to department heads a printout of the department's space data and a list of instructions for updating the information. He or she meets with department heads and draws on the assistance of other administrators (e.g., an associate dean in the school of medicine) to coordinate the review process for 125 department heads. Revised data are returned to the vice-chancellor's office for entry into the system.

Applications

Space information is not currently integrated in an automated way with other institutional databases. System designers are discussing ways to link space data with personnel and payroll records and information about research grant activity. Steps in this centralization process include identifying common fields in the different databases and agreeing on who should be responsible for the information and where it should reside.

Not only the vice-chancellor's office, but also the dean's office in the school of medicine, can use PCs to access space information. Typical reports group data by

specific building or level, by department, or by room use codes. The system offers the potential for many types of customized reports.

Administrators use the system for management (e.g., space allocation and reallocation), cost studies (e.g., indirect cost recovery, determining maintenance costs, documenting patient care costs), and planning and analysis.

For further information, contact:

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University of Minnesota Space Accounting System

The space programming and management office at the University of Minnesota maintains a text-based space accounting system on mainframe. Users print standard reports using COBOL forms and can generate specialized reports using off-the-shelf software packages such as Easy-trieve.

Text database

Software: COBOL
Easy-trieve

Hardware: IBM

Elements: Information is maintained for both buildings and individual rooms. Data elements maintained for buildings are: campus building number and name, construction year, street address, gross area, assignable area, nonassignable area, structural area, ownership status, condition, original cost, annual M & O cost, federal contribution, class IV equipment. Data elements maintained on an individual room basis are: building number, room number, assignable square feet, capacity of offices, classrooms and labs, room use, program, discipline, assigned department, user department, physical characteristics. (Space on research and experiment stations is not currently included in the inventory system.)

Graphic functions

The university does not have a computerized graphics component at this time.

Data collection

Three auditors in the university's space programming and management office conduct field audits of all space on a biannual basis (i.e., they check 50 percent of the space each year). Eight or nine staff people (three full-time) are required to maintain the university-wide system.

Applications

Through a program called AS, anyone in the university can copy the database for their own use. Those who use the database include staff responsible for physical

plant operations, hospital accounting, purchasing, research administration, and room scheduling.

Reporting of space-related data is facilitated by report generators programmed into the inventory system, an on-line summary capability, and the Easy-trieve software package. Space data can be sorted, summarized, or displayed in almost limitless ways. Reports linking space data with other institutional databases can be generated by downloading both databases into Excel. For example, the Instructional Space Utilization Report, produced each fall as a joint effort of the Offices of Space Programming and Management and Room Scheduling, details use of scheduled classrooms and instructional laboratories. Data elements reported include: size of room, number of seats, use by hour of day, use by day of week, number of students taught, and percent of seats used.

University administrators use the system for management (e.g., allocation and reallocation of space); cost studies (e.g., indirect cost recovery, instructional cost studies, and operational and maintenance cost calculations); planning; and reporting to outside agencies.

For further information, contact:

Michaeleen Fox
Director
Space Programming and Management
University of Minnesota
423 Johnston Hall
Minneapolis, Minnesota 55455
(612) 624-0885

University of Oklahoma Health Sciences Center Space Accounting System

The office of architectural and engineering services at the University of Oklahoma Health Sciences Center maintains a space inventory system that includes both text and graphic databases. Text is stored on a combination mainframe/PC system that allows users to link space data with other institutional databases. The graphic system operates on PCs using AutoCAD software.

Text database

Software: UNISYS DMS II
COBOL 74
RBase (PC)

Hardware: UNISYS A10H
IBM PC/386 compatible

Elements: for each room: building number, building name, using department, college code, program classification, room use, room size, prorated room size, station/capacity (i.e., number of lab stations), occupant (a new element), last inventory date

Graphic functions

Software: AutoCAD

Hardware: IBM PC/386

The CAD is currently a stand-alone system. The architectural and engineering services staff has plans to integrate it with the text database.

Data collection

A coordinator in the architectural and engineering services office collects and modifies space data. As changes occur due to remodeling or other factors, departmental personnel or engineering staff submit data entry forms requesting changes in the database. In addition, the coordinator will inventory the entire campus once a year. Other staff involved in producing reports include the campus architect and computing services personnel, who help produce custom reports generated from the mainframe. Ten standard reports are available from the mainframe; in addition, the data can be downloaded from the mainframe for custom reports in the PC environment using RBase.

Applications

Space data are linked through the mainframe with other institutional databases, including grants and contracts information (used to determine, for example, research dollars per square foot of research space) and enrollment information.

When institutional administrators want space information, they request a report from the architectural and engineering services office. The college of medicine, however, which requests reports most frequently, can load the data on their microcomputers and manipulate them as they wish. The RBase software provides a very flexible reporting capacity. Reports most often generated include a description of space by college, a list of space assignments by department, and a program classification analysis.

Campus administrators use the system for management (e.g., allocating and reallocating space, evaluating the productivity of space, evaluating the productivity of researchers, and space utilization and analysis); cost studies (e.g., indirect cost recovery and lease cost analysis); planning (e.g., justifying constructing or renovation and developing campus master plans); and operations (e.g., determining staff levels for maintenance).

For further information, contact:

Harley Campbell
Campus Architect
University of Oklahoma Health Sciences
Center
Architectural and Engineering Services
SCB142
P.O. Box 26901
Oklahoma City, Oklahoma 73190
(405) 271-2305

University of Vermont College of Medicine Space Accounting System

The College of Medicine at the University of Vermont uses a combination PC/mainframe format for its text-based space inventory. The university maintains a mainframe database, to which it has added certain data elements not kept by the university but required by the College of Medicine. The dean's office is responsible for updating these data elements. The data are downloaded onto PCs in the dean's office.

Text database

Software: Original software was Power Base, an off-the-shelf package with custom-designed applications. System is switching to Paradox because of its more flexible reporting capabilities.

Hardware: IBM 4300 series mainframe
Zenith 386 (IBM-compatible) PC

Elements: room number, department, room type, square feet, building, function, occupants, program, grant account numbers, description (includes additional pertinent information)

Graphic functions

The college does not have a computerized graphics component at this time.

Data collection

Two staff members in the dean's office (institutional research analyst and associate) maintain the system. They update data once a year by sending reports (usually in a one page per room format) to a contact person in each department. These contacts review the reports and make any needed changes. The dean's office staff members scan this material for accuracy and either input it into the system themselves or pass it on to the university administration for inputting. This annual review requires intermittent labor from January through May. The staff does field audits on a spot-check basis and anytime there is a change in space configuration.

Applications

The space accounting system is integrated with these other institutional databases: 1) university chart of accounts; 2) personnel and salary information system; and 3) class scheduling.

Departmental staff members use the data by requesting reports from the dean's office staff who maintain the system. Reports most frequently requested include: 1) room information listed by room number (sent to each department); and 2) room information listed by function (used by university administration). The somewhat more complicated program utilization report breaks down the use of each room into percentages.

The College uses the inventory for management (e.g., allocating and reallocating space, evaluating the productivity of space, monitoring the use of space); cost studies (e.g., indirect cost recovery and energy use studies); and planning (e.g., justifying construction or renovation, supporting grant applications, reporting to outside agencies, developing campus master plans, and recruiting department chairs).

For further information, contact:

Richard E. Laverty
Institutional Research Analyst
University of Vermont College of Medicine
Burlington, Vermont 05405
(802) 656-2160

Additional Sources of Information

1. Readers who wish to learn more about M.I.T.'s INSITE consortium may contact: Roy A. Davey, assistant director, Office of Facilities Management Systems, Massachusetts Institute of Technology, Room E19-451, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139. Telephone (617) 253-0594. FAX (617) 258-8249.

AAMC member institutions and affiliated universities that belong to the consortium include Brown University, Columbia University, McMaster University, Ohio State University-Health Services, Medical College of Ohio, Tufts University, University of Alabama in Birmingham, University of California-Los Angeles, University of California-San Francisco, University of Pittsburgh, Vanderbilt University, Albert Einstein College of Medicine, Texas Tech University Health Science Center, University of Massachusetts Medical Center, Massachusetts General Hospital, Memorial Sloan-Kettering Cancer Center, and Rush-Presbyterian-St. Luke's Medical Center.

2. The 1974 Federal Inventory and Classification Manual is being revised by a national committee. The purpose is not only to modernize space classification, but to serve as a prelude to a serious effort in the next few years to assemble a national inventory of institutional facilities. The National Center for Education Statistics (NCES) expects to publish the *Higher Education Facilities Inventory and Classification Manual* in the summer of 1991. Inquiries should be directed to Charles S. Lenth, director, SHEEO/NCES Communication Network, 707 17th Street, Suite 2700, Denver, Colorado 80202-3427.
3. Cornell University Medical College and its adjacent affiliate, New York Hospital, recently undertook an extensive inventory of space. Staff members are incorporating information on spreadsheets and the floor plans for college space into Aperture, a drawing and database information system that operates on a Macintosh. For more information, contact Janette S. Cooke, Office of Space Management, Cornell University Medical College, 1300 York Avenue, New York, New York 10021. Telephone (212) 746-6181.
4. During the course of a major building program at Mount Sinai Medical Center, administrators sought a workable space inventory that would record the changes taking place and provide an in-house capability to

keep data current. They developed an effective system by using a scanning process to convert paper drawings into electronic files for use on a personal computer. For more information, see Kenneth Ritchin's article, "Case study in space management: NYC's Mount Sinai Medical Center," in the November 1990 issue of *Health Facilities Management*. Or call Kenneth Ritchin, executive consultant to the senior vice-president, Mount Sinai School of Medicine, One Gustave L. Levy Place, New York, New York 10029. Telephone (212) 241-5972.

5. The University of Michigan Medical School recently completed a project to put all of its building plans and space data onto microcomputer systems. They have used a series of software and hardware products and expect to have a completely integrated and functional system for space data and graphic data by mid-summer 1991. All of the Medical School's building "key plans" have been accurately input into the University's Intergraph CAD system. These graphic files can be used on either minicomputer-based Intergraph systems or Microstation Intergraph systems that run on IBM-compatible or Macintosh microcomputers. Intergraph files are also easily converted to Autodesk's AutoCAD file format for use with a wide range of third-party software. Both Intergraph and AutoCAD can be linked with a variety of database systems ranging from dBASE to ORACLE-type database packages. The University of Michigan Medical School will be using Jung-Brannon's ARCHIBUS/FM software packages for managing its graphic and space data. They will use both IBM and Macintosh microcomputers. For more information, contact Horace I. Bomar, director, facilities management and planning, University of Michigan Medical School, 1590 MSRB2, Ann Arbor, Michigan 48109-0670. Telephone (313) 747-2788. FAX (303) 763-0299. Email Horace_Bomar@ub.cc.umich.edu.
6. The October 1990 issue of *Buildings* magazine (pp. 52-63) includes a "buyers guide" to over 100 facility-management software systems.
7. See abstract of "Description of Space Utilization Procedures," (1990), McMaster University Faculty of Health Sciences (see page 188).
8. The Society of College and University Planners (SCUP) is a large and prominent national group of planners and managers working with facilities. For more information, contact Joanne MacRae, executive

secretary, SCUP, 2026M School of Education Building, University of Michigan, Ann Arbor, Michigan, 48109, (313) 763-4776.

9. The following bibliography may also be of interest:

Architectural and Engineering Systems Staff. 1989. Scanning: The future of CAD. *Architectural and engineering systems*. September:17-18+.

Cyros, K. 1989. The M.I.T. INSITE space system. In *Planning and managing higher education facilities*, ed. H. H. Kaiser. 61 (Spring):37-48. San Francisco: Jossey-Bass.

Lee, K. 1991. Digitize! Give paper drawings a new life. *Facility management journal*. January/February:15-20.

Mondo, C. F. 1989. In search of a quality scanning service. *Architectural and engineering systems*. September:19.

Montgomery, D. A. 1989. Organizing for space management. In *Planning and managing higher education facilities*, ed. H. H. Kaiser. 61 (Spring):21-36.

Ruys, T., ed. 1990. Laboratory facilities. *Handbook of facilities planning*, volume I. New York: Van Nostrand Reinhold.

Appendix A

Abstracts of Space Planning and Management Documents

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
Building Report Card: Summary
(May 1990)

Description UCSF uses an evaluation tool called the "Building Report Card" to make decisions about the use of space and to guide planning for repair, renewal, and renovation. The document provides a rationale for the mechanism and summarizes its characteristics. The Building Report Card provides a scored evaluation of a building's current physical condition, broken down into components that indicate specific areas of need, and an assessment of a building's potential for conversion to other uses, specifically identifying aspects that may limit a substantial change in type of use.

The Building Report Card uses objective evaluation criteria, each of which is assigned a weighted score. Sources of data from which scores are derived include: campus facilities audit, which identifies the nature and cost of projects required to repair campus buildings and to replace obsolete or defective systems; capacity studies, which identify existing system loads; and structural design data.

Length 8 pages

Fee None

Contact Carol Copperud
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Office of the President
University of California
300 Lakeside Drive, 21st Floor
Oakland, California 94612
Telephone (415) 987-0782

HEALTH SCIENCES SPACE PLANNING MODEL
(February 1989)

Description The University of California, San Francisco, has collaborated with a number of other institutions to develop health sciences space planning guidelines and translate them into a LOTUS 1-2-3 model for IBM PCs. This document is a first draft of the Health Sciences Space Planning Model, which can be used to estimate overall space in health sciences research, instruction, and support. The document includes an introduction to the methodology used in developing the model, documentation of the spreadsheet model, hard copy of data printouts, an example of the model spreadsheet with space calculations for three fictional schools, and a program diskette.

In this model, estimates of need for research space are calculated on the basis of estimated growth in research funding. Ranges of space allotment are estimated for categories of research staff (i.e., principal investigators, professional researchers, lab staff, postdocs). Separate calculations are made for wet and dry research. Instructional space is calculated based on the number of students, with an additional increment to accommodate clinical teaching requirements. Academic office space is calculated for instructional faculty. Departmental, school, and campus administration and support space are calculated as a proportion of the total academic (instruction and research) space.

The document notes that the model is useful for projecting the impacts on space of projected changes to research funding, type of research (wet or dry), and demographics (number of faculty, staff, students).

Length 40 pages and one 5-1/4" disk on Lotus 1-2-3

Fee None

Contact Carol Copperud
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Telephone (415) 987-0782

SOUTHERN ILLINOIS UNIVERSITY--CARBONDALE
School of Medicine--Carbondale Campus
A Systematic Approach to the Allocation and Management of Space
(January 1983)

Description The document represents the space plan used since 1983 by the SIU School of Medicine--Carbondale basic science units. A split campus has made it possible to implement the plan for just this segment of the total School of Medicine space. The document includes a statement of institutional philosophy for the management of space, a description of operating procedures and guidelines for space allocation, and a list of priorities for space utilization.

A detailed inventory of available space by room type is appended to the document.

Length 20 pages

Fee None

Contact Rhonda Seeber
Business Manager
Southern Illinois University School of Medicine
Southern Illinois University at Carbondale
Carbondale, Illinois 62901-6503
Telephone (618) 453-1467

UNIVERSITY OF KENTUCKY
An Economic Impact Analysis of the Biomedical Research Building
for the UK College of Medicine
(October 1989)

Description The report, prepared by the Center for Business and Economic Research at UK, demonstrates the positive effects of a new research building and subsequent increased research funding on the local and Commonwealth economy. The report profiles the College of Medicine and the hospital, emphasizing their contributions to the community through teaching, research, and patient care. It explains the need for more space, developing a justification for the new biomedical research building. Finally, the report analyzes the economic impact of the new building. It establishes the relationship between space and the research dollars it can generate, warns of potential negative impacts of not adding space, and provides evidence of increased faculty research and publication activity. The report also includes a description and calculation of the "multiplier" effect of research funds brought into the college--i.e., how dollars spent multiply as they work their way through the local economy.

In April 1990, the Commonwealth of Kentucky approved in its 1990-92 Biennium Budget appropriations the funding and construction of a \$19.5 million Biomedical Research Building (approximately 120,000 gsf) for the University of Kentucky Medical Center.

Length 40 pages

Fee prepaid postage on a 9X12" self-addressed envelope
(document weight = 8 ounces)

Contact Thomas M. Rose
Associate Dean for Administration and Finance
University of Kentucky College of Medicine
Chandler Medical Center
800 Rose Street
Lexington, Kentucky 40536-0084
Telephone (606) 233-6582

UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE
Guidelines for Managing Research Space
(June 1989)

Description	<p>The document outlines recommendations from a facilities master-planning steering committee to assist the dean in the management of research space in the School of Medicine. The outline includes:</p> <ul style="list-style-type: none">o Criteria for assigning research space (direct financial support from grants and contracts, number of occupants, and special programs)o Specific guidelines concerning total departmental research space (not to exceed approximately 325 net square feet per occupant) and investigator supporto Recommended appropriate uses of research spaceo Responsibility for allocation of research spaceo Procedures for compiling and evaluating research space datao Composition of the dean's committee on research space
Length	2 pages
Fee	None
Contact	<p>Gregory F. Handlir Associate Dean for Resource Management University of Maryland School of Medicine University of Maryland at Baltimore 655 West Baltimore Street, Room 14-037 Baltimore, Maryland 21201 Telephone (301) 328-7009</p>

HARVARD MEDICAL SCHOOL
180 Longwood Avenue Building Utilization Study
(May 1988)

Description The document is an architectural and engineering review of the best uses of a three-story research building. It describes the building's condition in terms of circulation and egress; condition of existing finishes, building exterior; and the mechanical, plumbing, and electrical systems.

 The study evaluates alternative reuse options, including laboratory use, general administrative offices, seminar and conference functions, housing functions, and animal housing. The report concludes with six building renovation options, including discussion of timing, costs, and additional square feet gained through renovation.

Length 20 pages plus attachments

Fee None

Contact Ann Schwind
 Associate Dean for Planning
 Harvard Medical School
 25 Shattuck Street
 Building A, Room 103
 Boston, Massachusetts 02115
 Telephone (617) 432-0870

UNIVERSITY OF MINNESOTA
Minnesota Facilities Model
(July 1982)

Description The document describes a university-wide system to evaluate facilities need, use, and condition. The *Inventory Component* contains the university's space inventory system, which records assignment and usage of all university facilities. The document lists data elements maintained for buildings and rooms and provides examples of reports generated.

The physical condition and program suitability of existing facilities are evaluated in the *Qualitative Component*. The document describes (1) the physical condition audit, an effort to apply quantitative methodology to an evaluation of the physical condition of the primary structure (foundation, roof), secondary structure (windows, doors), service systems (HVAC, electrical), and safety systems; and (2) the functional audit, an application of quantitative methodology to assessing physical limitations of space for its intended use, in the areas of environment (lighting, acoustics), support services (equipment, waste disposal), space efficiency (location, area), and accessibility (elevator, rest rooms).

The *Predictor Component* identifies and defines program elements that generate or predict space needs. The document describes the retrieval and use of this information, divided into student data (instructional activity, pattern and mix of student enrollments), faculty/staff data (categories of employees with office and research needs), and programmatic data (supplemental space needs for unique programs).

The *Guideline Component* contains space standards and allowances that provide the means for translating program activities into physical space. The document includes a definition, outline of university policies on provision of space, description of space generators, and space allowance guidelines for five space types: office, research, instruction, library, and other (i.e., lounge/commons space, student union, recreational space).

The document also describes the process for collecting and verifying data and performing analyses. It includes copies of research factor evaluation forms and departmental worksheets. Appendices include physical condition audit forms, sample program predictor and space projection worksheets, and a table of laboratory and research allowances for all departments and all campuses.

Length 66 pages

Fee None

Contact Michaelen Fox, Director, Space Programming and Management
University of Minnesota
423 Johnston Hall
Minneapolis, Minnesota 55455
Telephone (612) 624-0885

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE
Needs Assessment: Research Space Survey Form

Description	The Washington University School of Medicine uses this four-page form to ask each of its departments to state the goals and objectives of its research program over the next 5 to 10 years. The form asks departments to identify future requirements for research personnel (by position type) and space (by room type). Departmental representatives are also asked to comment on the adequacy of present facilities; propose a departmental use for vacated space; identify special system and/or equipment requirements; explain needs for proximity to other departments or services; describe the routine work flow of people, materials, and specimens in the department; delineate a timetable necessary to achieve departmental research goals; and indicate a preferred site and type of environment for maximum efficiency and comfort in the department.
Length	4 pages
Fee	None
Contact	Tom Sonderegger Assistant Dean/Vice Chancellor for Program and Finance Planning Washington University School of Medicine Box 8211 660 South Euclid Avenue St. Louis, Missouri 63110 Telephone (314) 362-1251

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE
 The Resource Allocation Model
 (March 1989)

Description The document summarizes a presentation delivered to the AAMC Group on Business Affairs about the Resource Allocation Model (RAM). Primarily a financial model, RAM measures resources generated by departments (i.e., direct sponsored funds, indirect sponsored funds, patient-related income, patient-related overhead income) and resources utilized by departments (i.e., net assignable square feet, general fund allocation, FTE faculty, FTE employees). The summary stresses that the model does not measure quality of research effort or clinical effort, that it makes no provision for different earning powers or capacities of clinical specialties, and that it does not allow for comparisons between departments of different medical schools.

The summary includes a history of the development of RAM, a list and definitions of the computerized system's data items, and a definition of ratios produced by the system. The ratios allow administrators to review departmental activity in comparison to other departments. The dean can use information provided from the ratios in determining allocation of schoolwide resources. Examples of ratios include income divided by net assignable square feet (e.g., direct sponsored funds divided by research net assignable square feet); and general fund resources generated divided by general fund resources utilized.

Administrators have used the model to help determine general fund allocation, to respond to departmental requests for additional resources (money, space, faculty), to recruit department heads, and to increase awareness of departmental performance relative to schoolwide performance. In time, RAM might be used as a leading indicator of future departmental performance or to conduct inter-medical school comparisons of departments.

Length 15 pages

Fee None

Contact Tom Sonderegger
 Assistant Dean/Vice Chancellor for Program and Finance Planning
 Washington University School of Medicine
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 660 South Euclid Avenue
 St. Louis, Missouri 63110
 Telephone (314) 362-1251

UNIVERSITY OF OKLAHOMA
Space Evaluation and Planning Models--Health Sciences Center
(Revised February 1991)

Description	The document outlines space standards for classrooms, class laboratories, research space, offices, and libraries at The University of Oklahoma Health Sciences Center. The standards provide a framework from which detailed studies can be conducted. For each category of space, the document includes a definition, a discussion of factors influencing amount of space required, and a model for calculating space need, including space generator, standards, space factor, and space requirement.
Length	15 pages
Fee	None to AAMC members
Contact	Thomas R. Godkins Director of Capital Planning University of Oklahoma College of Medicine P.O. Box 26901, Library Building 221 Oklahoma City, Oklahoma 73190 Telephone (405) 271-2332

UNIVERSITY OF OKLAHOMA
Report on Research Expenditures per NASF Research Space--Health Sciences Center
(August 1990)

Description The report provides an analysis of research expenditures per net assignable square foot (nasf) of research space by department within college for the seven colleges that comprise the Health Sciences Center. The report includes summaries of research expenditures for federal sources only and nonfederal sources per nasf of research space. The document provides a framework from which an evaluation of the intensity of research space utilization can be completed.

For each summary, the document includes specifications required for computer analysis, expenditures per nasf of research laboratory space, expenditures per nasf other research space, and expenditures per nasf all research space.

Length 17 pages

Fee None to AAMC members

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University of Oklahoma College of Medicine
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Oklahoma City, Oklahoma 73190
Telephone (405) 271-2332

OREGON HEALTH SCIENCES UNIVERSITY
School of Medicine Space Policy
(October 1984)

Description A policy statement (October 1984) and descriptive cover letter from the assistant dean for planning (January 1990) outline a research space reallocation methodology developed by faculty of the School. The policy states that each department shall have a certain amount of core space, which is inviolable, and a certain amount of research space, which the department chair can reallocate within the department. The policy describes the process for identifying core space, which includes departmental offices; offices of primary faculty; space for postdocs, graduate students, and fellows; departmental conference rooms; and libraries. Once core space is established, it is generally not subject to review.

All other space is considered research space and is subject to periodic review by faculty peers. Continued use by the department depends on justification of need, demonstrated productivity, and overall mission of the department.

The documents describe the space utilization review process, which includes a site visit by a faculty space committee, a review of data, and a secret committee vote. Factors for consideration include grant funding, publication records, and evidence of strong training programs. Space disapproved for current use goes into a research space pool and may be reallocated by the department chair. Decisions to deny new space or to reassign a faculty member's space may be appealed to the dean.

The documents suggest that the faculty see the following strengths in this approach: it is a peer-review process, its findings are confidential, and its decisions are not based entirely on quantitative measures.

Length 7 pages (includes copies of two forms)

Fee To be determined

Contact J. Peter Bentley, Ph.D.
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Telephone (503) 494-4430, 494-8414

UNIVERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE
Research Space Utilization Review
(1990)

Description The packet of documents includes a presentation handout on "The Process and Politics of Space Utilization Review" (April 1989), a memorandum describing the research space utilization review process (June 1990), a policy for evaluation of productivity and for turnover of assignments of research space in the school, and a statement of criteria for identification of research space.

The documents outline guidelines and procedures for reviewing research space utilization at the University of Pennsylvania's School of Medicine. The director of resource planning and analysis and the subcommittee on facilities conduct an annual review of space productivity data (i.e., research dollars per research net square foot). Exemptions from the evaluation procedure are permitted. After calculations are refigured, departments with productivity ratios falling below 50 percent of the institutional mean are identified. A committee reviews these departments and evaluates their productivity in terms of publications.

Departments unable to meet the criteria for space productivity or publication productivity may be asked to reduce their research space, which then becomes available for reassignment by the dean to new or ongoing research programs.

Also included in the packet are copies of several forms used in the allocation/reallocation process.

Length 25 pages

Fee None

Contact Michael A. Hindery
Director of Resource Planning and Analysis
University of Pennsylvania School of Medicine
235 Med Labs/6015
Philadelphia, Pennsylvania 19104
(215) 898-3607

UNIVERSITY OF TEXAS SYSTEM
Final Report for The University of Texas Health Science Centers
Space Standards Committee
(January 1988)

Description	<p>The report describes a University of Texas System project to develop guidelines for evaluating space needs of Texas health institutions. The document presents methodology and findings for each of four phases:</p> <ol style="list-style-type: none">1) A comprehensive space inventory at each of the University of Texas Health Science Centers. Comparative data were collected to formulate ratios of teaching space per student, nonteaching/nonresearch space per one million dollars of educational and general expenditures, and research lab space per one million dollars of research expenditures.2) A nationwide survey of 16 similarly structured academic health science centers. Information gathered included space data, student and employee data, and expenditures data.3) A review of published and unpublished space studies and guidelines.4) Consultations with a higher education facilities consultant. <p>The project committee developed a model for estimating space needs for the education and research missions of academic health science centers. The model includes definitions of three categories of space (teaching, research lab, nonteaching/nonresearch lab space); variables for estimating space needs (student headcount, research expenditures, educational and general expenditures); and recommended space standards for Texas health institutions (asf per student for teaching space, asf per one million dollars of research expenditures for research labs, asf per one million dollars of nonhospital educational and general expenditures for nonteaching/nonresearch space).</p> <p>Appendices include data collection forms, definitions, a bibliography, and survey data.</p>
Length	20 pages plus tables (30 pages)
Fee	None
Contact	Joseph H. Stafford, Ph.D. Executive Associate for Planning and Academic Programs Office of Academic Affairs The University of Texas System 601 Colorado Street Austin, Texas 78701

UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT SAN ANTONIO
 Space Allocation Guidelines for Academic Departments
 (November 1985)

Description The document sets forth guidelines that indicate total space allocation for any department at the UT Health Science Center, San Antonio. The guidelines represent a base on which the administration can assign space in terms of present and future available space. The document begins with a description of the process and guiding criteria for allocating space (e.g., consideration of special needs of junior faculty, need for proximity to ongoing departmental activities.)

Allocation standards as outlined in the document are based on modules: 100 assignable square feet (asf) modules for offices, 300 asf for laboratory modules. A department is allocated the sum of the following:

- o administrative space: 1,000 asf
- o faculty FTE (state- and grant-funded): 200 asf
- o state-salaried staff FTE: 100 asf
- o bonus administrative space for larger departments
- o research (wet labs): 300 asf for each \$40,000 wet research funding (direct costs less faculty salary support)
- o research (dry): 300 asf for every \$100,000
- o fellows, graduate students engaged in laboratory research: 100 asf

The document concludes with a list of defined terms.

Length 4 pages

Fee None

Contact Robert B. Price
 Executive Vice President for Administration and Business Affairs
 The University of Texas Health Science Center at San Antonio
 7703 Floyd Curl Drive
 San Antonio, Texas 78284
 Telephone (512) 567-2000

UNIVERSITY OF VERMONT COLLEGE OF MEDICINE
Model for Determining Utility Cost Allocations
Associated with Conducting Research
(1987)

Description The project report describes a model produced by consultants for determining utility cost allocations for all physical and life sciences at the University of Vermont (including the College of Medicine, the largest consumer of utility costs). The preface notes that institutional cost accounting traditionally has treated energy consumption as an indirect cost item, allocated according to square footage occupied rather than based on actual consumption. The problem with this procedure, the document suggests, is that it does not reflect the high-energy usage associated with laboratory and research areas as compared to usage in classrooms, offices, and other low-energy-intensive room types. By treating all room classifications as equal energy consumers, the institution fails to recoup the full energy costs associated with grant-sponsored research.

Room-by-room metering of utility consumption is not practical, but the University of Vermont College of Medicine uses a cost-effective modeling technique designed to estimate actual room-by-room energy use. The model is described in detail in the report.

Information pertaining to energy usage is collected in three phases: (1) an engineering survey to document space conditioning systems for each building and to establish energy variables associated with the systems; (2) a room survey to document local room conditions that define annual room utility consumption; and (3) processing of equipment loads, heat transfer coefficients, operating schedules, etc., according to their individual properties in the mathematical computer model DUCAT. Room-by-room consumption of utilities is calculated and aggregated according to research and nonresearch activities.

The project summary includes recommendations for changes to the space inventory, defines components and terms of utility consumption and how they are used in the model, and demonstrates model output.

Length 11 pages

Fee None

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	Institutional Research Analyst	James Read
	Dean's Office	Budget/Statistical Analyst
	University of Vermont College of	Grant and Contract Accounting
	Medicine	University of Vermont
	Burlington, Vermont 05405	Burlington, Vermont 05405
	Telephone (802) 656-8584	Telephone (802) 656-2986

UNIVERSITY OF VERMONT COLLEGE OF MEDICINE
Space Management at the University of Vermont College of Medicine
(1981)

Description The document describes the College of Medicine's approach to space allocation and reallocation. It integrates a specialized information system with a "Space Priority Review." The primary objectives of the review are (1) to identify misused space and (2) to classify space in accordance with the collegial goals of education and research.

The variables used to identify space in the priority framework are room type (i.e., office, nonclass lab, special purpose rooms for instruction, research administration); function/program; occupant type; and research funding (principal-investigator salary support and overhead support).

The system assigns priorities to functions that require space in each room category and identifies the occupant associated with each function. For example, within office space, the first-priority function is departmental academic administration and the occupant is the department chair. Each room type, function, and occupant type is assigned a standard number of space "units" (the basic unit equals approximately 100 square feet). For example, a department chair is allowed 1.5 units, or 90 to 210 square feet.

When actual space use is calculated and compared to totals derived from the formulas for space priority review, discrepancies are pointed out in a consistent, objective manner and can be used as a basis for discussion regarding any potential reassignment of space. The document notes that the strength of the system lies in its ability to identify misused space, excess space, and departments needing space in a way that cannot be ignored or easily disputed.

The space priority review system resides in a personal computer database (Powerbase), which records data about room type, grant activity, number and type of faculty and staff. Summary reports identify, by room category, the individuals and functions in a department, their actual space use, and the number of units allowed. The system is currently being upgraded to Paradox software. There will also be improved linkages to the university database.

Length 7 pages

Fee None

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UNIVERSITY OF WASHINGTON
Final Report of the Task Force
To Review and Update the Planned Renovation of the Health Sciences
(October 1989)

Description The report reviews a 1975 plan for a 32-year cycle of renovation of the health sciences complex. One major finding was the recommendation that all new structures be designed for ease of renovation.

General Scope identifies factors considered in developing a new sequence and scope of work for renovation: changes in design requirements for labs, changes in the "culture" of research activity (e.g., large projects dominating the research environment require major architectural changes to provide blocks of contiguous labs and support space), changes in codes, identification of asbestos as major health hazard, rate of growth of new and expanding programs, and length of renovation cycle (32 years).

Planning Principles summarizes lessons learned from architectural and mechanical renovations since 1975, including: Evacuate entire wing floor during renovation. Involve a representative from occupying department. Establish "generic module" approach to design for labs and offices. Relocate specialized facilities, e.g., morgue and animal care, to new space, not surge space. Make the planning process consistent, dynamic, and focused on the near term. Design HVAC system to meet worst-case conditions. Accelerate renovation process to follow rate of change of research. Use surge space for temporary relocation during renovation rather than relocating programs to new space.

Planning Methodology describes a quantitative process for rating major systems of each wing and establishing a cost estimate for each item (e.g., HVAC, plumbing, electrical services, compliance with health and safety codes, asbestos removal, security, communications, circulation, architecture). The report describes existing conditions and major deficiencies of the entire health sciences complex and of individual wings. It identifies renovations and repairs needed for elevators, plumbing, fume hoods, electrical systems, architecture, PCB removal, solid waste management, loading docks and circulation, security, food services, and voice/data systems.

Length 23 pages

Fee None

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UNIVERSITY OF WASHINGTON HEALTH SCIENCES CENTER
Space Utilization Information System
(1984)

Description The paper describes the development of a space utilization information system (SUIS) that provides automatically updated space utilization information for schools, research centers, and administration of the University of Washington Health Sciences Center. SUIS was developed to determine current space utilization and to provide reliable data to plan functional renovations and new construction. The system does not attempt to set utilization standards, but rather provides a method for the gathering, tracking, and analysis of data.

The authors discuss why they felt traditional approaches to needs analysis and space utilization were inadequate given the changing conditions found in today's academic institutions: "We needed to develop a dynamic system that would use a steady stream of current data to analyze space utilization and would be capable of forecasting trends to help plan major capital expansions."

Creators of SUIS developed a hybrid relational database drawing on existing space, personnel, and financial databases. The social security number of faculty and staff links elements of the system, which establishes space utilization profiles for each faculty member, academic unit, and school.

The system presently requires monthly updating by the users; creators have plans for automatic updating. Developed on a DEC System 10 using 1022 Data Base Management System, the system currently runs on VAX 8600 in 1032.

Length 3 pages

Fee None

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MCMASTER UNIVERSITY FACULTY OF HEALTH SCIENCES
Description of Space Utilization Procedures
(January 1990)

Description A letter from the administrator for research programmes, and attached appendices, outline space utilization procedures at McMaster University Faculty of Health Sciences. The Faculty (i.e., school) owns all space, and a space committee is chaired by the vice-president, Faculty of Health Sciences. It assigns offices to departments or major programs to be allocated at their discretion. The associate dean for research assigns research space. The director of the research programs arranges individual researchers within that block of space.

An annual wet lab inventory, more detailed than the routine inventory of other types of space, counts people and the space they actually occupy and compares it to a formula that calculates space requirements. Summaries completed for each research program or group show space deficit or excess, total people in an area, annual grant support, and utilization of space per square foot. The summaries are used in determining whether the associate dean for research can or should provide additional space to specific researchers. Sample summaries are included in the document's appendices.

Length 8 pages

Fee Depending on request--minimal

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UNIVERSITY OF TORONTO
 Bridging the Gap Between Space Standards and Space Allocation
 (July 1986)

Description This paper, presented at a conference sponsored by The Society for College and University Planning, describes a university-wide methodology to help facilities planners adapt and expand on state space standards to make them site-specific and to tailor them to individual department use. The methodology is intended for use at the departmental level, for construction and renovation planning, and as a guideline for reallocation.

The paper reviews what the authors call the basic elements of an allocation/reallocation program: (1) a space inventory; (2) space standards (state or institutional averages of space allocations), which by their generalized nature may not be appropriate to specific functions or departments; and (3) institutional space policies, which frequently do not correspond to the space standards.

The authors suggest the following steps for reconciling institutional policies and requirements with space standards: (1) Identify a space standard for each category of space (e.g., classroom). (2) Review appropriateness of assumptions on which standard is based in terms of institutional policy, the department being reviewed, and constraints of existing facilities. (3) Determine uniqueness of department with respect to space type. (4) Review institutional policies affecting use of this type of space. (5) Collect required data (this methodology uses LOTUS spreadsheet). (6) Analyze data. (7) Prepare departmental program worksheet to compare analyzed data to standards.

The paper concludes with a more detailed list of steps for applying the methodology to each of the following categories of space: classrooms, teaching laboratories, research laboratories, offices, libraries, and general departmental space.

Length 27 pages

Fee For special mailing or courier only

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UNIVERSITY OF TORONTO
Space Analysis and Allocation: A Manual
(June 1988 draft)

Description This university-wide manual presents allocation guidelines and standards and acquaints those involved in space planning with the kinds of data that must be collected to carry out an analysis. The offices of the assistant vice-president for planning and space management use the data to determine current and planned rates of utilization in a proposed space program.

Section 1, *The Planning Process*, identifies the areas of responsibility various administrative groups have in the planning process. Section 2, *The Council of Ontario Universities (COU) Space Classification Scheme and Space Guidelines*, includes a history, statement of purposes, and description of the space standards used by postsecondary institutions in the province. The COU standards identify a classification scheme, a formula for space allocation, and a list of averages and assumptions on which the formula is based for each of the following categories of space: classrooms, undergraduate laboratories, research laboratories, offices, and general office support space.

Section 3, *University Standards and Guidelines*, discusses local interpretation of or modifications to the COU standards.

Section 4, *Reviewing Departmental Space Allocation*, includes detailed descriptions of data required for an analysis of a department's space allocation requirements. For each category of space, the manual describes three types of data required to analyze space need: (1) description of current facilities (space inventory and floor plans); (2) "hard data"--i.e., data that can be measured and manipulated and that may be held on institutional databases (e.g., for classrooms--number of course sections, number of enrollees, day and time, etc.). A spreadsheet format for recording hard data is included; and (3) "soft data"--i.e., data that cannot be quantified but that affects the utilization of space and may represent a situation that is unique and special to the department (e.g., for classrooms--description of unscheduled hours, proposed academic changes affecting classroom use, etc.).

Length 30 pages

Fee For special mailing or courier only

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Appendix B

Glossary

Definitions for Space Management and Planning

Academic Direction	Mapping the future to assist in the realization of institutional goals and utilization of organizational strengths.
Academic Planning	The development of research and instructional priorities by faculty. The faculty design the curriculum, originate research, apply to granting agencies for research funding, and supervise activity in this capacity. They are charged with developing plans for programs based on estimates of funding levels, enrollment patterns, community needs, and faculty research interests.
Access	A way or means of approach to provide physical entrance to a property.
Addition	Any construction that increases the size of a building, such as a porch, attached garage or carport, or a new room or wing.
Aesthetic Zoning	The regulation of building or site design to achieve a desirable appearance.
Alteration	A construction or remodeling project (or portion of a project) comprising revisions within or to prescribed elements of an existing structure, as distinct from additions of an existing structure.
Amenity	Aesthetic or other attractive characteristics of a development that increase its desirability to a community or its marketability. Differs from development to development but may include such things as a unified building design, recreational facilities, food service, parking, security systems, views, landscaping and/or tree preservation, and attractive site design.
Architect	Designation reserved, usually by law, for a person or organization professionally qualified and duly licensed to perform architectural services, including but not limited to analysis of project requirements, creation and development of the project design, preparation of drawings, specifications

	and bidding requirements, and general administration of the construction contract.
Architect's Punch List	A list of requirements in a construction/remodeling project which are verified upon project completion.
Architectural Scale	A graphic display of the relationship between areas on a map and actual areas.
As Built Drawings	Construction drawings revised to show significant changes made during the construction process, usually based on marked-up prints, drawings, and other data furnished by the contractor to the architect.
Assessment	Analysis of academic programs and related institutional support needs with regard to the capacity of the site or buildings to provide adequately for those needs.
Assignable Square Footage (ASF)	The sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant, including every type of space functionally usable by an occupant (except custodial, circulation, mechanical areas). Computed by measuring from the inside finish of permanent outer building walls to the office side of corridors and/or permanent partitions.
Auxiliary Enterprises	An entity that exists to furnish goods or services to students, faculty, or staff and that charges a fee directly related to, although not necessarily equal to, the cost of the good or services. Managed as essentially self-supporting activities. The general public may be served incidentally by auxiliary enterprises. Hospitals, although they may serve students, faculty, or staff, are separately classified.
Axonometric	A two-dimensional drawing showing plan and partial elevations on the same drawing. The plan is rotated from the picture plane and lines are projected vertically from the plan to form elevations.

Base Map	A map having sufficient points of reference, such as state, county or municipal boundary lines, streets, easements and other selected physical features, to allow the plotting of other data.
Bid	A complete and properly signed proposal to do the work described in the bidding documents for the amount stipulated.
Bidding Documents	The advertisement of Invitation to Bid, Instructions to Bidders, the bid form, other sample bidding and contract forms, and the proposed contract documents including any agenda prior to receipt of bids.
Budget	A financial plan for allocating financial resources within a specified period of time (usually one year). Some examples of budget formats are Line Item, Performance, Programming Budgeting System (PBS), Lump Sum, Zero Base, and Incremental.
Budget, Construction	The sum established by the owner as available for construction of the project, including contingencies for bidding and for changes during construction, supervision and inspection fees.
Budget, Project	The sum established by the owner as available for the entire project, including construction budget, land costs, equipment costs, financing costs, compensation for professional services, costs of owner-furnished goods (furniture, equipment, phones) and services (telecommunications), contingency allowance and other similar established or estimated costs (e.g., costs for moving).
Buffer Zone	A strip of land established to protect one type of land use from another.
Buildable Area	The space remaining on a site or lot after the minimum open-space requirements (coverage, yards, setbacks) have been met.
Building	A structure, of more or less permanent construction, having a roof and intended to be used for sheltering people, animals, property, or activities.

Building Coverage

The amount of land covered or permitted to be covered by a building, usually measured in terms of percentage of a lot. The horizontal area measured within the outside of the exterior walls of the ground floor of all buildings on a lot.

Building Height

The vertical distance of a building measured from the average elevation of the finished grade within 20 feet of the structure to the highest point of the roof.

Building Space Plan

A plan that describes the maximization of structural utilization potential to function.

Building Systems Capacity Analysis

Assessment of each building's ability to accommodate current and/or proposed functions.

Building/Systems Obsolescence Plan

Cost-to-benefit analysis of the usable life span of buildings; a match of the building/systems capacity and condition to program direction to determine the cost benefit of continued utilization.

Bulk Envelope

The three-dimensional space within which a structure is planned to be built and which is defined with respect to such measure as height, yards, building coverage, floor area ratio, bulk plane, and land use intensity.

Campus Environment and Amenities

Fitness, relaxation, entertainment, training, food, child care, and merchant services for campus communities.

Campus Logistics

Linkage systems required by programs to move people, materials, and information in an effective manner.

Capital Improvement

An acquisition of real property, a major construction project, or the purchase of a long-lasting, expensive piece of equipment.

Capital Improvement Planning

The formulation of campus space programs, usually developed within the framework set by the Long-Range Development Plan and implemented through the formal Capital Improvement program.

Capital Improvement Program (CIP) Budget	The portion of the campus's budgeted expenditures that accounts for the physical development of the campus.
Capital Improvement Program Schedule	A proposed timetable of all future capital improvements to be carried out during a specific period and listed in order of priority, together with cost estimates and the anticipated sources of financing.
Churn Rate	The rate of physical change within an organization, usually stated annually as a percentage (e.g., a 20 percent churn rate means that 20 percent of a unit's work stations are changed, whether space is modified or occupants moved, each year).
Circulation	Systems, structures and physical improvements designed and operated for the movement of people, goods, water, air, sewage, or power by such means as streets, highways, railways, waterways, towers, airways, pipes, and conduits.
Cluster Development	Generally refers to a development pattern--for residential, commercial, industrial, institutional, or combination of such uses--in which the uses are grouped or "clustered" through a density transfer, rather than spread evenly throughout a parcel.
Codes	Governmental regulations, ordinances, or statutory requirements relating to building construction and occupancy, adopted and administered for the protection of the public health, safety, and welfare.
Communications	Inter- and intra-campus electronic data and telecommunications applications.
Complicated Space	Buildings that require sophisticated support and control systems to accommodate high-capacity electrical, HVAC, and plumbing demands (i.e., wet laboratories and patient care facilities).
Construction Cost	The total cost to the owner of all elements of the project designed or specified by the architect, including (at current market rates with a reason-

able allowance for overhead and profit) the cost of labor and materials furnished by the owner and any equipment that has been designed, specified, selected, or specially provided for by the architect; but not including the compensation of the architect and the architect's consultants, the cost of land, rights-of-way, or other costs, which are the responsibility of the owner.

Construction Documents

Drawings and specifications setting forth in detail the requirements for the construction of the project.

Contiguous

Next to, abutting, or touching and having a boundary in common.

Contingencies

Deposits against uncertainty. Project reserves.

Contract Documents

Instructions and requirements of designer and contractor when a project is put out to bid. Typical items contained in the contract documents include: the contract for work, working drawings and specifications (if applicable), and the campus's design standards; the owner-contractor agreement, the conditions of the contract (general, supplementary and other conditions), the drawings, the specifications, and all addenda issued prior to and all modifications issued after execution of the contract; and any other items that may be specifically stipulated as being included in the contract documents.

Conventional Energy System

Any energy system, including supply elements, furnaces, burners, tanks, boilers, related controls, and energy distribution components, which uses any source(s) of energy other than solar energy.

Conversion of Space

Changing the original purpose of a building or major segment thereof.

Cost-Benefit Analysis

An analytic method whereby the actual and hidden costs of a proposed project are measured against the benefits to be received from the project. The application of any one of several techniques, mostly quantitative, for comparing the ratios of total estimated dollar costs for alternative projects or plans and compared to the

	total estimated dollar value of the benefits to be derived.
Cost-Effectiveness	The application of any one of several techniques, mostly quantitative, for comparing the ratios of estimated change in the level of performance in one or more areas. Unlike the cost-benefit analysis, effectiveness measures will usually be non-monetary.
Critical Path Method (CPM)	Charting of events and operations to be encountered in completing a given process; rendered in a form permitting determination of the relative significance of each event, and establishing the optimum sequence and duration of operations and events.
Cumulative Impacts	Two or more individual effects that, when considered together, are considerable or that compound or increase other impacts. The individual effects may be changes resulting from a single project or a number of separate projects. The cumulative impact from several projects is the change that results from the incremental impact of the project when added to other closely related past, present, and foreseeable future projects. Cumulative impacts can result from individually minor but collectively significant projects taken over a period of time.
Deferred Maintenance Project	Maintenance projects that were not included in the maintenance process because of a perceived lower-priority status than those funded within available funding. Deferred maintenance comprises two categories of unfunded maintenance: first, the lack of which does not cause the facility to deteriorate further and, second, the lack of which does result in a progressive deterioration of the facility for the current function.
Density	The average number of families, persons, or housing units per unit of land. Usually expressed "per acre."
Design Development	Project phase that follows preliminary planning, schematic and preliminary designs, in accordance with the facilities program. During this phase, the architect prepares routine specifications,

graphics, and the estimated project construction cost.

Design Development Documents Drawings and other documents that fix and describe the size and character of the entire project as to architectural, structural, mechanical and electrical systems, materials, and such other elements as may be appropriate.

Design Standards Criteria and procedures for design and construction of campus facilities. The scope of the standards encompasses general and technical performance criteria, systems and equipment specifications, list of acceptable manufacturers, standard design and construction procedures, standard detail drawings, design data, and campus maps.

Domino Projects A set of projects, associated with a major project, that must be completed before the construction of the major project can commence.

Drawings Graphic and pictorial documents showing the design, location and dimensions of the elements of a project. Drawings generally include plans, elevations, sections, details, schedules, and diagrams.

Elevation Two-dimensional graphic representation of the design, location, and dimensions of the project, or parts thereof, seen in a vertical plane viewed from a given direction.

Engineering News Report (ENR) A measure of future construction costs that adjusts current costs according to anticipated labor and material price fluctuations. The ENR is a construction industry standard based upon expected increases or decreases in costs due to inflation or deflation.

Environment The existing physical conditions that will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, and objects of historic or aesthetic significance.

Environmental Impact Report A document that assesses the effects on the surrounding environment of a construction project.

	Sections may include results of studies of air and water quality, topography (drainage), toxicological effects of hazardous materials, traffic, and biological impact.
Equipment Price Index (EPI)	A statistic based on industry pricing history and anticipated price changes. For budgeting purposes, the EPI is used for estimating future costs of equipment.
Externalities	Also called secondary impacts, side effects, or spillovers. The consequences of an action other than the direct targets or beneficiaries. Externalities may be desirable, undesirable, or some of both; they may be intended or unintended; they may be political, social, environmental, physical, or fiscal.
Facilities Management	Administrative and operational activities designed to maintain campus infrastructure, buildings, and service levels.
Facility Programming	The translation of academic program requirements into a written description of architectural design requirements.
Feasibility Study	A detailed investigation and analysis conducted to determine the financial, economic, technical, or other advisability of a proposed project.
Financial Management	Relatively short-duration economic decision-making.
Financial Planning	Projection of revenue estimates and expenditure trends correlated to meet capital and operational needs on a scheduled basis.
Finding	A determination or conclusion based on the evidence presented in support of a decision. A requirement to produce findings of fact is often found in due process rules of state legislation.
Fiscal Year	A designated 12-month period within which an annual accounting and budgeting cycle of an organization is begun and ended (usually July 1 to June 30).

Floor Area Ratio (FAR)	The ratio of floor area permitted on a zoning lot to the size of the lot.
Floor Area, Gross	The sum of the floor areas included within the outside faces of exterior walls for all stories, or areas, that have floor surfaces. It is computed by measuring from the outside face of exterior walls, disregarding cornices, pilasters, buttresses, etc., which extend beyond the face.
Forecasts	Estimates of future conditions.
Full-time Equivalent	FTE (employee) weighted by the percent of time actually employed--a percentage of 100.
Goal	A state which the administration desires to realize through management.
Hazardous Materials	Includes, but not limited to, inorganic mineral acids of sulfur, fluorine, chlorine, nitrogen, chromium, phosphorus, selenium and arsenic and their common salts; lead, nickel and mercury and their inorganic salts or metallo-organic derivatives; coal, tar acids such as phenol and cresols and their salts; and all radioactive materials.
Headcount	Headcount is used when referring to the number of individuals regardless of their percentage of time committed.
Health-Care Facility	A facility or institution, whether public or private, principally engaged in providing services for health maintenance, diagnosis or treatment of human disease, pain, injury, deformity or physical condition.
HEGIS	The Higher Education General Information Survey (HEGIS). Formerly an annual survey of college and university statistical data conducted by the U.S. Office of Education, National Center for Education Statistics. The HEGIS categories still provide the basis for most institutions' space inventory.
Impact Analysis	The process of evaluating a proposal's expected impact on its surroundings. Major federal or

federally-funded activities are required to go through an environmental impact statement (EIS) process before they can proceed; a number of states have enacted similar requirements. Their purpose is to make known to decision makers what is likely to happen if the project goes ahead as a way of helping them arrive at an informed decision.

Infrastructure

The permanent structural, logistical and utility delivery systems needed to sustain the base operational activities of an organization.

Intensity, Site

The degree to which land is used. Although frequently used synonymously with density, intensity has a somewhat broader, though less clear meaning, referring to levels of concentration or activity in uses such as residential, commercial, industrial, recreation, or parking.

Intensity Ratio

Intensity of use refers to quantity and type of complex building systems per square foot, including mechanical systems (HVAC, fume hoods) and utilities (piped services, electricity).

Long-Range Development Plan

A document providing guidelines for the physical development of the campus in accord with its academic goals, policies, and siting priorities. The LRDP identifies strategies for ameliorating existing programmatic deficiencies through facilities development, as well as for upgrading the overall operational efficiency of the campus infrastructure. The plan provides recommendations for site development, beautification projects, parking and transportation, classroom and instructional support, research support, material handling, and community relations.

Long-Range Planning

Planning that is known or intended to exceed a one-year realization period. Long-range planning usually covers a 5- to 10-year project plan.

Low Bid

Bid stating the lowest price for performance of the work, including selected alternates, conforming with the bidding documents.

Major Capital Project	Projects with budget exceeding a certain level, generally above \$200,000.
Microzoning	Very detailed zoning for small areas.
Minor Capital Project	Projects with budgets less than a certain level, generally less than \$200,000.
Mission	An enduring goal that an organization or unit has as its primary reason to exist.
Mitigation	An action taken in response to potential environmental impact, including avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the impact environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; compensating for the impact by replacing or providing substitute resources or environments.
Module	A repetitive dimensional or functional unit used in planning, recording, or constructing buildings or other structures.
Negative Declaration	A formal statement that a project has no negative or harmful environmental impacts that would merit further study.
Net Area	The sum of all areas available for use in a building. Includes institutional uses (assigned space), circulation, mechanical and custodial areas.
Noncomplicated Space	Space that is not designed for intensive research use.
Normal Maintenance	A systematic day-to-day process to control the deterioration of the college or university plant facilities, e.g., structures, systems, equipment, pavement, grounds.

Opportunity Planning	Advance formulation of programs and preliminary designs to take immediate advantage of funding opportunities as they arise.
Outline Specifications	An abbreviated listing of specification requirements normally included with schematic or design development documents.
Performance Standards	A minimum requirement of maximum allowable limit on the effects or characteristics of a use, usually written in the form of regulatory language.
Pipeline	The time elapsed from the initial planning decision to the final expenditure of project resources.
Planning	A continuous process whereby managers think, make decisions, and set objectives with regard to goals for the future and evaluate courses of action to achieve objectives.
Planning Cycle	A predetermined regular sequence of planning activities which is repeated, normally on annual basis. Usually precedes the budget cycle.
Plant Operations and Maintenance	Activities performed for administration, supervision, operation, maintenance, preservation, and protection of the institution's physical plant.
Plant Renewal	Expenditures over and above normal maintenance, for items with a life cycle in excess of one year that are not normally contained in the annual operating budget.
Preliminary Drawings	Drawings prepared during the early stages of the design of a project.
Preliminary Planning	Preliminary planning includes the translation of design requirements set forth during the facilities programming phase into actual field verified drawings.
Problem	In the context of the planning process, a problem is any present or future condition or situation

that is unacceptable or that offers an opportunity for change or improvement and that is susceptible to planned action.

Program Direction

The overall evaluation and related description of the institution's desired program mix.

Program Evaluation and Review Technique (PERT)

PERT defines a project in terms of a network of interdependent events and activities. These are shown diagrammatically in a flow chart. CPM, or Critical Path Method, is an added technique by which the "shortest" path through a PERT flow chart can be determined. All "events" that fall along the "Critical Path" become important milestones for a project.

Program Planning

The determination of priorities in the allocation of resources to achieve the educational, research, and public service goals of the institution.

Program Statement

Describes the use of a proposed facility. Can be thought of as a justification document, the general object of which is to convince the reader that the proposed facility is the result of a thorough analysis of the specific requirements of the program to be housed in the facility. Identifies the sizes and types of spaces necessary to house the program.

Project Backlog List

A list prepared annually including all known unmet and unfunded capital projects needs.

Project Costs

Include all design and construction, fees, asbestos removal or other rehab (as required), built-in equipment and administrative costs, together with other costs such as furniture, telephones, moving.

Project Engineer

The engineer designated to be responsible for the design and management of specific engineering portions of a project.

Project Manager

The individual designated by the principal-in-charge to manage the institution's services related to a given project. The project manager has the primary responsibility for a capital project through design, construction, and activation.

Projections	Estimates of conditions in the future, based upon an analysis of and extrapolation from past experience (i.e., projecting present trends into the future).
Public Agency	Includes any state agency, board or commission, any county, city and county, city, regional agency, public district, redevelopment agency, or other political subdivision.
Quantitative Measure	A measure that can be given a meaningful numerical value.
Relocation Planning	A set of activities that occurs during the facilities programming phase and is aimed at accommodating the needs of displaced staff and activities.
Rendering	A drawing of a project or portion thereof with an artistic delineation of materials, shades, and shadows.
Renewal and Replacement Maintenance Program	A systematic management process to plan and budget for known future repair and replacement requirements that extend the life and retain the usable condition of campus facilities and systems and that are not normally contained in the annual operating budget. Such requirements include major items that have a maintenance cycle in excess of one year, e.g., replacing roofs, painting buildings, resurfacing roads, replacing equipment (boilers, chillers, transformers, etc.).
Research Space	Space categorized as research houses activities specifically organized to produce research outcomes, whether commissioned by an agency external to the institution or separately budgeted by an organizational unit within the institution. It includes space for individual and/or project research as well as those of institutes and research centers.
Resource Acquisition Plan	Analysis of financial resources required to meet space plan needs, i.e., analysis of the available and forecasted financial and space resources required, overlaid on space plan needs.

Schematic Design Phase

The phase of project development in which the architect consults with the owner to establish the project scope and to ascertain the design limitations of the project. Schematic design studies consist of drawings and other documents illustrating the scale and relationship of the project components and a statement of estimated construction cost based on current area, volume, or other acceptable unit cost.

Scope Statement

A detailed description of the scope of work required for the project.

Section

A drawing of a surface revealed by an imaginary plane cut through the project, or portion thereof, in such a manner as to show the composition of the surface as it would appear if the part intervening between the cut plane and the eye of the observer were removed.

Short-Range Planning

Planning associated with goals that seek accomplishments within one year or less.

Site

A plot of land intended or suitable for development; also the ground or area on which a building(s) has been built or other facilities developed.

Site Analysis Services

Those services described in the schedule of designated services necessary to establish site-related limitations and requirements for the project.

Site Capacity Plan

The height, bulk and designated land-use footprint of the campus.

Space Conversion Plan

Schedule of actions required to meet space plan objectives.

Space Data Baseline

Actual space utilization data.

Space Factor

A combination of measures (e.g., space standards and utilization standards) that provide for assignable square feet per weekly student contact hour or full-time equivalent. A space/estimate guide used to calculate aggregate space needs.

Space Inventory	Data on location (building and room), occupant, room type, room function, area (square footage), and other space characteristics.
Space Planning	Planning the allocation and design of space to allow organizations to maximize space utilization efficiency.
Space Planning Guidelines	A model, often computer-based, used to evaluate the institution's need for space based upon its past and predicted ability to garner funds, FTE, and students.
Space Standard	Applied to academic space, can be defined as the number of assignable square feet per student or faculty station or other unit.
Specifications	Detailed instructions that designate the quality and quantity of materials and workmanship expected in the construction of a structure.
Strategic Planning	Planning that deals with problems and issues having major long-range effects upon an organization and/or changes in academic direction that are considered by top management to be worth monitoring and theorizing about eventual outcomes.
Strategic Program Plan	How the institution plans to get where it wants to be.
Structure	Anything constructed or erected on the ground or anything that is attached to something located on the ground.
Survey	Can mean (1) boundary, topographic and/or utility mapping of a site; (2) measuring an existing building; (3) analyzing a building for use of space; (4) determining owner's requirement for a project; (5) investigating and reporting required data for a project.
Swing/Surge Space	Space reserved by an organization to temporarily house programs until permanent facilities can be made available. Could be used to house programs displaced as a result of remodeling their

assigned facilities or to house new programs while permanent space is prepared for occupancy.

System

The process of combining components and parts into single integrated units or continuums.

Unfinished/Shell Space

Rooms or areas that are constructed as unfinished space and that are not in use at the time but are programmed and designed for eventual completion.

Unscheduled Major Maintenance

Work requiring immediate action to restore service or remove anticipated problems that will interrupt necessary activities or services.

Use

The purpose or activity for which a piece of land or building is designed, or for which it is occupied.

Utility Survey

A survey showing existing site utilities.

Utilization Standard

Refers to the number of hours in a week that a particular facility, or a station in that facility, should be used. This can be based on weekly room hours, station use (such as a seat in a lecture hall or work areas in a laboratory), or a combination of the two.