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Patrick Joseph Keating

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DOCTOR OF PHILOSOPHY degree in Educational Administration

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MODELS FOR CAMPUS MASTER PLANNING AND FACILITY DEVELOPMENT: A COMPARATIVE CASE STUDY ANALYSIS OF FOUR PRIVATE RESEARCH UNIVERSITIES

BY

Patrick Joseph Keating

A DISSERTATION

Submitted to Michigan State University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Educational Administration

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ABSTRACT

MODELS FOR CAMPUS MASTER PLANNING AND FACILITY DEVELOPMENT: A COMPARATIVE CASE STUDY ANALYSIS OF FOUR PRIVATE RESEARCH UNIVERSITIES

BY

Patrick Joseph Keating

The development of campus facilities at colleges and universities across the country has a long and varied history. An integral part of this history has been the use of a master planning process to guide institutions in their future campus growth. The literature which describes this process is prescriptive in nature focusing on what a campus master plan should include rather than on how an institution might go about assuring that its plans are implemented once they have been created. The literature also reveals that many plans have failed during implementation or have been unable to survive the test of time or meet the changing needs of colleges and universities.

This research project undertook a comparative case study analysis of four private research universities with regard to their approach to implementing campus master plans for their future facility development. The investigation focused on a central question: can an institution that desires a sense of order and community among its facilities develop and implement a master plan in order to achieve this goal? In addressing this question the exploration had four purposes: to identify the key factors involved in implementing campus master plans, to determine how the four universities function with respect to those factors using a case analysis methodology, to draw inferences with respect to the success of these universities in their facility planning efforts, and to develop a model and/or principles that

institutions might follow in their approach to developing and implementing master plans in the future.

The research effort culminated in the development of two models. One model proposed a structure and process for campus master planning. The second model proposed organizational arrangements and a process for development of individual facilities within a context of an overall campus master plan. Together these two models provide a mechanism for an institution to successfully create and implement an overall facility plan. The process involves complex interrelationships among staff members and significant interaction among groups involved in the various steps of the process. The efforts on the part of the four institutions investigated to develop and implement such processes provide supporting evidence of the importance of an effective master planning and facility development process. The two proposed models outline the important relationships, responsibilities and necessary steps for such a processes and serve as a guide to institutions interested in developing effective mechanisms for campus master planning and facility development.

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A project of this scale is not accomplished without the assistance and support of many individuals. The encouragement and support that I received from my supervisors and colleagues at Carnegie Mellon University, Richard Cyert, Angel Jordan, Bill Elliott, Fred Rogers, Omer Akin and Norman Johnson was extremely helpful. The master planning responsibilities and challenges provided here helped spur my interest in this topic and gave me the incentive to "look for a better way" to implement campus master plans. Ted Nierenberg and Pat Crecine deserve special mention in this regard. Ted's questioning and constructive criticism regarding the implementation of Carnegie Mellon's plan and Pat's constant support gave purpose to this work.

The individuals at the institutions that were the subject of the case studies also provided significant support to this project. Marilyn McCoy, Jeremy Wilson, Gabor Zsolnay at Northwestern University, Bill Dickson and Bob Simha at MIT, Don Hess, Ron Paprocki, and Bill Daigneau at Rochester, and Bob Zemsky, Al Levy, Marna Whittington, and Susan Shaman at the University of Pennsylvania all were candid, open, generous with their time, provided access to key documents and were genuinely supportive of my investigation.

My doctoral committee was not only supportive but provided excellent guidance and offered important suggestions and advice. Fred Whims, the chair of the committee combined analysis with constructive criticism that resulted in improved quality of my work. His encouragement was important to me. Jim Rainey, who has advised me over a span of eight years during my coursework, exams and this research project asked probing questions that helped clarify the methodology and my own thinking. Cass Book's research expertise and willingness to review early drafts of the chapters was a tremendous advantage to me. Cass's questions and suggestions also helped to strengthen this work. Marylee

Davis' interest and experience in the area of capital planning processes helped to keep this effort focused and on track.

Two other individuals played an important role in this effort. Ted Fenton's constant prodding and encouragement were helpful but he also provided editorial advice for which I am extremely grateful. Words can't really express how much this meant to me. To Ted I owe a great debt. I also wish to thank Margie Rennick who assisted in typing this dissertation.

Last but most important my family deserves much credit for putting up with me during this period and supporting this effort. My two boys Jeff and David who at young ages include dissertation in their vocabulary always seemed to understand that dad was working on his project. My mother-in-law, Mary Lutostanski's support during the final weeks of this effort was the critical difference in terms of finishing this on time. My wife Rose supported me throughout the eight years that this endeavor took and in the last two years did so even though her own burdens were far more important than this. She also provided suggestions for the two models that put me "over the top" in terms of clarifying my findings and recommendations. Rose's sacrifices along with those of Mary and the boys allowed me to achieve a personal goal and for that I dedicate this work to them.

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Chapter 1

Summary/Purpose of the Study

The development of campus facilities at colleges and universities across the country has a long and varied history. An integral part of this history has been the use of a master planning process to guide institutions in their future campus growth. Such plans generally include suggestions for the location of facilities, building types, building sizes, circulation patterns, landscaping, and in some cases even design standards. The literature which describes this process is prescriptive in nature focusing on what a campus master plan should include rather than on how an institution might go about assuring that its plans are implemented once they have been created. Also evident in the literature is the fact that many plans have failed during implementation or have been unable to survive the test of time or meet the changing needs of colleges and universities.

This research project entails a comparative analysis of four universities with regard to their approach to implementing campus master plans for their future facility development. The investigation focused on a central question: can a master planning process in the contemporary college and university environment successfully bring order and a sense of community among buildings on a campus? In addressing this question the exploration had four purposes: to identify the key factors involved in implementing campus master plans, to determine how the four universities function with respect to those factors using a case analysis methodology, to draw inferences with respect to the success of these universities in their facility planning efforts, and to develop a model and/or principles that institutions might follow in their approach to developing facilities in the future.

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Definition of Campus Master Planning

Master planning is a widely used term that has a number of different meanings, the most basic and general being an overall guide to future development of an organization or set of programs. State governments, state higher education coordinating boards and individual institutions have all used the term "master plan" to refer to the overall long term program plan for their particular organization. This terminology also has been used to describe the overall long range facility plan for an organization. In the context of this study, master planning refers to the mechanism used to design the future physical and architectural development of a campus. Master plans can vary greatly in terms of scope, time frame, and physical area. Plans of this type generally include a site plan or model of how the campus will look in the future based on certain programmatic assumptions adopted by the institution. In 1929, Charles Klauder provided the following description of what he termed development plans.

> Order, then, is the guiding star under which a development (facility) plan is desired, conceived and followed. That the group of buildings shall not be a motley jumble of structures so located as to be at odds with each other, displaying discordant styles, erected at haphazard sites, confusing to beholders and irritating to occupants, but rather that it should be homogeneous, clearly to be an apprehended scheme, in which there is a studied and happy balance of things, of buildings located with regard to their function, importance and architectural effects.[1]

Master planning goes beyond the simple description of an institution's future facility needs; it is also a process for translating goals and objectives into facilities. Any process must be able to operate in a changing environment. Warren R. Kark describes the process as "charting a future course which is sympathetic to the past and present. Recognizing the evolution of the University campus and understanding the relationship between its current mission and the function and dysfunction of the physical plant represent the starting point for this undertaking".[2]

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Master planning as it has been applied within colleges and universities is a process for establishing the relationship between educational philosophy and goals and the long term, comprehensive development of the campus facilities and its environs. The master planning process is the focus of this study.

The Planning Problem -- Master Plan Implementation/Effectiveness

The process of master planning within American higher education has had a cyclical history. The University of Virginia, utilizing the plan created by Thomas Jefferson in the early 1800s, is generally credited with the first real campus plan. Portions of campus plans existed prior to this one among the colonial colleges at Harvard (the Yard), at Yale (the Row), and at William and Mary, but Jefferson's design at Virginia was the first full scale plan. Immediately thereafter campus planning came into its heyday and lasted until the mid-twentieth century. Many examples exist of excellent plans that resulted in equally fine facilities that make up what campus planners generally consider the best college and university campuses today. In addition to Virginia, they include Princeton, Union, Chicago, Rice, Stanford, and Berkeley, to name a few.

Campus planning was a serious effort across the various institutions of higher education. Klauder's "order" was a prime concern in the development of colleges and universities. Much of this interest in planning and orderly development was rooted in traditional or classical architecture stemming from the influence of the quadrangle concept found at Oxford and Cambridge. Various architectural styles fit beneath this umbrella and included Georgian, Gothic, and Beaux-arts type facilities. Planning as a discipline unto itself also became popular during this period, and in combination with traditional views toward architecture, formed a strong alliance for campus facility development.

The period from approximately 1940 to 1970 was a low point for campus master planning. Modernistic styles became a force within the field of architecture and classical or

traditional design concepts were rejected. Buildings were entities unto themselves and the relationship between facilities and the concern for order became unimportant. Higher education also experienced tremendous growth and change during this period. Master planning became outmoded as a useful tool for guiding the development of facilities and in fact was rejected on many campuses. Paul Turner summarized the prevailing attitude regarding campus planning at this time as a concern for the process of planning more than for the final form of a master plan.[3] Sarah Williams summarized this period of campus planning and the architecture that resulted as a low point for higher education.[4]

Campus officials of the 1970s and 80s emerged from this period with a new interest in campus master planning. Many institutions have revised or developed new campus plans. Both Turner and Williams attribute this revised interest in campus planning to the preservation movement, which views tradition and history as something to protect rather than replace.[5]

The central question, however, still remains: can an institution which desires a greater sense of place and order -- a community of buildings -- develop and implement a master plan to achieve these objectives? Is there a process of campus planning that will allow institutions to change in a programmatically positive and advantageous way, but still respect the longer term vision of campus development? Clearly the lessons from the past indicate that a static plan strictly adhered to is doomed to failure. A process for implementing such a plan is necessary and is therefore the focus of this research.

Potential Significance

The significance of such a study of institutions of higher education is considerable. As Williams pointed out and much institutional research supports, competition among institutions for students and faculty is increasing. Facilities and campus environments are becoming an increasingly important factor in student enrollments and faculty hiring. In

addition, there is widespread dissatisfaction with the results of campus planning and campus architecture of the last 30 to 40 years which has put renewed emphasis on order and a comprehensive view of campus development.[6] Reminders of these failures, present in buildings that still exist, will not go away. A process or model of a campus planning process can at least provide an institution with the potential for avoiding a repetition of the mistakes of the past. It may also provide the ability to achieve a campus whose facilities succeed in creating a sense of place and order. The ultimate goal of this research is to develop a model showing how campuses might approach their future as it relates to the process of campus facility planning.

Prior Research

Very little research exists on the processes for implementing campus master plans at colleges and universities. Most of the literature is descriptive in nature and traces the process of developing master plans from the perspective of what should be included in such plans. There are three major works in this field.

Charles Z. Klauder [7] and Richard P. Dober [8] wrote the two most significant works in the area of campus planning. Both works concentrate on developing a guide to planners in the creation and development of their plans. Neither looks at the situations or challenges faced by institutions in implementing such plans.

Paul V. Turner [9] wrote a significant descriptive work about the factors that have influenced campus planning and development in this country. It is a complete treatise on the "state of facility planning" and describes in a comprehensive way the volatile nature and history of campus planning. It does not, however, attempt to prescribe any type of process or model for campus planning.

A more detailed review of the literature reveals a number of descriptions of individual campus planning processes. These include articles describing campus planning

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at Virginia Polytechnic Institute[10], the University of Michigan[11], and the University of Chicago[12]. All are descriptive in nature, but they do focus on implementation strategies for these individual campuses. None attempts a serious research approach to this topic, and none prescribes any type of model campus planning process.

The Oregon Experiment [13] does describe a process of organic, incremental growth for the University of Oregon. The basis for this recommended process comes from the authors' experience as architects and their work on the University of Oregon campus. They reject the accepted tenets of master planning and propose a participatory and evolutionary process for facility development as its replacement. While not the outgrowth of a research effort, the evolutionary process they recommend may be useful in understanding the critical variables required to implement a planning process. This work is now fifteen years old and grew out of a climate at the University of Oregon where campus master planning had not been historically successful. Overall assessment of the success of the Oregon Experiment is difficult since an important aspect of the process, reliable and regular funding for smaller campus projects, was not adopted.[14] That may explain why it has not served in any significant way as a model for other institutions.

Morley prescribed a systems approach to master planning for elementary/secondary school facilities. This systems approach detailed the necessary steps an organization should follow in developing and implementing a plan for a specific building project but did not focus on the process related to a group of facilities.[15]

Given the paucity of research on this topic within the fields of higher education and architecture, the literature in the area of urban planning was reviewed. The primary value of this review was to determine how cities have dealt with the problem of implementing master plans to achieve order and a sense of community among buildings, and to identify the critical variables present in the urban planning processes that may be applicable or transferable to higher education.

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Methodology

The general methodological approach of this research study involved the selection of four universities to be the subject of detailed exploratory and descriptive case analyses. Each case analysis focused on the process by which campus master plans were implemented. Conclusions were identified regarding the degree to which each institution successfully implemented its plan or developed a campus planning process. Comparisons across cases were made in order to develop an overall model or guide for institutions interested in implementing their plans.

The 27 private institutions that are members of American Association of Universities served as the population set for this investigation. These institutions form a like set of organizations where the environments, institutional histories, and programs provide both a challenge and an opportunity for campus master planning processes. A number of criteria were utilized to select the institutions for the case studies. These criteria include the nature of the facility master planning process, institutional organization, the physical setting of the campus, and willingness of the institution to participate in a study of this type. An initial investigation was undertaken to determine the set of possible institutions that met these criteria to yield a set of four universities for use in the case studies.

An inquiry structure was designed to serve as the basis for the case analyses. The inquiry structure identified the critical variables relevant to implementing a campus master planning process. Some examples of potential critical variables are the institutional organization for facility planning and development, the type of master plan in use, the process of program review, the capital or facility decision-making process (both budgeting and project implementation), the process of selecting an architect, and the existence of architectural design standards or codes. A detailed interview guide was developed based

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on the inquiry structure. The interview guide served as the basis for collecting and analyzing information.

Data were collected by analyzing information relevant to the inquiry structure from institutional documents and interviews of key institutional representatives. A contact person at each institution was identified to provide access to and assistance in interpreting documents, to arrange for interviews of key personnel, and to provide a critique of the case study.

The analyses took place at two levels. The individual case studies concentrated on how each institution performed with regard to the critical variables referenced above. Outcomes were analyzed across the set of institutions, and conclusions drawn concerning the effectiveness of these approaches for each of the critical variables. Based upon this research, two models were developed to serve as a guide to implementing a master planning process. This analytical approach is based upon the methodology used by Nick E. Poulton in his dissertation that investigated the impact of institutional academic planning activities at five public and private research universities. That study did not focus on facility planning processes at those institutions.[16]

Organization of the Study

Chapter 1 includes a statement of purpose and a summary of the research proposal. Chapter 2 contains a review of the literature about the history of campus and urban planning. The review focused on the evolution of these processes and presents a detailed description of the problem that has resulted from the failure of campus master planning since the late 1940s. In light of this background, Chapter 3 identifies the critical variables that form the basis of the inquiry structure, and describes the case study approach, the mechanism for choosing the set of four universities, the techniques for collecting data, and the manner by which these data are were analyzed within the case analysis framework.

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Chapters 4 through 7 present the analysis of the campus planning process of each institutional case. A comparative analysis and a set of conclusions relevant to each of the inquiry structure variables identified in Chapter 2, are presented in Chapter 8. Chapter 9 presents two models; one for campus master planning, and a second model regarding facility development processes. Areas of potential future research are also presented in Chapter 9.

[1] Klauder, Charles Z. and Wise, Herbert C., Collegiate Architecture in America (New York, Charles Scribner's Sons, 1929), p. 25.

[2] Warren R. Kark, "Incremental Master Planning: Concepts and Implementation at Virginia Tech," Planning for Higher Education 14:4 (1986), p. 20.

[3] Paul Venable Turner, Campus: An American Planning Tradition (Cambridge, Mass: The Architectural History Foundation/MIT Press, 1984), p. 260.

[4] Sarah Williams, "The Architecture of the Academy", Change, 17:2 (1985), pp. 15-16.

[5] Turner, op. cit., p. 301; Williams, op. cit., p. 16.

[6] Williams, op. cit., p. 16.

[7] Klauder, Charles Z. and Wise, Herbert C., College Architecture in America (New York, Charles Scribner's Sons, 1929)

[8] Richard P. Dober, Campus Planning (Cambridge, Mass: Reinhold Publishing Corporation, 1963)

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[12] Calvert W. Audrain, "The Ninth Quadrangle", Planning for Higher Education, 14: 2, (1985-86)

[13] C. Alexander, M. Silverstein, S. Angel, S. Ishikawa, D. Abrams, The Oregon Experiment (New York: Oxford University Press, 1975)

[14] J. Finrow, "The Built Results of Alexander's 'Oregon Experiment'", Architecture, (Februrary 1988), p. 73.

[15] Harvey Nelson Morley, A Comprehensive Systems Approach to Master Planning for Educational Facilities, (Ed.D. Dissertation, The University of Alabama, 1972)

[16] Nick E. Poulton, Impacts of Planning Activities in Research Universities: A Comparative Analysis of Five Institutional Experiences, (PH.D. Dissertation, The University of Michigan, Ann Arbor, 1979)

Chapter 2

The Nature of Campus Planning

Chapter 2 provides the historical background and literature review that support this investigation. This investigation focuses on a central question: can a master planning process in the contemporary college and university environment successfully bring order and a sense of community among buildings on a campus? The concept of campus master planning will be defined and a review of the major historical periods relating to master planning within colleges and universities will be presented. This review will also serve to identify major shortcomings in the development of campuses that master planners have dealt with in rather mixed ways.

This chapter will review the basic literature in the area of urban planning, since much of campus planning had its origins in this field. A detailed description of master plans and processes will be presented in order to provide the framework for the central investigation. The chapter will also present an overview of models for overall institutional planning processes. An understanding of such models will serve as the basis for the inquiry structure, the key variables, which will be the focus of this investigation. Chapter 3 will present this inquiry structure and the methodological approach to be used for the case studies.

Campus Master Planning, A Definition

The word "campus" has come to represent the physical nature and character of colleges and universities in the United States. It was originally used in the early eighteenth century to describe a grassy field which was part of the overall grounds at Princeton. The term has since taken on two wider meanings: to describe the entire property or set of buildings at a university, and to capture the spirit of the place -- the "genius loci"-- that has become so predominant in the architecture and grounds of colleges and universities. "Campus" now sums up both the distinctive physical qualities of the American college, and the architectural expression of its educational and social ideals.[1]

Master planning is a widely used term that has many meanings. Usually it connotes an overall guide to future development of an organization or program. In the context of this study, master planning will refer to the mechanism used to design the future physical and architectural development of a campus. Master plans generally include a map or scale model of how the campus might look in the future. These visual representations may range from a simple outline of potential buildings, parking locations, and circulation patterns to detailed plans for types of buildings related to program objectives, architectural considerations and guidelines, landscape treatment, cost estimates, and phasing schedules.

The roots of master planning in colleges and universities lie in the discipline of urban planning. Probably the earliest urban plan in the United States was developed for the city of Philadelphia in the late 1700's. It included a gridiron street pattern, a system of open areas, and uniform spacing and setbacks for buildings.[2] Urban plans for Washington D.C., Annapolis, and Williamsburg all helped to set the pattern for similar planning concepts for colleges and universities. These institutions were destined to become "academical villages", a happy phrase coined by Thomas Jefferson when he described his vision for the University of Virginia.[3] As they developed in this country, universities attempted to remove themselves from the governance of the city, therefore creating for themselves an opportunity to develop independent control and still retain an urban environment. University campuses became laboratories for urban design.[4] This development produced the need for order and organization in their growth which Charles Klauder so eloquently described in his work "Collegiate Architecture in America".[5]

In his work titled "Campus Planning", Richard Dober accepted this concept of order but went further in order to outline the major features and characteristics that distinguish various types of campus master plans. These include the plan time frame, the area encompassed by the plan, and program detail and design characteristics. Longer term campus development plans tend to view the campus over a ten to twenty-five year period; they include analysis of the use of a broad, comprehensive land area and are general rather than detailed and specific in their program and design specifications.[6]

The master planning concept provides an order that corresponds to the programmatic objectives of a university. Alexander describes this concept in the following way:

> "These maps, and master plans, are intended to coordinate the many hundreds of otherwise independent acts of building. They are intended to make sure, in a word, that the many acts of building in a community will together gradually help to create a whole, instead of merely making up an aggregation of unrelated parts, a chaos."[7]

Perkins and Wills Inc. describe campus master plans as action plans for growth that include a description of an institution's philosophy, goals, educational needs, projections, size, location opportunities, form, and appearance.[8]

This master planning concept is more than simply a plan for a point in time of an institution's development; it is also a process of translating an institution's educational goals and objectives into a plan for the orderly development of facilities. Such a process must be able to survive in an ever-changing environment. Warren Kark describes the process as "...charting a future course which is sympathetic to the past and present. Recognizing the evolution of the University campus and understanding the relationship between its current mission and the function and dysfunction of the physical plant represent the starting point for this undertaking".[9]

Master planning as it has been applied within colleges and universities is a process for establishing the relationship between educational philosophy and goals and the long term, comprehensive development of the campus facilities and its environs. The master planning process will be the focus of this study.

Master Planning Phases -- History -- Review of Literature

The literature in this field is primarily descriptive and provides a history of the development of the campus. It is pertinent to this study, however, because it establishes a framework for inquiry into mechanisms for implementing master planning principles.

These principles underlie master planning, which has had a long and varied history at colleges and universities in the United States. Evidence of such planning is found in the first

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colonial colleges that were influenced by English tradition and has proceeded through a number of stages that can best be described as "American" in its style and influence. American colleges and universities rejected many European traditions of collegiate organization and campus development in favor of principles that were unique and which satisfied their own educational philosophies and objectives.[10]

The concept of a total educational community requiring not only academic facilities but support buildings for housing, worship, and recreation was developed in this country. The rejection of the placement of educational institutions within cities in favor of a more rural atmosphere was also unique. Finally, the concept of open space that led to the notion of the college as a "campus" was particularly American. These were principles that resulted from an overall vision or plan that the leaders of these institutions possessed and put into practice. Educators utilized these principles through the post-civil war period when architecture and planning merged to provide a heyday of campus design and order. In the modern era, however, change and growth provided significant challenges to educational institutions and their campus planning processes.

Colonial Period -- Early Years -- Foundation For Campus Planning

The period up to the early nineteenth century presents a number of important examples of college planning. Harvard, William and Mary, Yale and Princeton were colleges that utilized some type of planning in the development of their campuses. Early buildings at these colleges were heavily influenced by the Oxford and Cambridge closed quadrangle style. This closed style set the college apart from the community to provide a sense of isolation, a function of the monastic influence in England. The American version of this quadrangle was open or three sided and therefore rejected this separatist view for a more accepting and inviting relationship to the outside world.

Harvard's approach utilized the construction of separate buildings to form a three sided quadrangle. There were a number of reasons for this separation. A practical one was the danger

of fire and the protection which separation provided. Another was the vastness of the landscape, the use of what is now called the "yard" to embrace an expansionary vision of the college. Separate buildings also symbolized the establishment of individual colleges which together formed a university. The open end of the quadrangle was a significant feature often copied in American colleges and universities. With the construction in the early 1700's of Harvard, Stoughton, and Massachusetts Halls, Harvard continued this planning concept and repeated it in the years that followed. Through its physical plan, Harvard set forth an educational objective of openness to the outside community that was distinct from English tradition. It is clear that even in its early years, Harvard's physical layout was the result of conscious and long-range planning rather than simply haphazard responses to needs as they arose.[11]

In the late 1600's, William and Mary college developed a plan for a closed quadrangle much like that of the Oxford/Cambridge model. This plan preceded the development of the town of Williamsburg where the college was eventually located and therefore was truly part of a rural setting. This was the earliest example of a specific master plan for a college. The quadrangle was never finished, however. With the creation of the town of Williamsburg as the capital of Virginia, the college changed its plan by constructing two buildings that formed a quadrangle that faced rather than turned its back on the new city. The central building of this quadrangle, the Wren building, named after the architect who was credited with the plan, was also reorientated to face east rather than west. This new plan was an example of collegiate planning interacting with a more global urban design.

Almost 100 years after the William and Mary plan, Yale college commissioned John Trumbull to develop a plan that built upon and protected the green space known as the "Row".[12] This plan had a heavy emphasis on utilizing landscape as part of the overall development and consisted of a number of buildings that formed a boundary for the college. The existing and projected buildings along the Row formed one of the most repeated planning concepts in American college and university campuses.

Princeton offered two distinct and memorable features to campus planning. The trustees of the College of New Jersey placed the campus in a small village named Princeton. Plans were immediately started for the construction of a major building set back away from Nassau street, the main road of this village. The building, the largest of its type in the colonies, was placed on a four acre tract of land off the road, and the space between the building and road formed an impressive green space.[13] This space later became known as the "campus", thus the origin of this term. The building and land arrangement differed from Harvard's yard or Yale's row and formed more of a village green. The building itself housed all of the collegiate functions. Architecturally it was an impressive sight with a pedimented facade facing the road. This combination became one of the most popular in America and was imitated at many colleges in the late 1700's and early 1800's.

These colonial colleges offered significant examples of campus planning -- open quadrangles, green spaces, rural settings apart from the city, openness to the outside world, impressive buildings designed in a context with their environment and surroundings, and even modest beginnings of formal campus plans. These concepts and principles served as the foundation for more significant efforts in campus master planning after the Revolutionary War.

In the early nineteenth century two major campus plans were created that became landmarks of campus planning. These plans were designed for Union College in Schenectady, New York and the University of Virginia in Charlottesville. The plan for Union College was the result of interactions between the college president, Eliphalet Nott, and a French architect, Joseph Jacques Ramee. This ambitious plan was the most significant planning effort of its time. Figure 1-1 is a representation of the Ramee master plan. It provides a U shaped organization of buildings connected by a colonnade with a large open courtyard facing the west. In the center of the courtyard is a circular Pantheon-like building. The central campus was to be flanked by gardens.

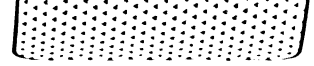
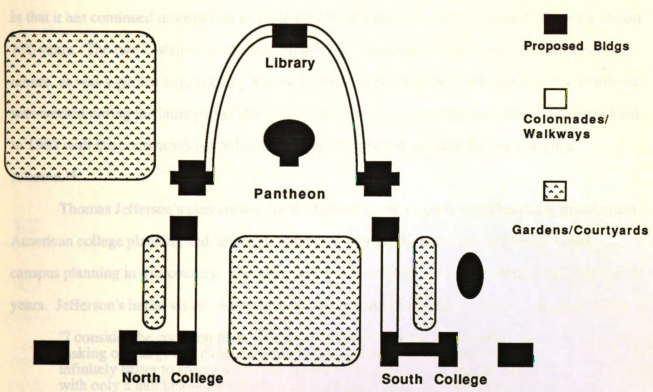


FIGURE 2-1

UNION COLLEGE SITE PLAN

(JACQUES RAMEE 1813)



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Figure 2-2

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This plan was a compromise between the architect and the president and reflects both American and European traditions. The architecture of the buildings, the gardens and the colonnade reflect European influence. The courtyard and the buildings (North and South College) facing the west are American, however, and similar in concept to Yale's Row. An unusual aspect of Ramee's plan is that it has continued more or less to guide the central campus growth at Union College for almost 150 years. The two L-shaped wings (see Figure 2-1) were constructed during President Nott's tenure, as was a garden suggested by Ramee for the area north of the main campus. The Pantheon was erected during the latter part of the 19th century, while the easternmost section was completed in 1962 with the construction of Schaffer Library, designed to simulate Ramee's original scheme.[14]

Thomas Jefferson's plan created for the University of Virginia singlehandedly transformed American college planning and, although somewhat delayed, significantly influenced future campus planning in this country. The plan, which was finished in 1817, evolved over a number of years. Jefferson's initial vision was presented to the trustees of East Tennesse College in 1810:

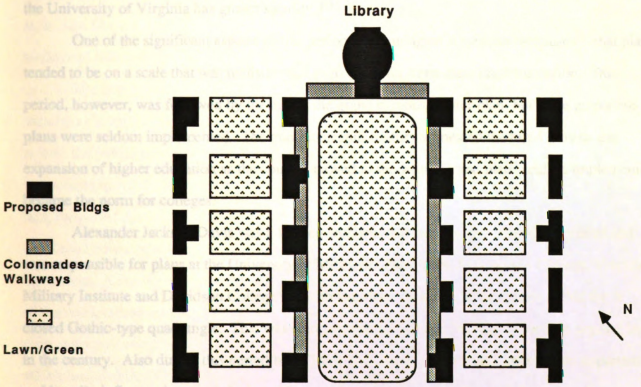
> "I consider the common plan, followed in this country but not in others, of making one large and expensive building as unfortunately erroneous. It is infinitely better to erect a small and separate lodge for each professorship, with only a hall below for his class, and two chambers above for himself; joining these lodges by barracks for a certain portion of the students opening into a covered way to give a dry communication between all the schools the whole of these arranged around an open square of grass and trees would make it, what it should be in fact, an academical village...."[15]

Figure 2-2 provides Jefferson's plan layout for the University of Virginia. The basic plan called for the creation of a mall or green area surrounded on three sides by professors' houses. This was revised in the Virginia plan to include a Rotunda to house the library on the side facing the open area of the mall . This Rotunda was designed to serve as a major focal point for the campus. The emphasis on the library was unique for its time. Jefferson also suggested differing architectural styles for the professors' pavilions therefore enhancing his vision of a village. The plan was largely completed by 1825 a year before Jefferson's death.

FIGURE 2-2

UNIVERSITY OF VIRGINIA SITE PLAN

(THOMAS JEFFERSON 1817)



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The idea of a village surrounding a mall with the possibility of future expansion and growth fit the American style perfectly. The specific form of Jefferson's design -- a mall lined with buildings with a central structure as a focal point -- was destined to have a curiously delayed influence on American college planning. Around 1900, however Jefferson's design was rediscovered and began to exert a great influence on college planning. Since that time the appeal of the University of Virginia has grown steadily.[16]

One of the significant aspects of this period of planning on American campuses is that plans tended to be on a scale that was realistic enough to allow for immediate implementation. This period, however, was followed by the age of the grand campus master plan, but these grandiose plans were seldom implemented. The mid-nineteenth century witnessed the rapid growth and expansion of higher education as the country moved to the west. Grand plans seldom implemented became the norm for colleges.

Alexander Jackson Davis was a leading architect and campus designer of this period and was responsible for plans at the University of Michigan, New York Agricultural College, Virginia Military Institute and Davidson College in North Carolina. His plan for Davidson called for a closed Gothic-type quadrangle. This was controversial for its time but was to become popular later in the century. Also during this period both Greek and Gothic architectural styles were important and heavily influenced campus design. These styles were classical and carried a sense of democracy, tradition, and importance to campus buildings of their time.

Post Civil War -- 1900's -- Focus on Planning

In 1862, the passage of the Morrill Land Grant Act establishing land grant universities moved American higher education into a new era.[17] Each state was allotted a share of land to sell so that the proceeds could be used to establish colleges to teach agricultural and mechanical education. Campus planning moved away from the grand schemes of the Davis style and reflected a more informal and freer attitude toward campus planning and design. Frederick Law Olmstead

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was the leading architect and planner of this period. His work, most notably at Berkeley, influenced many land-grant colleges. He also worked for Cornell, the University of Massachusetts at Amherst and Iowa State among others.

Olmstead was a park planner and his designs rejected the more rigid styles of the past for a more informal grouping of buildings in park- like settings. This informal style fit the needs of these land-grant institutions as a way to deal with growth and change. The more modest campus style also fit the rural values of these colleges in contrast to the elitist and formal values of the traditional colleges.[18]

The late nineteenth and early twentieth centuries was a period of significant growth and expansion in higher education, a period during which education was promoted as having benefits to both the public and individuals. Both an expansion in enrollments and the creation of new institutions resulted. This was also a watershed period for campus planning and architecture. In fact, the period marked the golden era of master planning in higher education. Many campuses developed master plans. Design competitions were used to develop plans for individual institutions. A survey conducted by Charles Klauder in the late 1920's found that over 25 percent of the two hundred leading institutions in the country had instituted some type of general plan for their orderly development.[19] Representative of this period were a number of major developments which included the Beaux-Arts system of campus organization, the birth of campus planning as a formal concept, the revival of the Jeffersonian mall as a campus organizing element, and the application of master planning to existing campuses.

The Beaux-Arts system, derived from the French art school in Paris -the Ecole des Beaux-Arts - provided an organized approach to developing a unified and symmetrical pattern to campus development. This system utilized axial alignments to connect its various sections and buildings It also relied heavily on the concepts of city planning and urbanism. This system was demonstrated at the Columbia Exposition in Chicago in 1893. Universities, seeing themselves as small urban environments, moved rapidly to adopt this type of planning and organization for their campuses.[20]

This style of planning allowed for the development of impressive plans for college campuses. Philanthropy was also prevalent during this period and gifts from wealthy individuals funded plans of this type. The Beaux-Arts style, with its organization and sense of grandeur, fit the times very nicely in this regard. Plans done for the University of Chicago and Stanford University, for example, were both influenced significantly by this Beaux-Arts style.

The Stanford plan was the result of the collaboration of Leland Stanford, the founder of the university, and the team of Frederick Olmstead and Charles Coolidge, campus planners hired to do this work. The plan included a main quadrangle which was defined as a main secondary east-west axis which could be expanded with additional quadrangles as the university grew. Dormitories were placed to the east and west and in the four angles between the intersecting axes. Diagonal streets were to accommodate faculty housing, which made the campus a self sufficient city.[21]

One of the strengths of the Beaux-Arts style was the flexibility it offered in terms of architectural styles. While classical Renaissance and Baroque styles were most prevalent, this was not a limiting or constraining feature of the Beaux-Arts concept. Stanford utilized a Spanish-Mediterranean style, while Gothic was used at Chicago, and many different approaches were used at other institutions fitting their own particular needs and tastes.

Competitions became a very popular method for choosing designs for universities during this time and were undertaken at Washington University in St. Louis, The United States Military Academy at West Point, Carnegie Institute of Technology, the University of Pittsburgh, the University of Minnesota, and at the University of California at Berkeley. The Berkeley competition, funded by Phoebe Apperson Hearst, benefactress of the University, was a lavish and grand affair. The prospectus for the competition included the following statement:

> "All is left to the unfetterd discretion of the designer. He is asked to record his conception of an ideal home for a University, assuming time and resources to be unlimited. He is to plan for centuries to come.... The architect will simply design; others must provide the cost".[22]

Emile Benard of France won the competition with a typical Beaux-Arts design, but upon his arrival in California, he decided not to stay on as designer of the campus. The university selected a

runner-up firm for the job, John Galen Howard and S.M. Cauldwell. Their design was reminiscent of Jefferson's at Virginia, with a central mall terminating in a domed structure but with superimposed cross-axes and subsidiary spaces, a very popular pattern among colleges and universities of this period.[23]

Campus master planning had arrived as an important feature of college and university development. In 1903, the architect and educator A.D. Hamlin argued that a good master plan was important due to the complexity of the modern university which required many facilities of different types. He felt that the main tasks facing the planner were to create a general unity of effect out of these different elements in order to produce harmony and order. He cited master plans at NYU, Stanford and Berkeley, among others as examples of such achievement.[24] Claude Bragdon in an article on American architecture pointed proudly to the new beauty and dignity projected for higher education.[25] Implicit in this view was the assumption that such plans would be implemented. Even at this early stage of campus planning the problem with this assumption was duly noted. Montgomery Schuyler in 1910 stated:

> "...the history of American collegiate architecture shows that the original architect, essaying to set a point of departure for his successors, is commonly found to have done so in the sense only that they depart from his work as speedily and as widely as possible."[26]

Another major outgrowth of this planning period was the popularity of the mall concept originally designed by Jefferson for the University of Virginia. Malls fit the Beaux-Arts style nicely and were easily adaptable to future extensions, subsidiary axes and groups of buildings. Many campuses and their designers utilized this concept. These included Carnegie Tech, Johns Hopkins, Emory, Maryland, the Harvard Business School, and Rice, to name a few.[27]

Most of the grand-planning that took place during this period focused on the creation of new campuses or campus parcels. This desire for order was not limited to new campuses but spread to replanning existing campuses. Such a concern marked the beginning of the modern era in campus planning and the recognition of the primary challenge for campus planners. A. D. Hamlin and Montgomery Schuyler were vocal about this need for adopting master planning for

existing campuses. Hamlin commented that, while it might be impossible to correct existing chaos, "it was at least possible to establish a definite plan and scheme to which all future additions shall conform".[28] In a series of articles on this subject, Schuyler chastised colleges for their lack of order.[29] Howard Githens summarized the new interest as follows:

> "Lately the colleges have sickened of the haphazard buildings and trustees have come to architectural advisors, landscape and otherwise, and each received something in the nature of a comprehensive plan, ingeniously contrived so that by moving a building here, tearing down a building there, building anew yonder, taking up the old meandering drives and paths and setting out straight ones, and so forth, their predecessors' sins might no longer be in evidence".[30]

The notion was to transform campuses wherever possible to achieve this order, symmetry, axial organization and geometric orientation that was popular during this period. But while this period represented a major breakthrough leading to a recognition for the principle of campus planning, it was also a period when planners and educators began to recognize the difficulties inherent in implementing master plans.

In the early years of the twentieth century a backlashed developed against the growth that was taking place in higher education. This reaction focused on developing more personal and introspective views of the campus -- on humanizing the large impersonal university. These values became evident in campus designs of this period and are best represented by the use of the closed quadrangle concept. Residential colleges became the norm. In combination with the general liberal arts curricula, the quadrangle formed the basis for a tight knit community of teachers and students to be housed in groups of facilities that formed the enclosed space so prevalent in the English tradition of Oxford and Cambridge. A number of architects championed this philosophy and carried it through in their campus designs. Two of the most famous were Walter Cope and John Stewardson whose designs at Bryn Mawr, Penn, Washington University and Princeton utilized quadrangle concepts for campus organization.[31]

Princeton became one of the leading examples of this thinking and philosophy. In fact, to accomplish its goals of a more unified Gothic -quadrangle style for the campus, Princeton in 1906 hired Ralph Adams Cram to prepare a "general plan" for the development of the campus and to act

as Supervising Architect for the university. Cram was to determine the location and overall form and character of new buildings but not necessarily be involved in the actual design of these buildings.[32] Cram set out to develop a plan for the campus that would accomplish these objectives. All new buildings would be of Gothic architecture and quadrangles would form the basis of the campus organization. Cram described his plan for Princeton as " a walled city against materialism and all its works."[33] Cram stated that the design principle for the campus "should not reveal itself at once and from any spot, but gradually, through narrowed and intensified vistas, the unforeseen opening out of unanticipated paths and quadrangles, the surprise of retirement, the revelation of the unexpected."[34] This strategy on the part of Princeton not only showed a commitment to the principles of the campus design but also to the implementation of the plan.

Across the country during this period campus designs took on an interesting mixture of Gothic quadrangles, introspective and irregular at times, protecting the university from the outside world and providing intimacy for those within. At the same time the Beaux-Arts principles of axial organization -- grand scale and order -- open to the outside world provided a greater vision for the campus plan. This contradiction was pointed out by William Blackburn, a professor at Duke University, commenting on the Duke plan: "irregular buildings face upon a regular court... as if a Gothic village had been put down in a Renaissance garden."[35]

Campus planning had reached its heyday in America. Grand plans were commonplace. Competitions brought much attention and publicity to the problems of campus organization and design. The difficulty in fulfilling these visions had been recognized and attention was devoted to supervising the implementation of these plans. Shortly after World War II, however, the foundations and principles of campus planning would be turned upside down with the advent of modernism in combination with the tremendous growth and change that would take place among colleges and universities.

Post World War II Era -- Modernism -- Ineffective Planning

The late 1940's and early 50's brought a major turn in attitudes toward planning on college campuses. Two developments fostered this change. One was the arrival of a modern architectural style that essentially rejected tradition, and the other was the expansion and change that took place in higher education itself. Architecture was undergoing a major change to a new modernist or international style in which traditional or classical ideals were no longer considered acceptable. Architectural Forum was a major supporter of this modernist movement and used its pages as a means to advance this viewpoint. In 1949, Walter Gropius chairman of the architecture department of Harvard, wrote an article for the New York Times entitled "Not Gothic But Modern For Our Colleges". A year later Walter Creese outlined the quandary facing colleges in terms of the conflict between traditional and modern architecture.[36] The Illinois Institute of Technology in Chicago is one of the best examples of this conflict in the design and campus plan developed by Ludwig Mies van der Rohe. This plan presented a campus which represented the ultimate international style of architecture based upon an exposed steel-frame structural system.[37] This proposal lay at the opposite end of the design spectrum from the traditional or classical approach.

At the same time higher education was undergoing rapid expansion in both enrollments and mission. This change produced tension and stress for campus planners to the extent that traditional campus planning became outmoded. In 1964 the head of Harvard's planning office stated that his policy was "guided, organic growth" rather than a master plan.[38] In response to a survey about whether master plans had been made for the campus, one official responded "Several, by professionals at great expense--usually discarded".[39] Joseph Hudnut, who introduced modern architecture at the School of Design at Harvard, described the new attitude to campus planning in the following excerpt :

> "Every attempt to bind universities to a pattern laid out in advance has failed - and ought to have failed.... Let's imagine the university, as the city planners imagine the city, as a growing organism whose form lies partly in the past partly in the future. Our university will never be completed. If we make a master plan, then, it must be in such general terms as will admit of new interpretations and unexpected development."[40]

In fact Hudnut also challenged one of the basic tenets of collegiate and urban design when he stated:

> "Let no building depend for its character upon its relation to another, nor let any of the open spaces be of such absolute proportions that new construction built into them will destroy them". [41]

This view tore at the basic fabric of campus design--the concept of order, the community of buildings, and the spirit of place, that heretofore had formed the overall objectives for campus planning. Turner summarized the prevailing attitude regarding campus planning at this time as a concern for the process of planning more than for the final form of a master plan.[42]

During this period -- the late 1940's, 1950's, and 1960's-- buildings were considered as individual entities independent of the idea of a community of buildings. Dober referred to "planning modules" where the module--a building, group of buildings or land area--was a chess piece and the campus a chess board.[43] This concept led to the rejection of formal master planning on American campuses in favor of a more independent and isolated view of facilities. Some campuses such as MIT and Brown adopted this view to its fullest, opting for a campus consisting of facilities that were unrelated to each other in any way, an eclectic approach to campus development.

This was also the period of the greatest dissatisfaction with campus architecture, a period generally considered as a failure for both campus planning and design. Hardly a campus or a set of buildings constructed during this period is looked upon with the same reverent view as those built in the pre-modernist era. In describing his view of the plan for Yale's Morse and Stiles colleges, Banham stated "its [the plan's] picturesqueness disgusted me at sight and represented a creeping malady suggesting that Yale is a very sick place".[44] Both the literature on the subject and campuses throughout the country document this trend; individual facilities often seem to have no

relationship to the overall campus setting. Sarah Williams summarized the view toward campus planning and architecture that resulted from this period:

> "Today, the one visible legacy of the 1960's that we live with every day is the buildings -- a dozen or more on larger campuses -- built during that period. Chances are, few of those buildings warrants a stop on an admissions tour. Many are an out-right embarrassment. Universities built fast then, and built cheaply (often within government guidelines): the driving idea was simply to create new space for the hordes entering college. Architecturally these years were a low point."[45]

The University of Chicago, a Gothic-quadrangle styled campus originally designed by Henry Ives Cobb, was particularly hurt during this period. Calvert Audrain describes this period as producing some of the most unattractive buildings on the Chicago campus. The situation, not unique to Chicago, found the building boom occurring with almost total disregard for historic precedent, for a sense of campus, or for a guiding plan.[46]

In 1963, however, the University of California at Santa Cruz developed a master plan that reflected a philosophy of a cohesive, caring, non-competitive community where the landscape and environment were to be integral to the development of the campus. Santa Cruz was to consist of a number of smaller colleges, that would come into existence over time as enrollment demand grew. The chancellor Dean McHenry stated that " the architecture of this campus is overwhelmingly important and that the design for each college must convey to its members, both students and faculty a sense of the place which will enhance the educational experience and deepen the cultural implications."[47] The most famous and idealistic approach to design of one of Santa Cruz's colleges was embodied by the plans for Kresge College. The architects, William Turnbull and Charles Moore, followed the principle of the campus as a village by creating a series of facilities that formed a community. The architectural style fit the democratic and participatory nature of the college and also respected the landscape in a way that fit the ideals and spirit of the mid 1960's. More importantly though, the plan for Kresge college was a return to the concepts of Jefferson's academical village. The concern for order and community was a reaffirmation of the long held

principles fundamental to the concept of campus planning that had been so roughly dismissed in the previous decades.[48]

Campus planning of the 1970's and 80's emerged from this period with a new interest in what Klauder described as "order". Many institutions have revised or developed new campus plans. Some like Stanford have even put forth restrictions on future campus buildings in order to guarantee consistency with the original campus facilities. Both Turner and Williams attribute this revised interest in campus planning to the preservation movement, which views tradition and history as something to protect rather than replace.[49] The stability, or at least lack of significant enrollment growth, in higher education has certainly played a role in this development. Competition for students also is a factor. Williams states: "Today's buildings must not only accommodate students, but also attract them. The brighter the student, the more options he or she has and the more likely it is that the campus itself has to impress".[50] Alan Greenspan states that "ignoring physical facilities could well jeopardize the fiscal health of an institution".[51]

Basic Problem -- Central Question

Given these lessons from the past, how can institution insure that its campus development achieves a sense of order both in style and function? Mayer puts the dilemma well: "It is not often in planning in this country that one finds examples of a seventeen year old plan which is still functioning effectively. All too often, plans that have been in existence for this period of time are either in need of a thorough update or have been shelved as ineffective".[52]

Much of the success that institutions have had in campus master planning has been when the subject was a totally new campus or involved major additions to existing facilities and grounds. The period at the turn of the twentieth century and, more recently, master planning at the new community/two-year colleges bears this out. The difficult challenge for campus planners is in developing a master plan for an existing campus, a plan that will provide for future needs and more often than not attempt to correct previous mistakes by reestablishing order or a sense of place for the campus.

The central question, however, still remains: can an institution which desires a greater sense of place and order -- a community of buildings -- develop and implement a master plan to achieve these objectives? Is there a process of campus planning that will allow institutions to change in a programmatically positive and advantageous way, but still respect the longer term vision of campus development? Clearly the lessons from the past indicate that a static plan strictly adhered to is doomed to failure. A process for implementing such a plan is necessary and is therefore the focus of this research.

Relationship of Campus Planning to Urban Planning

While colleges and universities fled the embrace of the city in their early days, many similarities exist between the modern day university environment and that of the urban community. The city, like the university, is faced with the need for orderly development and growth. Universities today are small cities providing a home and related services for large numbers of residents. Both organizations are complex in terms of their decision-making processes and the necessity to deal with a variety of environmental, political, social and demographic forces.

Cities have been involved in planning for their orderly growth for centuries. Williamsburg, Philadelphia, and Washington D.C. are examples of urban districts that were the result of a grand plan. But the need for planning in cities grew out of more utilitarian objectives -- the protection of the public welfare. Growth and development needed to be controlled by the local government to protect property values and the rights of property owners. Zoning ordinances and regulations were early mechanisms for achieving this objective.

Modern day city planning has evolved to fit a rational process of goal establishment, identification of alternatives, plan development, implementation, review and modification.[53] Plans for city development and growth have become comprehensive in nature and encompass a review of the physical structure of the city, a measurement of development trends, definitions of goals and objectives for future growth and change, and specific recommendations in the form of maps and charts which outline the plan and establish standards for development. Such plans

include critical decisions for the city regarding size, land use, standards, circulation, and reservation of open spaces. By necessity planning within cities is a process of addressing these challenges and constantly evaluating and updating the comprehensive plan.[54]

William Goodman and Jerome Kaufman described the five major responsibilities of local governments in the area of planning. These included the development of a comprehensive plan, creation of specific detailed plans for certain areas or functions, establishment of long range implementation strategies, preparation of regulations to guide the development and implementation of the plan, and administration of the plan. The backbone of the city's future development was to be based upon the comprehensive plan. The plan generally included goals and assumptions regarding growth, employment opportunities, housing needs, circulation patterns, space requirements, industrial/commercial/residential needs, and the need for certain public facilities and amenities. These goals and assumptions lead to further analysis of specific conditions, existing inventories, and future projections of economic and physical characteristics.

Next land use and circulation plans are developed which designate areas to be devoted to specific uses and identify standards and quidelines to be utilized in future development. More detailed planning may take place for the identification of particular strategies for such areas as public facilities, parking, subdivision planning, sewage, etc. An action program or plan is ultimately developed and may include a long range capital improvements program, annual capital budgets, or the official map which represents the comprehensive plan. Regulations and codes are developed as key points in the implementation of these plans. These include zoning ordinances and review processes, building codes and standards, and general safety regulations for health fire, utilities, etc. Finally the city's decision-making organization is key in this process and normally involves the use of a planning agency reporting to an advisory planning commission. The day to day responsibility of the comprehensive plan and the planning process fall under the responsibility of these two entities. Usually the mayor and local council are the elected officials ultimately responsible for this decision-making and planning process.[55]

Clearly the measure of success of any plan, whether it pertains to cities or universities, is the degree to which it is put to use. Planners fear that the plan will be put on the shelf. Implementation strategies and processes therefore are crucial to achieve the plan's objective. No single tool or method can insure the implementation of a plan. The essence of implementation is the orchestration of a series of strategies or actions which, if followed, will fulfill the aspirations of the planners. In other words, a successful plan must have a successful process for implementation, reevaluation, change and adaptation.[56]

The nature, organization and process of developing and implementing a comprehensive plan for an urban area provides an interesting framework for colleges and universities. While many similarities exist, especially the basic objective of orderly growth and development, there are a few important differences. One is the basic political nature of cities vis a vis universities. Universities are significantly less subject to the political process than cities, even though oversight boards in public universities are sometimes elected. The chief executive of a university is appointed and not, like a mayor, elected by the citizenry. Universities also control the development of their property, unlike a city which must set in place a process that influences and controls how others, primarily in the private sector, develop land within their boundaries. These differences give universities greater freedom and control, compared to cities, over the opportunity to develop their campuses.

Master Planning Concepts -- Components

The development of campus master plans has been the traditional approach used by colleges and universities to achieve order and a sense of community with respect to their facilities. Master plans can vary from general informal outlines of future building locations to detailed specific representations which include program, design, cost and timing specifications. The objective of such plans is to present schemes for the future development of campus facilities in a manner that is consistent with the institution's overall goals and philosophy and that maintains a sense of orderly development of future buildings.

Richard P. Dober identifies four major characteristics that are critical to campus master plans. These are the time frame, the physical area to be covered, the precision of the program, and the characteristics of the design. Time frames may run from very short periods, one to three years, to extremely long ones of twenty to twenty-five years. Short plans tend to be much more specific. They are usually driven by a particular building project and provide more detail about a given building program or site than plans with longer time frames. These short term plans are often tied specifically to budgetary or construction schedules for given projects that have a high probability of being built.

Plans that cover a longer time frame -- five to ten years -- are somewhat more general and provide a mechanism for outlining future priorities and building locations for projects that are needed but whose program and funding are not complete. Plans of this time frame are quite popular in that their length is short enough to be practical in terms of the potential of implementing major pieces. Five to ten is long enough to incorporate a significant number of future projects yet short enough to begin work on most components of the plan. Oftentimes plans of this duration are utilized as fundraising tools and developed formally with the use of models and sophisticated graphics.

Long range plans tend to be more visionary and bold in their intent and therefore, given their length, are less specific than plans with shorter time frames. They provide the institution with a vision for adapting future needs, most likely unforeseen, into an orderly facility development scheme. Longer term views specify areas of the campus for future development and prevent short term pressures and demands from interrupting its overall organization. Plans of this length also can boldly suggest acquisition of future properties or advocate tearing down existing facilities that do not meet the overall objectives of the campus plan. These types of plans by nature must be more flexible and more general than other plans since their view of the future is inherently less certain. Given their generality, these longer term plans are also more difficult to implement since numerous variables can influence a plan over the years.

Dober argues that the second characteristic of master plans, the physical land or site area covered, may also vary from quite small sizes that encompass only an individual building and its immediate surroundings to the total campus and beyond. Smaller areas provide detailed planning opportunities primarily related to an individual building project but they rarely allow for analysis of spaces or facilities adjacent to the particular building. Broader questions concerned with building relationships, definition of spaces, and circulation among buildings outside the immediate project are usually not entertained in such an effort. Plans that deal with sections of a campus and include a number of buildings and spaces as part of the study area do allow for consideration of important long range issues, at least at they relate to the portion of campus under review. By planning for a section of a campus, issues of future building opportunities, relationships between buildings, definition of spaces, circulation paths, etc., can all be dealt with in a long term perspective. Plans that deal with the total campus, the more traditional master plan approach, obviously allow for the most comprehensive view of the campus and of all the issues related to future site development.

Dober's third characteristic, programmatic plans, objectives, and policies, underlie the development of facilities. Program information provides policy direction in terms of the type, use and nature of facilities or spaces. In combination with certain criteria, usually related to space in terms of function sizes, i.e. offices, laboratories,etc., these programmatic data provide the necessary building blocks for facility plans. The precision of program information also varies depending on the type of planning exercise being undertaken. Program information for an individual building tends to be quite precise and specific according to types and sizes of spaces. Information that supports a plan that encompasses the total campus for some time into the future however by necessity is much more general. It is closely tied to the institution's overall long term policy objectives regarding future enrollment, faculty expansion, research growth, the need for additional support facilities, and overall land acquisition strategies. Longer term views may focus on campus activity zones that organize facilities and spaces into functions that are similar in use such as research, housing, recreation/athletic, support functions, administrative, medical, etc.

The last major distinguishing facility planning feature identified by Dober are the design characteristics of the plan. Design, which involves the architectural presentation of program requirements for a set of facilities or spaces in a given area over a specified time period, brings together all of the issues and analyses that result from such a process. Design criteria can include such things as building styles, massing, height, materials, roof treatments, circulation routes, landscaping, etc. This is most oftened presented visually in a map or site plan for the campus. But design characteristics also provide a much more important feature in terms of achieving the key objective of master planning, that being order. Proper design criteria related to building sizes, materials, general styles, circulation paths, campus zoning concepts and open spaces play a critical role in achieving the orderly development of future campus facilities.

Table 2-1 outlines various planning time frames and compares the nature of program specifications, land area, and design characteristics present in each type of plan. The possibilities range from the most detailed and specific layouts for an individual building area to the general land use site plan in the case of long term views of campus development. This matrix provides the full scope of possible master planning approaches available to colleges and universities.[57]

TABLE 2-1

CAMPUS FACILITY PLANNING APPROACHES

Time Frames	Land Area	Program Specifications	Design Characteristics
Short Term (1-3 yrs)	Immediate Building & Vicinity	Detailed Requirements For Building Functions Circulation/Parking/Open Space -- Immediate Area	Specific Criteria for Building -- Massing, Height, Materials, Pre-Schematics, Floor Plans
Medium Term (3-5yrs.)	Campus Areas, Sections	Major Program Areas, Functions, General Institutional Parameters	Site Plans, Overall Circulation, Massings, General Design Criteria
Long Term (5 yrs and beyond)	Total Campus & Beyond Projections of Future Requirements	Campus Wide Program Needs -- General	Campus Site Plan, General Activity Zones, Very General Design Considerations

Planning Processes and Systems -- Theoretical Framework

The history of campus facility master planning planning demonstrates that virtually no study or attention has been given to the process of plan implementation in higher education. Therefore no theoretical framework or models exist that can guide an institution. As a result the concept of master planning, the creation of orderly facility development, has suffered greatly because institutions lack guidelines to effectively address the implementation of such plans.

Two recent publications, however, describe how the University of Michigan and Virginia Polytechnic Institute (Virginia Tech) approach implementation of their campus plans. The University of Michigan has charged an in-house planning staff with responsibility to apply the principles of the campus plan to day to day decisions. Mayer describes the workings of the in-house staff and their well defined duties as the key to plan implementation.[58] At Virginia Tech two general implementation strategies are used. One views every potential change to the campus

environment as an opportunity to enhance its functional, aesthetic, and experiential qualities. The second strategy redefines constraints as opportunities. These approaches focus on the challenges of implementation within the context of their overall capital facility planning process .[59] While both of these cases are excellent examples of implementation strategies, they do not form, nor are they the result of, research inquiry.

In the absence of a framework for master planning of campus facilities, it is useful to review the basis for general organizational decision-making and planning in order to allow for the development of a technique for further inquiry into this problem. The discipline of organizational theory has developed a view that organizations are entitities that approach decisions in rational ways. The concept of rational choice has been viewed as "means to ends" decision making among a set of limited programmed alternatives such as production goals, pricing strategies, or sales quotas.[60] This concept evolved into the rational decision-making model. Richard Cyert and James March, in their classical study of organizational behavior describe the rational model to include the establishment of goals, searching mechanisms, evaluation of alternatives, choices, feedback and adaptation.[61] This behavioral approach defines budgeting as the interaction of decision strategies.[62] Planning is defined as a general problem solving technique for the transformation and realization of organizational goals.[63] Rationality is defined as the process of selecting alternatives in terms of some system of values whereby the consequenses of behavior can be evaluated.[64] The rational model has served as one of the main frameworks for the study of organizational behavior and decision making.

Given the applicability of such a model to the study of organizations in general, the rational model has also been used as a basis for studying decision-making and planning processes in higher education. Ellen Chaffee defined the rational model as decisions by reasoned problem solving and used this approach in a case study of the Stanford University budgetary process.[65]

Nick Poulton applied the rational model to the study of impacts of planning activities in research universities and found that most previous investigations dealt with only a portion of the set of variables involved with planning or with only a single management technique. He found

few studies of planning or planning systems in colleges or universities. Those he discovered focused on state-wide planning, individual academic departmental planning, and the role of information systems in planning processes.[66]

Marvin Peterson analyzed alternative planning models within higher education institutions, and his work provides a sound framework for developing a structure for investigating the process of master plan implementation. Peterson defines planning:

> "as a conscious process by which an institution assesses its current state and the likely future condition of its environment, identifies possible future states for itself, and then develops organizational strategies, policies, and procedures for selecting and getting to one or more of them."[67]

The focus of this type of planning is on the planning process and by nature is a dynamic rather than a static orientation. This dynamic view is critical to creating an effective planning process. The history of campus facility master plans supports the use of this process because viewing the master plan as a static entity has proven to be ineffective.

Peterson identifies six theoretical models and approaches to planning within college and universities. Three of these models fall within the rational approach and include formal, organizational development, and technocratic/empirical types of planning. The other three models are the philosophical synthesis, political advocacy, and coordinated anarchy styles of planning. Each is described briefly below.

Based upon Peterson's review, the formal-rational model of planning is the most widely accepted and complete approach to planning both in higher education and in other organizations. This approach assumes a comprehensive sequence of planning elements and includes formulation of a mission, development of goals, establishment of broad program and resource allocation strategies, selection and design of action plans, implementation and evaluation, and review. The intent is a self assessing and self correcting spiral of comprehensive planning activities. Such an approach gives high visibility and continuity to the planning process within the institution. Organizations, however, are not always rational in their decision-making, and planning processes

can become incremental in terms of their impact and the change that results from this type of planning.

A second rational model is the organizational development approach which has as its focus a human relations tradition in which the planning process is concerned with the needs and abilities of individuals within the organization. Planning is concerned with innovation and change in an experimental or trial and error environment. The advantage of such an approach lies in its emphasis on change and on the strong motivating force it provides individuals within the organization. A disadvantage is the tendency to rely on outsiders, such as consultants, to act as the major forces in producing change, oftentimes an ineffective method.

The last of the rational models is the technocratic empirical approach. This style emphasizes techniques that are quantitative and information based. Forecasting, resource allocation models, and delphi techniques are all used in this approach to planning. It focuses on analysis, precision, and the quantifiable basis for justifying strategies and decisions. Such methods sometimes are unable to deal with non-rational aspects of the organization, however, and the process tends to be somewhat divorced or separated from the governance structure of the organization.

The philosophical synthesis model does not assume a rational organized approach to planning but rather focuses on fundamental questions and issues that affect the organization and its future. Major new developments and changes often result from such a process. Examples of this approach are found in higher education institutions that take on a unique or even radical mission. This is a value dominated planning style that has been successful in only limited situations. There is little process involved in this approach, and it tends to be a relatively ad hoc approach to planning.

The political advocacy model uses the workings of the political decision-making process as the foundation for planning. Context analysis, interest group articulation, policy formulation, legislative transformation, and enactment are the components of such an approach. The model views the organization as composed of a series of interest groups who resolve conflicts and make

decisions with respect to priorities and issues. Advocacy and power are key elements in this process. The appeal of this type of process is that the reality of many organizations, or at least the resolution of some issues, fits this model closely. The arguments against it are that it is quite easy in an advocacy style to lose a sense of mission or direction. Instead issues are usually resolved on a piecemeal basis rather than within the context of overall goals and objectives.

The last basic planning model, coordinated anarchy views the organization as a diverse set of autonomous units. It emphasizes planning at the unit level, while the central organization attempts to reflect direction and mission through allocations and support, or lack of support, of the units. The overall organization at development reflects the movement of the various units. The process is pluralistic in that the planning task attempts to foster and accommodate individual units. This model is spontaneous and allows for rapid change. It also assumes that units are capable of changing quickly or will tend to support those that do, leading to the potential of overextension or imbalance. Maintaining or achieving balance in the organization is very difficult under such an approach.[68]

The presentation of these planning models and processes, the description of master planning concepts, and the historical literature review all provide the framework for undertaking the investigation of the central question of this reseach. The central question is: Can a master planning process in the contemporary college and university environment successfully bring order and a sense of community among buildings on a campus?

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Chapter 3

A Methodological Approach to the Study of Campus Master Planning

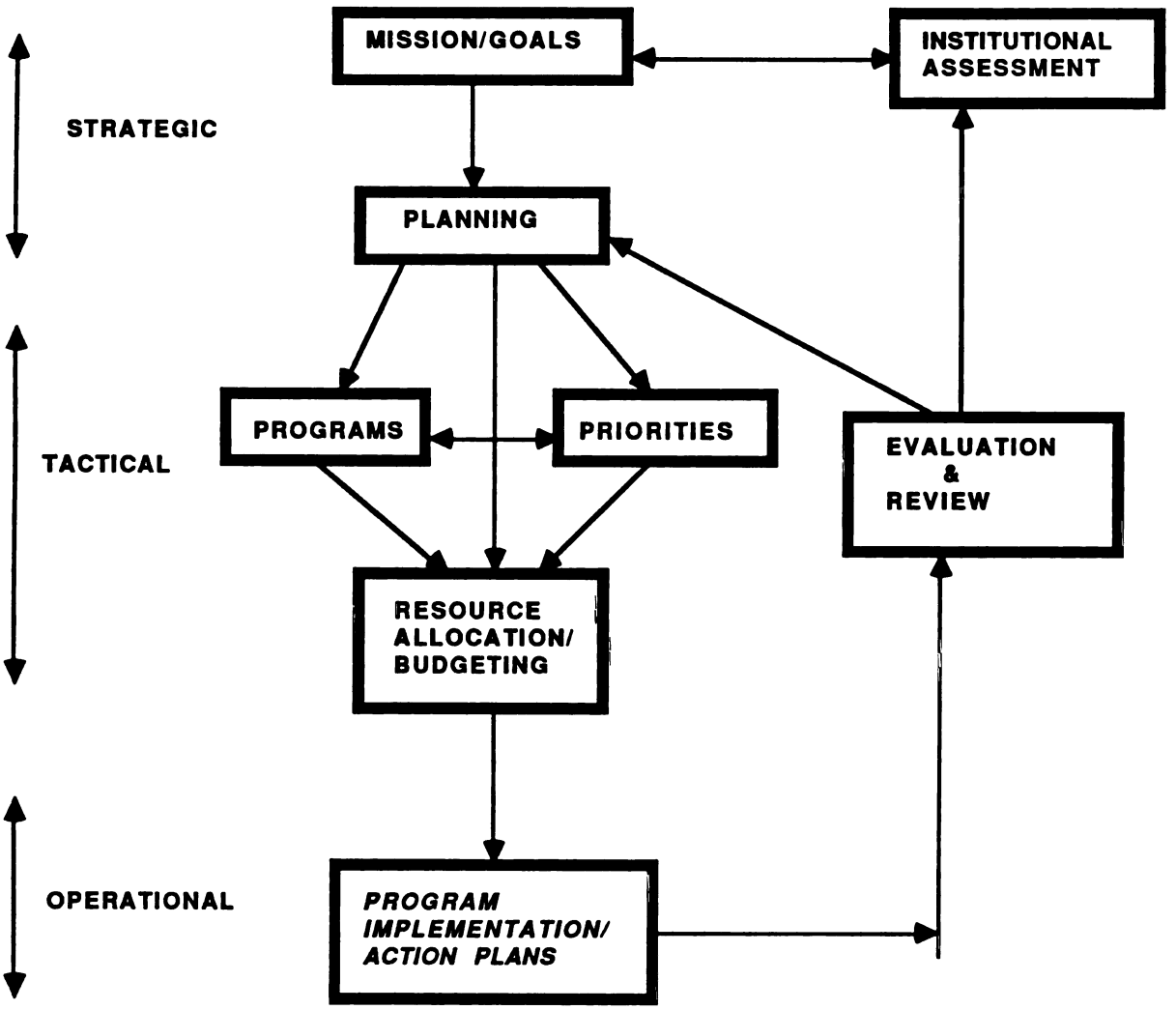
Chapter 3 describes the inquiry structure which forms the basis for the development of the case analyses. The structure focuses on the key variables in the master planning process that influence the ultimate implementation of such plans. Chapter 3 will also describe and summarize the methodological approach for this investigation. It reviews the nature of exploratory and descriptive research and explains the case study methodology, including the benefits, limitations and data collection techniques of this type of approach. The various stages of the research will also be described. These include the criteria and process for selection of the four cases, the specific types of data collection techniques, and the basis for case analysis.

Inquiry Structure -- Linkage to Campus Master Planning

While no one model described by Peterson in the previous chapter fits all possible situations, and pieces of each are evident in many organizations, it is apparent that the rational approaches to planning are more prevalent and more widely utilized than non-rational ones. In addition, campus facility master planning lends itself more naturally to the rational model. Mission, goals, strategies, resource allocation, project (building) implementation, and evaluation are all important to the determination of an effective facility planning process. Therefore in terms of the case analysis approach utilized in this effort, the rational model will be assumed as the underlying framework for the analysis of facility planning processes. Figure 3-1 identifies Peterson's basic structure for the rational planning model.

FIGURE 3-1

THE RATIONAL PLANNING MODEL



The planning cycle has three major components which are strategic, tactical, and operational. The strategic portion deals with broad issues of assessment, both internal and external, and with their relationship to the overall institutional mission. The tactical and operational portions are primarily designed to assure the implementation of institutional priorities and include the development of the plan itself, resource allocation to effectuate the plan, actual implementation, and finally evaluation. These key tactical and operational components provide the focus for this case analysis as they are the mechanisms that organizations use to assure implementation of their plans.

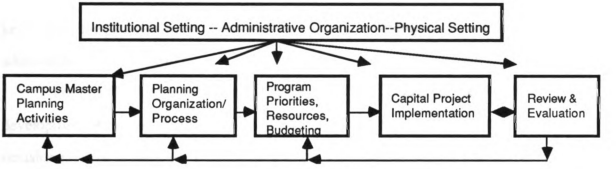
The framework provided by the rational planning model served as a guide for the identification of an overall inquiry structure. This exploratory empirical investigation requires such a framework since the profession has provided neither a theoretical model nor a set of hypotheses for the establishment of procedures or processes to guide the implementation of campus facility plans. An inquiry framework or structure is a systematic organization of concepts, characteristics and key variables that serve as a guide. The investigation is intended, by way of the case study approach, to identify methods or models of organizational functions for implementing facility planning. The analysis was flexible in that several components from one or more of the cases were useful in drawing conclusions or developing recommendations. This approach to investigation is similar to that employed by Nick Poulton in his study of the impact of planning activities at five public and private research universities, although the focus of the research is quite different. Poulton studied and compared the impacts of different planning techniques on central administrative operations. The purpose of Poulton's research was to describe and analyze how selected planning techniques changed the kinds of decisions and processes of decision-making for allocating resources and changed the operating characteristics of the institution apart from influencing specific decisions.[1] This study focuses on a related problem -- how to determine the way institutions might best implement a set of specifically identified building

identified building plans so that planning can best be organized to improve implementation of these campus facility plans.

The key components for this inquiry are the organizational and physical setting, the type of facility master planning utilized by the institution (Table 2-1), the planning organization and process, facility program priorities/resource allocation/capital budgeting techniques, capital project implementation processes, and review/evaluation mechanisms. The interaction and relationship of these various components are the subject of this inquiry. Figure 3-2 provides both an outline of this inquiry structure and the detailed set of variables to be investigated. This structure utilizes the key components of the rational model applied to facility master planning.

FIGURE 3-2

INQUIRY STRUCTURE



Campus Master Planning Activities	Planning Org. Process	Program Prior. Resources, Budget	Capital Project. Implementation	Review & Evaluation
1.Type of Plan a. Time Frame b. Area c. Program Specificity d. Design Character	1.Decision-Making Process 2. Org. Placement a. Staffing b. Linkages c. Responsibilities 3. Participation, Membership 4. Relationship To Institutional Planning	1. Capital Budgeting Outlay-Process 2. Financing 3. Priorities 4. Org. Placement a. Staffing b. Linkages c. Responsibilities 5. Participation, Membership 6. Relationship To Master Plan	1. Org. Placement a. Staffing b. Linkages c. Responsibilities 2. Detailed Program Development-Approval 3. Architect Selection 4. Cost Estimating 5. Project Bidding Proc. 6. Design Development 7. Construction Supervision/ Monitoring	1. Org. Placement a. Staffing b. Linkages c. Responsibilities d. Interrelationships 2. Program 3. Budget 4. Design 5. Master Plan

Organizational and physical setting refers to the administrative organization and basic decision-making structure of the institutions selected for the case study. While the institutions were limited to private research universities, the particular administrative style, communication mechanisms, and the participatory nature of decision making in each one were important variables. In addition the physical environment, the campus setting, and the relationship of the organization to the local community influence each institution's planning process. Differences in these areas were not the primary focus of the study, however.

The types of facility planning activities were limited to those outlined previously in Table 2-1. These focus on the planning time frame, the physical area under consideration, the degree of program specification, and the design criteria itemized in the plan were the common variables used for comparative analysis. The analysis concentrated on the relationship of these various planning types to the other inquiry variables since this is the key to effective planning based upon the theoretical framework of the rational model. In addition the nature of organizational participation and plan flexibility was investigated.

The planning organization/process involves the mechanisms that lead to the development of the plan, the front end of the process. This involved identification of the decision-makers, groups, and individuals who carried responsibility for this activity as well as determination of the process by which plans were developed. Participation, membership, staffing, needs determination, organizational placement and linkages, and relationship to overall institutional planning were investigated. The roles of the various actors or groups in this process were critical to understanding how the process works.

Program priorities, resource allocation and capital budgeting constitute the set of variables critical to institutional decisions as a plan's implementation process begins. The primary focus here was on institutional decision-making techniques and processes that led to capital or facility projects. In Peterson's rational model this is referred to as the tactical

segment. Budgeting procedures and institutional funding strategies have a significant impact on plan implementation. Again this involved identification of the decision-makers, groups and individuals who had responsibility for these functions as well as determination of the process by which decisions were made. Decision-making processes were investigated and the focus included participation, membership, organizational placement and linkages, and the relationship between capital budgeting and facility master planning.

Capital project implementation refers to the key set of activities and processes involved in implementing the planning and budgeting decisions made by the organization and is the operational component of the rational model. These items include program development for the project, architect selection, cost estimating, project bidding procedures, design development, and construction supervision. As with the other variables, decision-makers, groups and individuals who had responsibility for these functions were identified, and the process by which these responsibilities were carried out was investigated.

Review and evaluation is closely tied to project implementation procedures and includes program, design, budget, and master plan review. These are also key parts of the implementation process, and responsibility for these functions and how they were carried out was identified. This part of the investigation focused on the interrelationships of these reviews within the context of the original plan, their role in the overall process, and their impact upon the master plan and the master planning process.

The combination and interaction of these sets of variables formed the foundation of this investigation. The case analysis methodology was used to isolate those sets of factors from the inquiry variables described above that had significant bearing on master plan implementation and,provided the foundation for the identification of a model for dealing with this problem of plan implementation.

Methodology: The Nature of Exploratory and Descriptive Research

Claire Sellitz, Lawrence Wrightsman, and Stuart Cook identify four major purposes for research. These are: (1) to gain familiarity with a phenomenon or to achieve new insights into it in order to formulate a more precise research problem or develop a hypothesis; (2) to portray accurately the characteristics of a particular individual, situation, or group, with or without a specific hypothesis; (3) to determine the frequency with which something occurs or with which it is associated with something else, usually with a given hypothesis, and (4) to test a hypothesis of a causal relationship between variables. Studies that serve the first purpose are classified as formulative or exploratory. Studies that meet the objectives of the second and third type require more formal design and are therefore classified as descriptive. The fourth purpose lends itself most neatly to experimentation.[2]

The nature of this investigation of campus facility planning processes falls under the first two of these purposes and therefore was both exploratory and descriptive in nature. The study was exploratory in that the objective was to gain insight into the organizational facility planning and implementation processes of institutions. Sellitz, et. al. describe three basic methods for conducting exploratory research. These include a review of the related literature, a survey of people with relevant experience with the problem, and analysis of insight-stimulating examples.[3] The literature review presented in Chapter 2 points out the inadequacy of that approach for this particular problem. A survey of people with relevant experience in combination with analysis of insight-stimulating examples does meet the stated objective. Insight-stimulating examples require an intensive approach to the study as well as the ability to integrate diverse pieces of information into a unified interpretation or pattern. Case studies that have sharp contrasts or have striking features are useful, since in exploratory work the identification of minor differences is difficult. [4]

The study also is descriptive in nature since it will attempt to portray accurately the the process characteristics of each organization. Descriptive studies require a more formal

and rigorous approach to the investigation. Such a study must include a problem statement and methods for data collection, sample selection, data verification and analysis of results.[5]

The Case Study Approach

Robert K. Yin argues that the need for case studies arises out of the desire to understand complex social phenomena and that such an approach can satisfy the range of research strategies -- exploratory, descriptive, or explanatory. The case study strategy is appropriate where the form of the research question is "how" or "why" based, the investigator has no control over the the behavior or events being studied, and the focus is on contemporary rather than simply historical events. Yin provides the following technical definition for case study research.

> A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used.[6]

Paul B. Foreman states that the case study approach is useful for four types of problems. These are: (1) where the immediate problem is to open a field of research, (2) where the problem demands further conceptualization of factors or functions affecting a given activity, (3) where the problem demands emphasis on the pattern of interpretation given by subjects or functionaries, and (4) where the problem is to determine the particular pattern of factors significant in a given case.[7]

The research question posed for this investigation fits the case study requirements. The basic investigation centered on the issue of how institutions implement facility master plans to achieve a sense of order for their campuses and therefore was both exploratory and potentially descriptive. There was no possibility of control over the events involved in such a process and the problem at hand was contemporary since the focus wasn't solely

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historical. This investigation focused on the last three conditions identified by Foreman which include further conceptualization of the problem and the identification and interpretation of a pattern of significant factors in the cases.

While it is clear that the case study approach is useful in the investigation of a problem of this type, the case study research method has limitations. Formal methods of exploratory research are not well developed.[8] Case studies also have drawbacks in terms of their usefulness for theory construction. They are situation specific, ahistorical, tacitly prescriptive, and one-sided.[9] Even with these limitations, the case study approach was chosen for this investigation since the limitations were addressed through the case study design which included multiple case studies, multiple methods of data collection that include both current and recent past experience, a questionnaire that was both structured and open-ended, and comparative cross case analysis.

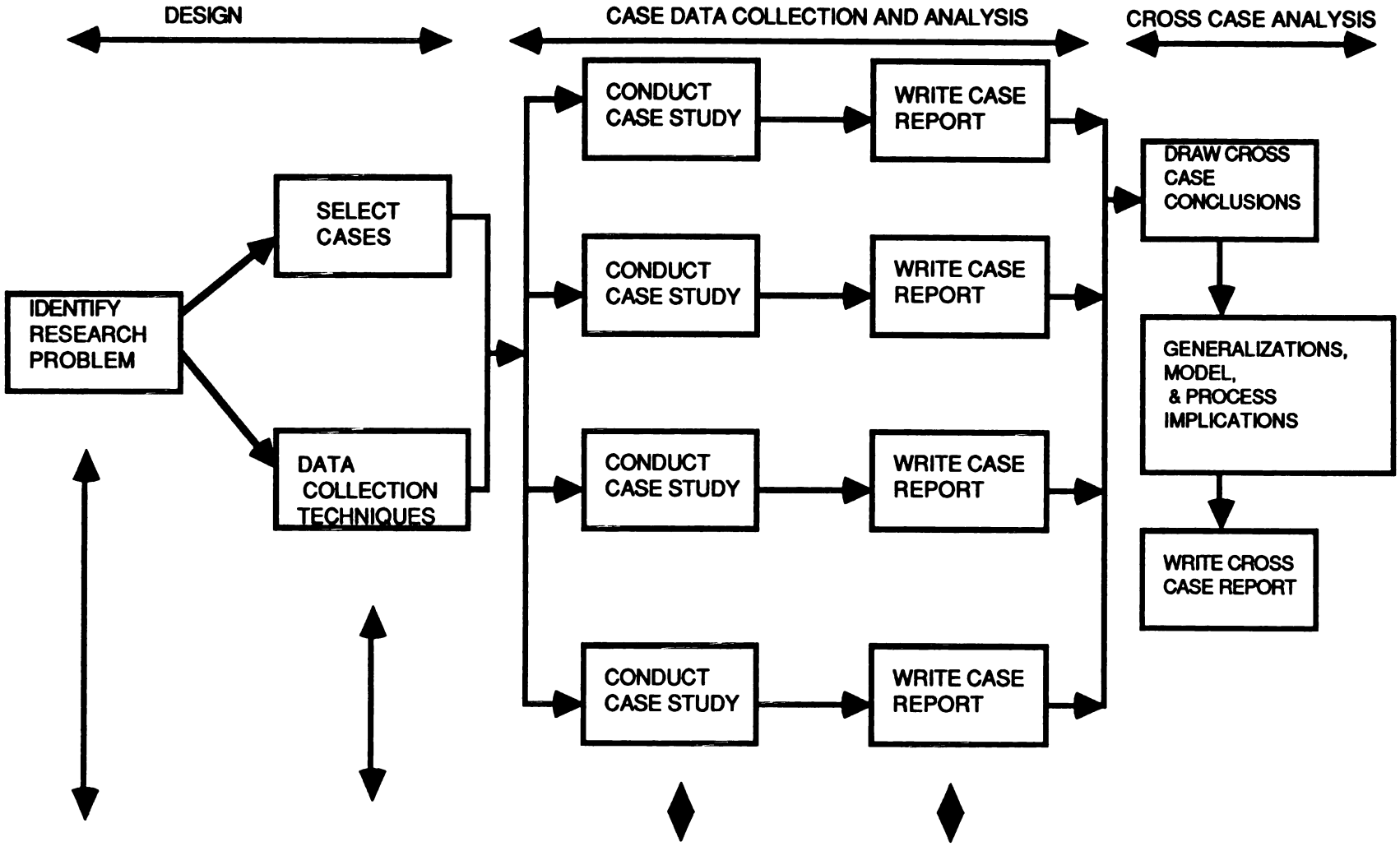
Multiple case studies were utilized to allow for the identification of patterns or the replication of organizations or processes, and for the development of empirical generalizations regarding the critical variables outlined in the inquiry structure presented in Chapter 2.[10] Multiple methods of data collection and the questionnaire were necessary to improve the reliability of the data and to allow for more accurate description of the cases. The objective of the cross case comparative analysis was to:

> ...obtain accurate evidence regarding emergent categories and concepts and identify empirical generalizations regarding the properties of category or concept and the extent to which properties apply.[11]

Figure 3-3 summarizes the overall case study design and identifies the the major stages of the research effort.

FIGURE 3-3
CASE STUDY RESEARCH DESIGN

FIGURE 3-3
CASE STUDY RESEARCH DESIGN



Research Stages

The investigation was conducted in three major stages: (1) the selection of the four institutions for the case studies, (2) the collection of information which included review of pertinent documents and the completion of the questionnaire during site visit interviews, and (3) the analysis of the individual cases, and comparative analysis of the four institutions. The last two stages overlapped somewhat since data were being analyzed for one case while another was being conducted.

Selection of Cases

A number of criteria were utilized to select the case studies. These criteria included type of institutional control, program complexity, the nature of the facility development process, the physical setting of the campus, and willingness of the institution to participate in a study of this type. Institutional control and program complexity are closely related in this instance. Institutional control is important in terms of the amount of direct influence an institution has over its own facility development process. The ability of private universities to influence their own process is significantly greater than that of public universities since public institutions are subject to pressures and constraints from state governments that are outside their direct control. Program complexity influences the process in terms of the pressures generated by institutions with significant research programs, fund-raising activities, and a mix of academic programs that lead to competition for both students and faculty. Planning for the long term facility development of institutions of this type is difficult since the impetus for change can come from so many different directions. Donors, research sponsors, faculty and students can all influence specific building projects. These pressures are what make the process of implementing master plans so difficult; they are most prevalent and acute in major research universities. Therefore the set of institutions was limited to the 27 major private research universities so designated by the American Association of Universities.

The American Association of Universities, founded in 1900, currently consists of fifty-four American and two Canadian universities with strong programs of graduate and professional education and scholarly research. Membership in the association is by invitation only and requires the assent of three-fourths of the membership. The association serves its members through activities designed to encourage timely consideration of major issues affecting the quality of academic research and graduate and professional education to enable its member institutions to communicate more effectively with the federal government.[12] The 27 private American institutions within this group all have significant research programs, sizeable endowments, major fundraising activities, a diverse set of academic offerings, highly selective admissions policies, and they exist in a very competitive market for faculty. Appendix A provides summary statistics related to these factors for the 27 institutions.

Most of these institutions have existed since at least 1900 and have experienced the evolution of attitudes towards master planning and architecture in this country that were described in Chapter 2. Institutions of this age also have had the opportunity to build numerous buildings and to develop campus master plans. The physical setting is important in terms of the past success that an institution has had in achieving Klauders' sense of order and in the amount of flexibility and control that an institution has over its campus. Open spaces, architectural identity, and integration with the surrounding community are all factors that influence an institution's master planning process.

The attitude of institutions about facility master planning and a concern for the objective of developing a sense of place or order for their campuses was essential to the study. While the nature of the institutional master planning process was a major focus of the case study some initial investigation was undertaken in order to determine whether or not the institution supported this overall objective for the development of its facilities. It was also important to have a balance or range of master planning activities among the

institutions selected for case study analysis since, as Sellitz, et. al. point out, the identification of minor differences is quite difficult in exploratory studies of this type.

Lastly, institutions which met the above criteria also must have been willing to participate in the case study. A contact person was necessary to act as a resource in selecting key individuals for interviews, to provide access to documents and necessary supporting information, and to critique the case study results.

The four institutions selected for the case studies were not chosen as a result of a statistically based survey but rather through more informal inquiry. Since the population of 27 institutions is quite homogeneous with respect to the criteria of institutional control and program complexity the case study results, comparative analysis and recommendations can be generalized to the set of AAU private-research universities. Given this, the type of overall approach to facility master planning and willingness to participate were key in the selection process. Further identification of potential candidates began as part of an informal survey conducted through the Office of University Planning at Carnegie Mellon University that was designed to identify the nature and organization of facility planning at a number of comparative institutions. This survey was expanded for purposes of this investigation to the full set of AAU private-research universities. The results of this informal survey are reported in Appendix B. Institutions that did not adhere to the overall objective for campus development cited above were eliminated from consideration. The selection process focused on institutions that were committed to facility planning as a guide to their future development and also had recent experience with developing or implementing plans. There was not an attempt to limit the institutions selected to a single facility or master planning approach. In fact, for the purposes of case analysis and comparison a variety of approaches were sought. Given these objectives, the survey results, and informal discussion regarding their willingness to participate, four institutions were invited to be the subject of this case study. The four institutions selected for the case studies were the

Massachusetts Institute of Technology, Northwestern University, the University of Pennsylvania, and the University of Rochester.

Data Collection

Robert K. Yin identifies six different sources of evidence and three essential data collection principles for case study research. The six sources of evidence are documentation, archival records, interviews, direct observation, participant-observation, and physical artifacts. The three data collection principles are the use of multiple data sources, the creation of a case study data base, and maintaining a chain of evidence.[13]

For the purposes of this study only the first three of the six evidence sources cited above were appropriate since the two methods of observation and physical artifacts were not relevant for a study of this type. The data collection included documentation, archival records and interviews of key personnel. Documentation involved the use of internal memoranda, reports, studies, evaluations, minutes of committee meetings, etc. Archival information included organizational charts, position descriptions, job titles, calendars, etc. Interviews were in part both open-ended and focused. The interviews were designed to identify not only how key elements of the planning and implementation processes worked but also to determine the attitude of the various respondents toward these key factors. The interview guide is presented in Appendix C. These various data sources were targeted to provide information regarding the variables identified as part of the inquiry structure presented in Figure 3-2.

Yin's three essential principles were also followed. A process which improved the validity of the case included the use of multiple sources of information which provided for cross checking of the findings, helped in the identification of key patterns, and assisted in corroborating the conclusion drawn from each case. A data base was developed that contains the documentation and results of the various interview sessions(see Appendix D). This served to provide both the background information and the supporting evidence for the case reports. Finally, in order to maintain the chain of evidence, a contact person at

each institution was identified who provided access to and assisted in the interpretation of documents, arranged for interviews of key personnel, and provided a critique of the interviewing guide and the case study report.

Case Study Analysis and Verification

The general strategy for case study analysis involved the development of a case study description. The descriptions for each case were organized around the inquiry structure outlined in Figure 3-2 to include the type of master planning activity, the planning organization and processes, the method of priority and budgetary decision-making, the process of capital project implementation, and review and evaluation procedures. Interview notes and document analysis were segmented into these major areas. Each case and each inquiry area was studied with the intent of accurately describing processes and procedures, identifying patterns both across the set of variables and those that developed over time for a given variable, and uncovering logical or consistent relationships among the critical variables.

The analyses took place at two levels. The individual case studies evaluated how each institution performed with regard to these critical variables. Outcomes were also analyzed across the set of institutions, and conclusions were identified concerning the effectiveness of these approaches for each of the critical variables.[14] Based upon this research, a model was developed that could serve as a guide to implementing a master planning and facility development process.

Verification of the case studies was achieved in a number of ways. Information gained from document analysis was cross checked with key informants where appropriate. In addition, during the interview process cross checks were made among informants in order to improve the validity of the interview data. Lastly, the case report was reviewed and critiqued by the key contact person in each institution

Introduction of the Case Studies

The four institutions were all involved in significant campus facility master planning efforts. Both Northwestern and MIT had long standing master planning processes for their campuses directed by staff who have been involved with these activities since the 1960s. Penn and Rochester are currently in the process of developing comprehensive campus master plans after extended periods without such planning.

Responsibilities for master planning and facility development were concentrated in a single vice president at MIT, Rochester, and Penn. Penn, however, delegated master planning functions to a faculty member in the Architecture Department on a contractual basis. Northwestern delegated responsibilities for master planning to the Associate Provost and while facility development were assigned to the University Architect who reported to the Vice President for Business Affairs.

Capital budgeting procedures were weak at Penn, Rochester and Northwestern. Only MIT had a well structured capital budgeting process that was integrated with overall facility planning. The other three institutions were all in the process of developing a more formal and integrated capital budgeting approach. This interest in improved capital budgeting procedures resulted from the increase in demand for additional facilities, and the availability of debt financing.

The facility development processes, which include programming, design and construction activities, were well formulated and have been in place for over twenty years at both MIT and Northwestern. Such processes were not well developed at Penn or Rochester, but both institutions were in the midst of correcting this situation.

The case studies present the detailed analysis of campus master planning and facility development processes at each institution. The following four chapters present the case studies in the order of the campus visits.

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1 Nick E. Poulton, Impacts of Planning Activities in Research Universities: A Comparative Analysis for Five Institutional Experiences, (PH.D. Dissertation, The University of Michigan, Ann Arbor, 1979), p. 19-21.

2 Claire Sellitz, Lawrence S. Wrightsman, Stuart W. Cook, Research Methods in Social Relations (New York: NY, Holt, Rinehart and Winston, 1976), p. 90.

3 Sellitz, et. al., op. cit., p. 92.

4 Sellitz, et. al., op. cit., p. 101.

5 Sellitz, et. al., op. cit., pp. 101-111.

6 Robert K. Yin, Case Study Research: Design and Methods, (Beverly Hills, Ca.: Sage Publications, 1984) pp. 13-26.

7 Paul B. Foreman, "The Theory of Case Studies," reprinted in Billy J. Franklin, and Harold W. Osborne, eds., Research Methods: Issues and Insights (Belmont, Ca.: Wadsworth, 1971) p. 204.

8 Stanley H. Udy Jr.., "The Comparative Analysis of Organizations," in James G. March, ed., Handbook of Organizations (Chicago, Ill.: Rand McNally, 1965) pp. 683-684.

9 Karl Weick, The Social Psychology of Organizing (Reading, Ma.: Addison-Wesley, 1969), p. 18.

10 Yin, op. cit., pp. 41-53.

11 Barney G. Glaser and Anslem L. Strauss, The Discovery of Grounded Theory: Strategies for Qualitative Research (Chicago, Ill.: Aldine, 1967) p. 22-25.

12 Association of American Universities, (Washington D.C.,1986)

13 Yin, op.cit., pp. 78-98.

14 Poulton, op.cit., p. 58.

Chapter 4

Northwestern University -- A Case Study

Introduction

This case study presents the organizational structure and process utilized by Northwestern University with regard to facility development. The case study demonstrates a structured team approach for programming, designing and building facilities within an overall facility planning and decision making process. Northwestern's success in this area is built upon the particular organizational arrangements that take advantage of the roles and tenure of two key staff members in combination with a process for planning and decision making that has been consistently applied to construction and renovation projects for more than two decades.

Institutional Profile

Northwestern University was founded in 1851 by a local group of professional people with the objective of creating an institution of the highest order of excellence to serve the people of the Northwest Territory. Two years later the founders purchased a site twelve miles north of Chicago, Illinois. The town that grew up around this site was named Evanston in honor of one of the founders of the university. By 1900 the university was composed of seven undergraduate and graduate professional schools which included programs in law, medicine, and dentistry. Northwestern was also a pioneer in the education of women, enrolling its first female student in 1869. In 1910, Northwestern established the Graduate School and adopted the German university model of emphasizing graduate education and research in addition to undergraduate programs.

Today as a major research university, Northwestern belongs to the American Association of Universities. The AAU group comprises the nation's most distinguished institutions in terms of the nature and magnitude of their research and graduate programs.

Northwestern has expanded to two lakefront campuses, the original in Evanston and a second campus in Chicago. The Evanston campus houses the College of Arts and Sciences, the School of Speech, the School of Music, the J.L. Kellogg Graduate School of Management, the Technological Institute (formerly the engineering college), the Graduate School, the Summer Session, the Medill School of Journalism, the School of Education and various administrative, research, athletic and academic support units. The Chicago campus houses the Medical School, the School of Law, the Dental School, the University College (continuing education), the McGaw Medical Center, the Managers Program (the evening business program) as well as various support functions. The University has grown to employ 1400 full-time faculty, a total enrollment of 12,000 full time students of which 6,800 are undergraduates and 5,200 graduate students. The annual budget is approximately $300,000,000.[1]

In recent decades Northwestern's physical expansion has matched the growth of its academic and research program. The period immediately following World War II transformed the university in a dramatic way, especially the Evanston campus. The campus is located in a primarily residential area just north of the Evanston business district. Sheridan Road, a major north-south thoroughfare, bisects the campus. In general, the primary academic facilities, along with a residence complex reside to the east of Sheridan Road while administrative, recreational and dormitory facilities are located to the west. The expansion of physical facilities there took place in two major phases, the first during the 1950's and early 1960's and the second during the mid 1960's and 1970's. The current map of the Evanston campus is provided in Appendix F.

An overall campus plan did not guide the construction of facilities built during the 1950's and early 1960's. The construction during the first phase was in response to rapid growth in enrollment and programs; therefore, the prime focus was on the development of facilities that would provide space in an economical and reasonable way. Major dormitory space was added to the campus near existing student housing facilities on the northern and

southwestern areas of the campus (Sargent, Bobb, McCulloch, Shepard, and Allison Halls). A major classroom and office facility, Kresge Centennial Hall was built on the southeastern portion of the campus. Expansion of science and engineering facilities were accomplished with an addition to the Technological Institute. With urgent and immediate space needs met, the university took a longer term view as it moved into the mid-1960's, a view concerned with both expansion and aesthetics. An administrator commented that "the building of the fifties was to meet the needs of the present; the building of the sixties was aimed toward the goals of the future."[2]

The second phase of facility expansion included two major features, the first of which involved an ambitious development plan that included a landfill which extended the Evanston campus into Lake Michigan and added 84 acres to the campus. Given the lack of available land on the existing campus this extension was designed to support future growth. The firm of Skidmore Owings and Merrill was commissioned to develop a comprehensive plan for this new space. The first portion of this landfill was completed in 1964 and named the J. Roscoe Miller campus. A second ten acre fill was completed in 1968. During this period and into the 1970's the plan was implemented and included a number of major facilities including Vogelback Computing Center, the University Library, Norris Student center, science facilities, Lindheimer Astronomy Center, and a number of science and fine arts facilities. A second major feature of this period was the establishment of Faculty Planning Committee's. The first of these committees developed plans for the University Library building. The role of such committees would become an important feature in the development of the campus during the 1970's and 1980's.

Northwestern University is recognized as one of the leading institutions of higher education in the country. The campus, the facilities, the university organization and the process for facility development provide an excellent basis for a case study of campus facility planning.

Campus Facility Planning -- Master Planning

Current facility planning at Northwestern University is influenced by the experience of the University during the 1960's when the comprehensive campus master plan for the 1970's was completed. At that time the Chicago Office of the architectural firm Skidmore Owings and Merrill, prepared a master plan for the lakefill addition to the Evanston campus. The master plan coincided with expansion plans of the University and has served as a major guide for the development of the campus. Plans developed for the campus during the 1930's and 1940's were not as comprehensive or as influential as the later plan. In fact desires of the earlier plans for a more rigid adherence to gothic style architecture were rejected in order to allow future facilities to have their own unique style and character.[3]

During this period a major effort was undertaken to develop overall academic plans that would ultimately serve as the basis for future programs, staffing and the long term facility needs of the university. The Faculty Planning Committees, created initially for the University Library building were the vehicle by which this was achieved. This concept has survived to the present time although they are now called Building Program Committees.

The Skidmore Owings and Merrill (SOM) plan established development zones for the lakefill addition, which was called the J. Roscoe Miller campus. Under this plan the area was to be divided into three intellectual zones: north a science-engineering complex; center a social science complex; and south, a humanities-fine arts complex. A student center and campus lecture center were to be built in the middle directly east of the planned University Library which SOM was also designing at that time. Dormitories were to expand along the outskirts of this area .[4] The planning effort also encompassed a number of other related campus needs in addition to the siting of future facilities. These included detailed and targeted studies concerning traffic routings, utility systems, landscaping and the development of the medical campus. The focus of the plan was this new landfill area since this is where most future facility growth would occur. The strategic decision to

expand the campus into Lake Michigan allowed the University to approach this area in a comprehensive manner, in a sense building a new campus. The Skidmore plan did not extend to the west across Sheridan Road where opportunities for expansion were much more limited and also required land acquisition.

In fact the construction of the Rebecca Crown administration center, located in the southwest corner of the campus predated the SOM's plan for the seventies. Other major facilities on this part of the campus, such as the Bloomquist Recreation building and the Foster Walker dormitory complex were planned and constructed independently of the campus plan. The focus of the campus development at Northwestern has been on the lakefill addition and in fact the majority of campus construction since the early 1960's has taken place in this area. Much of the plan has been implemented and the buildings have followed the general zoning pattern laid out in the initial plan. A recreation and aquatics center building, built in 1987 in the northern portion of the lakefill area and the fact that no dormitories have been built in this area are the only major divergences from the plan to date. This was the last formal campus plan for Northwestern; it has served the campus for over twenty years.

Two of the key staff members who were involved in the development of the SOM plan are still employed by the University and play a significant role in facility planning. These two positions include that of the Associate Provost and the University Architect. Responsibility for the evolution of the campus master plan has rested with these two individuals during this entire period.

These individuals view the plan as an informal document that permits flexibility in siting and program content of potential facilities, i.e. the zone concept where building of similar program types are located near each other. Formal campus-wide planning schemes such as major quadrangles, campus greens or malls, and axial alignment of buildings so prevalent in many campus plans are not present in the Northwestern plan. Instead informal placement and siting of buildings on the available landscape within the overall zone concept

has been the major tenant of the organization of the campus and this was further emphasized in the SOM plan for the J. Roscoe Miller campus area. While a number of student dorm quadrangles exist on the campus along Emerson Street and Sheridan Road in the northern area of the campus, these predate the SOM plan and were not developed as part of some grand overall scheme of campus organization but rather built independently without reference or relationship to other existing or future planned facilities.

The University Architect refers to a loose-leaf type plan which does not prescribe specific building siting requirements but rather lays down more general land use patterns in zones of similar or related facilities that together provide an overall development scheme for this area of the campus.[5] Over the years the plan has been generally adhered to in terms of the siting of major facilities, supervised by these two individuals who have primary responsibility for analysis and recommendations to the executive group regarding the siting of future buildings. A recent departure from the plan resulted when the recreation and aquatics facility was located within the science and engineering area of the J. Roscoe Miller campus. The original plan would have placed this facility in the center potion of the campus.

At the time of this master planning effort, a number of key organizational strategies were put into place which have helped insure the life of the plan. These included the establishment of Building Program Committees which were essentially responsible for the development of program requirements for new facilities, the delegation of responsibility for campus facility planning to the person that eventually became the Associate Provost, and the growth in functions and influence of the position of University Architect.

The process of assigning program development functions to this Building Program Committee has been in place at Northwestern since the 1960's, grew out of the planning efforts for the University Library building and serves as a primary mechanism for constantly updating and reevaluating the campus plan each time a particular building project is undertaken. Each committee is chaired by a senior administrator such as a Dean, for the

particular program area to be served by the new facility and includes a number of key personnel involved in these programs along with the Associate Provost and the University Architect.

The Associate Provost is the key university staff member regarding academic planning and in addition to facility and space planning is involved in Northwestern's program review process. The Associate Provost is concerned with all facets of planning related to academic units and to overall institutional facility planning. During the program development phase of the project the Associate Provost is responsible for maintaining a vision of how the proposed facility will fit with the overall campus plan. He must also insure that the program requirements are consistent with the university's academic or operational plans. The involvement of the Associate Provost in both the academic planning process in conjunction with his role with the Building Program Committees therefore insures a measure of consistency between current plans and institutional program and facility aspirations. It also contributes a level of institutional memory for the process.

The University Architect or his designee also serves on the Building Program Committee and provides support to the Committee and the Associate Provost regarding issues of siting or design. He also plays the primary role in translating program requirements into specific facility and space needs. As a project moves from the conceptual and planning stages to implementation, the role of the University Architect moves from support to supervision.

This planning process evolved from the efforts undertaken during the the 1960's when both the process and the people were put into place. A chart of the organizational structure that eventually emerged appears on page 71. The role of Associate Provost evolved from the position of Planning Coordinator. The Planning Office was responsible for all facets of facility planning and was also responsible for design and construction functions. At that time, the position of University Architect reported to the Planning Coordinator. The current Associate Provost initially held the Planning Coordinator

position and was responsible for hiring the individual who now holds the position of University Architect. Over time these positions were split into two different organizations with the Planning Coordinator Position becoming the Associate Provost and reporting to the chief academic officer, the Provost. The University Architect 's office became primarily responsible for project coordination and supervision and now reports to the Vice President for Business, the chief administrative officer of the institution.

The evolution of these positions and finding individuals to fill them are major factors in the facility planning process at Northwestern. In combination with the existence of the Building Program Committees and the process of program development, Northwestern has established a facility planning mechanism that allows for regular review, debate and analysis of plans for future facilities. The institutional memory that has developed over the years about issues of facility planning, such as siting considerations, zoning, design characteristics, etc., is extensive, well entrenched and continually represented throughout the process. While this is true the concepts of the plan are now being more seriously questioned, especially by the President. An example of this is the decision to locate the recreation and aquatics center in the science and engineering zone which, as previoulsy stated, is a departure from the original plan. The need for this facility was not forecasted in the original plan and the availability of building space in this area of the campus became too great of a temptation when compared to the other sites considered. These included sites that were near the Norris Student Center and in the center of the campus along Sheridan Road. Both of these locations were more consistent with the overall plan than the chosen site. These more central locations lost out primarily due to their distance from existing residence halls.[6]

As a result of these type of tensions the administration is considering updating the campus master plan in a way that will allow codification or indexing of the major principles represented in the plan. If this plan proceeds the intention is to develop a more descriptive set of documents that represent the current state of the long term plan for Northwestern and

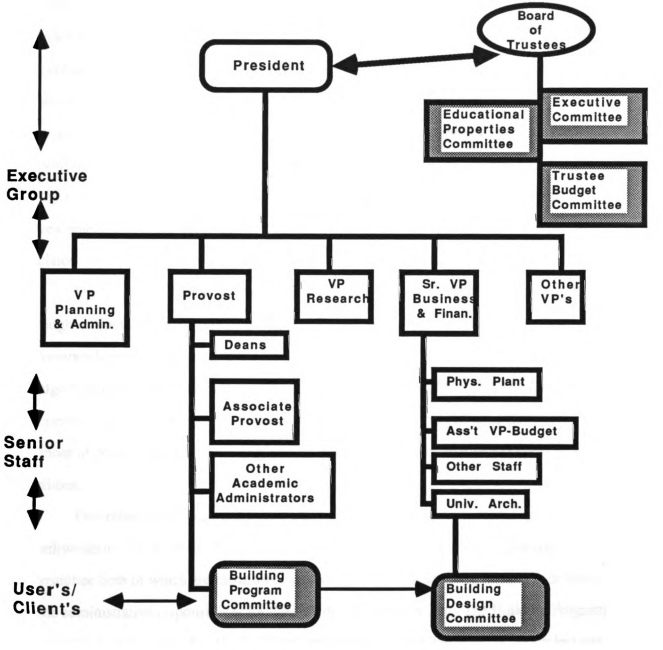
to maintain at the same time the informal or loose-leaf nature of the plan which has allowed so much flexibility in the past. Northwestern has achieved a sense of order on the campus not only in the organization of its buildings but also in the character of design and materials that are prevalent there. In the words of the University Architect the campus has a certain "ethos" that is reflected in the buildings, an ethos which is well recognized and respected within the campus community.

Organization and Administrative Environment

For the purposes of this case study it is useful to review the formal and informal organizational arrangements that are in place at Northwestern especially as they relate to the various facility planning and implementation processes. Figure 4-1 presents the formal organizational scheme that is relevant to this topic. (In order to assist the reader Figure 4-1 on page 71 should be viewed as one reads the next section.)

At the executive level, the President's cabinet consists of himself, the Vice President for Planning and Administration, the Senior Vice President for Business and Finance, the Provost, and the Vice President for Research. This group is responsible for the key policy and strategic decisions of the institution with regard to facilities as well as most other important issues. Within this group the ultimate debate takes place and final decisions are made about such matters as whether or not a building project is worth considering, siting, and funding. Issues, recommendations and information come to the cabinet through the senior staff who are involved in one way or another in all aspects of facility related decisions. These staff members include the Associate Provost; the Assistant Vice President for Budget Planning, Analysis and Allocation; and the University Architect.

Figure 4-1
Northwestern University
Organization Chart
Campus Facility Development Responsibilities



The Associate Provost reports to the the chief academic officer of the university, the Provost, and is responsible for insuring the needs of academic programs are represented in the facility planning process. The Associate Provost will also play a key role in the development of the programmatic requirements for new or renovated facilities. This is a role that is shared with the University Architect. The Assistant Vice President for Budget Planning, Analysis and Allocation reports to the Senior Vice President for Business and Finance and is primarily responsible for issues related to the funding of projects. The University Architect also reports to the Senior Vice President for Business and Finance and is responsible for assuring adequate consideration of the long-range campus physical plan. Ultimately during the life of a project, he will become administratively responsible for supervising the design and construction process.[7] By necessity and through practice, this group of senior staff works closely together during the various phases of a project's development, and at the necessary points, they bring a project to the executive cabinet for a decision.

The Board of Trustees plays a review and approval role in this organization through its committee structure. Through the President, the administration takes final recommendations for approval to the Executive Committee of the Trustees. The Trustee Budget Committee reviews and recommends action on the annual budget. The Educational Properties Committee plays a significant role in reviewing and providing advice at a number of points during the planning, design and construction of new or renovated facilities.

Two other groups play important roles in the development of facilities at Northwestern. These are the Building Program Committee and the Building Design Committee both of which are made up of individuals who will either be housed in or have some administrative responsibility for the new or renovated facility. The Building Program Committee is responsible for developing the programmatic requirements for the project and is chaired by the senior administrative official whom the building will serve. For academic

facilities the Associate Provost, while never serving as chair of the committee, plays a key role. The University Architect serves as an ex-officio member of this committee. The Building Design Committee is responsible for working with the chosen architects during the design phase of the project. The University Architect is administratively responsible for coordinating the work of this committee.

The administrative environment at Northwestern provides rather clear lines of authority in a hierarchical structure. Mechanisms for widespread input exist through the Building Program and Design committee. Issue resolution takes place at the executive cabinet level with opportunity for trustee consultation, review and involvement. Interviews with participants clearly indicate that the structure is well understood, widely accepted, and viewed as sensible. The interviews also highlighted the role and the importance of interaction among the senior staff, especially the interaction between the Associate Provost and the University Architect on issues related to the overall campus plan, siting, and program requirements.[8]

Capital Project Process

The process and procedure used by Northwestern University for the renovation of existing facilities and the construction of new buildings is outlined in Table 4-1. The major phases of the process include planning and programming, budget/resource allocation, and implementation. For each of the major phases, the primary functions are identified along with the administrative unit or group responsible for these activities. For each activity the relevant review or approval group is also identified. The remainder of this section will describe each phase of capital projects in detail.

Table 4-1

Northwestern University

Capital Project Process

Phase:	Activity Type	Responsible Organizational Unit	Approval/ Review Body
Planning & Programming	Initial Concept/ Idea	Initiating Department	Provost,VP & Executive Group
	Program Needs, Functions, Space, Budget, Requirements	Building Program Committee	Executive Group
Budget/Resource Allocation	Review Program,Costs Site, Funding, Master Plan Implications, Establish Project Budget	Executive Group & Key Staff	Board of Trustees' Committees-- Educational Properties, Executive, Budget
Key approval point for moving ahead to design phase.			
Implementation Phases:			
Design	Architect Selection	Senior Administrative Group	Executive Group & Educ. Prop. Comm.
	Preliminary Design- Floor Layouts, Exterior Design, Site Issues, Budget	Building Design Committee, Univ. Architect, External Architect	Executive Group & Educ. Prop. Comm
Key approval point for moving ahead to detailed design phase			
	Definitive Design, Working Drawings, Final Cost Estimates	External Architect, Univ. Architect	Executive Group & Educ. Prop. Comm.
Final approval point for authorization to begin construction.			
Construction	Contractor Selection, Project Oversight/ Supervision, Project Completion	Univ. Architect, Contractor(s)	Sr. Vice President Business & Finance, Executive Group Educ. Prop. Comm.

Planning and Program Development Phase

A project takes on functional definition during its planning and program development phase. This phase encompasses the initial development of a project concept or idea and proceeds to a detailed set of program requirements, definition of space arrangements, initial budget estimates, and potential schedules.

An academic department or administrative unit develops the initial idea or statement of a basic need to begin the process. In the case of academic related facilities, the facility needs are represented in a request to the Provost and to the appropriate vice president for non-academic facilities. The request briefly puts forth the programmatic rationale in terms of why additional or improved facilities are being requested. This request will include a brief description of existing and proposed space needs. The initial project is reviewed by the Provost or appropriate senior executive and then by the President and the broader executive group. Consideration will include a review of probable costs, funding opportunities, and future maintenance requirements. Approval at this stage allows the project to move into a more detailed and comprehensive planning and programming effort. Without approval, project development stops at this point.

Once the initial need has been approved by the executive group, a Building Program Committee is established to develop the program requirements for the project. A Program of Requirements document is produced by this committee. The committee is chaired by the senior program administrator to be housed in the facility and usually includes five or six individuals who represent the programs or functions affected by the project. The University Architect is an ex-officio member of the committee and, whenever appropriate, the Associate Provost also serves on the committee. Through the membership of these two individuals the concepts and vision of the overall plan with regard to siting and general program requirements become represented in the individual building project.

The Program of Requirements document is the key to providing the necessary definition and scope for the project. The document will include a specification of various

kinds of facilities, special program requirements, and estimates of square feet required to accommodate people and programs. The members of the committee that represent the programs and functions to be served in the building carry the responsibility for specifying these programmatic requirements and the relationships between functions. The University Architect assists the committee in translating program requirements into space and facility needs. Proposed project schedules and initial cost estimates will also be developed at this stage. Consultants may be used where a certain expertise or type of facility requires such assistance. The completion of this step provides a detailed set of program requirements for the project and serve as the basis for all future work on the project. The project and the program requirements then go to the executive group for review and approval of the program and establishment of the project budget.

Budget, Program and Resource Allocation Decisions

Upon receipt of the Program of Requirements document from the Building Program Committee the executive group, including the three senior staff members, review the project from a number of standpoints. For a new facility they begin by reviewing siting and long term campus plan issues. Any major questions of location or overall project scope are debated, reviewed and decided at this stage. This is an important step in making sure that the project is consistent with the institutions' overall plan and a key factor in terms of the effectiveness of the long term plan. The recent experience with the recreation and aquatics center is an example of the current state of the overall plan.

The project budget and financing potential is also reviewed at this stage. Historically the approach to this financial review has been somewhat ad hoc and not part of an overall budgetary cycle. Each project was reviewed on its own merits without a sense of the impact the project might have on the institution's overall capital budget. Often this approach led to projects proceeding without a clear understanding of how they were to be financed. An example of this problem is found in plans for renovating the Technological

Institute, a major research facility housing science and engineering programs. Plans have been developed and some initial renovation work authorized for this facility without a clear sense of the funding potential for the total project. Preliminary estimates are that the total project will cost approximately $70 million. The commitment to this project will significantly influence the University's ability to undertake other projects. The magnitude of this project and the impact it has on the University's finances is a prime reason why more attention is being paid to establishing a capital budgeting process.[9] Until recently a detailed annual budget review process has existed for Northwestern's operating budget but not for the capital budget. The Associate Vice President for Budget Planning, Analysis, and Allocation at the direction of the executive group, is now developing a more orderly capital budget cycle where projects will be reviewed within the context of a total capital budget.[10] Through establishment of this capital budget plan, the university will be able to evaluate facility needs relative to established program goals and objectives, and link capital project priorities to established program priorities. For major new facilities and renovation projects, the Program of Requirements document provides the necessary information for the executive group in consideration of the annual capital budget plan. In addition to these major projects, the capital budget plan will include facility rehabilitation and site improvement projects as well as deferred and routine maintenance matters. The capital budget plan will provide a prioritized project listing, a description of each project, a project budget, a schedule for project work to be done and financing sources.[11]

In the past approval of the Program of Requirements by the executive group allowed the project to proceed to the implementation-design phase. In the future approval at this stage will incorporate the project into the capital budget plan as it moves to the next step.

The Board of Trustees become involved at this point primarily with the review of the project by the Educational Properties Committee. This committee reviews the program of requirements, siting, schedule and cost information for the project. The Senior Vice

President for Business and the University Architect are responsible for presenting the project to the committee and obtaining their input and approval to proceed. At this point the project is ready to move to the first step of the implementation phase -- design development.

Implementation - Design Phase

The design phase translates the facility program as prescribed in the Program of Requirements document into detailed building drawings upon which the actual construction or renovation will be based. The first steps in the design phase of a project at Northwestern involve the establishment of a Building Design Committee and the selection of the project architect. This Building Design Committee generally includes many of the same individuals from the Building Program Committee and is charged specifically with working with the project architect during the preliminary design phase. As with the Building Program Committee the chairperson of this Building Design Committee is the senior administrator of the program that will be housed in the facility. The University Architect is administratively responsible for coordinating the work of this committee and that of the project architect along with providing technical expertise. The membership of this committee includes faculty and key administrative or staff personnel involved with the particular program.

The chairperson of the Building Design Committee along with the Associate Provost, the Senior Vice President for Business and Finance and the University Architect comprise the group that actually interviews and selects the architect for a project. They give initial consideration to firms that have experience with projects of this type or have done similar work. Anyone can recommend a firm for consideration by this group. Typically the list of potential firms to be interviewed will be limited to between three and six.

Northwestern also prefers to utilize Chicago based firms for reasons of proximity. This preference has worked well for the university; in fact, the only negative experience in

the recent past involved an architect who belonged to a firm that was not from the Chicago area. The selection process involves review of materials prepared by each firm relevant to the project, a visit to the firm's office, and at least one interview with the firm's project team. Selection is generally based upon consensus among the members of the administrative group cited above. The recommended choice of the administrative group is taken to the President for review and approval. After approval by the President, the Senior Vice President for Business and Finance carries this recommendation to the Educational Properties Committee of the Board of Trustees' for review and approval. With these necessary approvals in hand, the University Architect is charged with negotiating a contractual agreement with the selected firm, and then the actual design effort begins.

The initial step in the actual design phase of a project is the development of preliminary or schematic plans. The Building Design Committee, the architect chosen by the University, and the University Architect form the team responsible for schematic plans. Plans at this stage involve the the actual translation of the program into a building plan. These plans include floor layouts which identify space for each of the program components, building circulation, support systems and general exterior design and site placement characteristics. The architect's role is to interpret program requirements and provide a set of plans that will accomplish the program in a building that is functional and within the prescribed budget. The Building Design Committee assists the architect in understanding the program. At Northwestern, the interaction between the committee and the architect resolves any issues with regard to the program.

In addition to the general coordinating and administrative responsibilities during this phase, the University Architect also plays other vital roles. He must assure adequate consideration of long-range campus physical plan requirements. He must pay attention to appropriate traffic patterns for both persons and vehicles. He must coordinate relationships with other buildings on campus. Finally, he must see that the needs for various services such as steam, chilled water, sewer etc., have been anticipated.[12]

During this early phase key issues with regard to building materials , site orientation, massing, scale, and landscaping are addressed and represent the external aspects of the building. As mentioned previously, in the words of the University Architect, a certain "ethos" has developed over the years at Northwestern with regard to the design of buildings. This "ethos" has become institutionalized and well accepted by members of building design committees and outside architects. Examples of this ethos include using limestone, limestone like materials and concrete for academic buildings, using brick for dormitories, and developing an informal or natural landscaping style. Klauder uses the terms "spirit of place"and "order" to describe such a phenomenon.[13]

At the completion of the preliminary design phase, issues with regard to the program, building layout, and external building design have been resolved to the satisfaction of the Building Design Committee, the University Architect, and the outside architect. In addition a project budget has been also prepared. Any major problems with the project budget have been resolved at this stage in adjustments to the program or design. At this point the preliminary design is forwarded to the Executive Group for review and approval.

Project reviews take place at two critical levels, one with the Executive Group which concentrates on project funding, and the other with the Educational Properties Committee of the Board of Trustees, which focuses on building program and design. The Executive Group looks primarily at the issue of whether or not funding support exists for the project, although any major issue of program or building design will be looked at as well. In the past Northwestern has not had a strong capital budgeting process; in fact, capital project decisions were made independently of other projects and without consideration of how a particular project fit into an overall set of capital priorities. The process currently being developed will change this loose practice and provide a framework for capital budgeting.

The Educational Properties Committee of the Board of Trustees will review the project from a program and building design standpoint. Once again issues relating to how this projects affect the long term campus physical plan are discussed. Presentations to this committee are made generally by the University Architect and the Senior Vice President for Business and Finance.

With approvals from these two groups, the project is ready to move into the more detailed design phase. Through this point in the project's life, approximately one to two percent of the total project budget has been expended. With this expenditure the major program, planning, budget, design, and schedule issues have been resolved so that the next step of detailed design may proceed. This is a key approval point for the project, but it only authorizes the completion of the design phase which amounts to an expenditure of another four to six percent of the total project cost. Authorization for the start of construction must await the satisfactory completion of the detailed design drawings.

Once the preliminary or schematics design phase is completed and the necessary approvals have been granted, the architect moves into the definitive design and working drawings stage of the project. The definitive design stage extends the work of the schematic plans to a more detailed level for all of the major components, the building program and space configurations, the exterior design, and the building support systems or infrastructure. The University Architect and his staff play an increasingly important technical and supervisory role during this stage of the process. The Building Design Committee plays less and less of a role as the design process proceeds since most program and design issues have been resolved during the schematic phase.

The working drawings or contract documents provide the detailed level of information that is required by a contractor to construct the building. The first purpose of such drawings is to serve as the basis for preparation of bids by potential contractors seeking the job of constructing the building. They also serve as the construction "blueprints" from which the building will be constructed. Upon completion of the

working drawings, the project is subject to another round of approvals identical to those required at the completion of the preliminary design phase. With the appropriate approvals, the project moves into the construction phase. The President and the Executive Group may choose to delay the project at this point if the funding is not available. Otherwise approval at this point authorizes the start of construction and the expenditure of the full project cost. Typically the design phase takes up to a year or longer to complete.

Implementation--Construction Phase

During the construction phase, the University Architect plays the key role for the university. Responsibilities include negotiating contracts with construction firms and general supervision of the project. The University Architect or his staff representative play the role of project manager.

The first step in this phase is the selection of a firm to actually undertake the construction or renovation of the facility. A full set of options are available to the University Architect in this aspect of the project. Initial consideration is given to a group of approximately fifty firms. Generally five or six firms are prequalified in terms of their ability to do a project of this type or magnitude. Size of the firm and experience are the key criteria for selection. The actual selection process varies and may include a number of approaches and issues including low bidding, interviews and negotiations. The project architect assists in the selection process. The administration through the Executive Group approves the selection of a contractor based upon the recommendations of the University Architect.[14]

Northwestern has used both general contractors and construction managers in the past, but from the institution's standpoint the University Architect's office plays the key role as the representative of the university in terms of day to day project management throughout the construction phase of the project. The University Architect makes progress reports to the Senior Vice President for Business and to the Educational Properties

Committee. As long as it stays within the budget, the project proceeds. If problems develop, the University Architect goes back to the Executive group for review and approval of any corrective actions.

Observations:

The persons interviewed for this case study all expressed a deep commitment to the process for planning and decision making with respect to the development of facilities at Northwestern University. The individuals also demonstrated an understanding of the overall direction for future facility development. This was of course due in part to their direct involvement in the process. Nonetheless this commitment and understanding provide a framework that allows for the development of a significant team approach to the process. In addition, the lack of a formal capital budgeting process that was integrated with the facility plan was viewed by those interviewed as a major shortcoming and steps were being taken to correct this deficiency. Following are a series of more detailed observation regarding the organization and process at Northwestern University.

Organization

The organizational structure presented in Figure 4-1 is both straightforward and clear. The relevant individuals all understand their roles and the roles of their counterparts and colleagues. Key responsibilities for facility planning are housed within the academic side of the organization, primarily in the role of the Associate Provost. Implementation responsibilities reside with the University Architect and the Senior Vice President for Business and Finance. The role of the Executive Group as the primary decision making and review body is also clear and well accepted.

The working relationship between the staffs of these two areas is certainly a major element in the success of the process at Northwestern. In fact the relationship between the Associate Provost and the University Architect is extremely close and provides an excellent

linkage between planning and implementation. This close working relationship is fostered by both individuals and, in their opinion, widens their scope of influence. The length of their tenure with the university enhances this relationship. Both individuals have been employed at Northwestern for over twenty years and both have played influential roles in the facility development process during that period. This combination of tenure and working relationships that cross organizational boundaries makes for an extremely powerful and effective influence on the process.

Another critical organizational ingredient is the establishment of the Building Program and the Design Committees. These committees insure significant input into the process from a key group, the user or client. From an organizational standpoint it institutionalizes input from this group and formalizes the input into the planning and decision making process. It is quite clear from the perspective of those interviewed that the views of this group are quite important in the initial planning, programming and design stages of a project.

Campus Facility Planning -- Master Planning

The informal nature of the campus plan is quite evident and well accepted by all of those interviewed for this case study. The key to the plan is its flexibility and adherence to a zone concept. The plan has been followed since the mid 1960's when it was developed by Skidmore Owings and Merrill. The fact that two of the staff in the current process were involved with the plan during that period is extremely important to its success. The plan is constantly represented through the work of the Associate Provost and the University Architect. In a sense they have become owners of the plan and insure its influence during the development of each individual project. With their involvement over the years and throughout the complete planning and decision making process, the plan has become part of the institution -- embedded into institutional memory. The plan is revisited with each

major project and represented at numerous points in the cycle, again primarily through the input of these two individuals.

The result of this process has been the evolution of the campus "ethos" described by the University Architect. This "ethos" or spirit is represented by the style, scale and placement of buildings on the campus. The facilities of the J. Roscoe Miller campus built as part of this plan have a certain feel or presence through which the sense of community or place has been achieved. Without question the role of the University Architect working with the design architects hired by the institution has played a significant role in this success.

The staff members interviewed agree that the plan is informal and not well documented in terms of being an easily referenced tool. They view as desirable the loose-leaf nature of the plan which includes details for many of its components. However, they recognize the need to better document the nature of the plan and to revisit the major issues in a more comprehensive way than can be achieved within a single project. In the opinion of the University Architect, the plan needs to be updated and codified. The process and organizational structure are so well entrenched, that the success of future facility planning seems assured.

On the other hand there is evidence that the concepts of the plan are being challenged. The fact that the plan is twenty years old and has not been significantly updated in a comprehensive manner leaves it subject to being ignored as was the case with the recreation aquatics facility. In addition, the plan served only a portion of the campus. Even though the plan area is where the majority of building took place it did not address or serve the area west of Sheridan Road.

Program Development

Northwestern invests significant energy in the development of a building or renovation program. It is quite clear that the program which lays out the specific requirements of the facility is an extremely important step in the process. The establishment of the Building Program Committee charged with developing the Program of Requirements document helps to establish a strong and clear foundation for a project prior to decision making regarding its future. This is achieved primarily with in-house staff and sets the stage for the future development of the project.

This detailed program development also allows for input and review of long term campus master plan considerations for each project. The continuity provided by the Associate Provost and the University Architect are important factors in the work of this committee. In fact given the informal nature of the plan and the fact that it is not well documented the long term vision of the campus might be lost without them. While staff continuity is clearly a strength in this case the plans viability would be significantly weakened by their departure. This is a shortcoming that in part will be addressed by better documenting the plan.

Capital Budgeting

Capital budgeting at Northwestern has been rather ad hoc in the past in that each project has been reviewed from a funding standpoint on its own merits and often without consideration of either its financial implications or the possible priority of other projects. Projects have often been approved for construction prior to the completion of fundraising. This practice was viewed as a major shortcoming by both the Associate Provost and the Assistant Vice President for Budget Planning, Analysis and Allocation. The Assistant Vice President is now in the process of developing a more detailed capital budget planning process that will assist the university in decision making and in setting priorities for capital

projects. Such a process will allow for the establishment of project priorities, identify funding possibilities and clarify commitments.

Such a process will certainly provide greater context for the review and decision making with regard to individual projects. A more formal capital budgeting process will correct the shortcoming that exists in the current process where projects tend not to be viewed in relationship to other present or future projects. The strength of the programming and design phases of the process have overcome this particular weakness. In fact the financial health of the institution is more at risk than the physical plant. Improvements in capital budgeting will only serve to strengthen the overall facility planning and decision making process for Northwestern.

Implementation -- Design Through Construction

The use of local architects has been an effective mechanism for enhancing both the long term facility plan and the development of the overall spirit or ethos of the campus since the 1960's. Over the years with the use of local architects combined with the influence of the University Architect, the plan and ethos of the campus have become a reality. Creation of buildings as architectural statements unrelated to their surroundings has not been a goal of the university. Rather the process has been geared to the creation of a consistent style where the buildings in general work together as opposed to standing out as individual statements. The individuals interviewed expressed great satisfaction with this approach. The future continuation of this policy will certainly enhance this development.

The utilization of the Building Design Committee provides an effective mechanism for translating and interpreting program requirements to the design architect. This strategy builds upon the concept of a strong program. This is consistent with the philosophy that a project must have a well defined set of program and functional requirements. The fact that schematic plans are developed, therefore expending a small percentage of the total project cost prior to a commitment to the project, provides a significant benefit at rather low cost.

The information provided through the program and schematic design phase is extensive and provides an excellent basis for both decision making and fundraising The risk that expectations will be set such that the future decision to commit to a project is viewed as automatic or a foregone conclusion is small and rather easily controlled. The benefits in terms of a sound program and a design consistent with both the user's needs and long term campus plan are significant.

The authority delegated to the office of the University Architect during the design and construction phase is substantial. This condition enhances the influence of the long term campus plan both due to the University Architect's long tenure and to his involvement in representing the plan's vision. The University Architect is represented through out the full life of a project from programming through construction. This situation provides tremendous continuity to the process and helps insure that the foundation built during the program phase will be carried through to construction.

Review and Evaluation

There are a number of important review checkpoints throughout the facility planning process at Northwestern, and these are conducted primarily by two groups, the Executive Group and the Educational Properties Committee of the Board of Trustees. These reviews and eventual approvals are a significant and effective mechanisms for decision making with regard to facility projects. The three most significant review and approval points are upon completion of the Program of Requirements document, the completion of schematic plans, and the completion of working drawings. At each point these authority groups can provide their input into the process and authorize or stop future development. These checkpoints dominate the early stages of a project and serve to make sure that a strong foundation has been built prior to giving the final commitment to proceed with construction. This is the most dominant feature of the process utilized by

Northwestern, the emphasis on a strong program and the focusing of the process in order to make sure that such a program is developed.

The framework of the rational planning model assumes a more or less sequential process with key decision points at various stages. These approval points are critical to a successful process and are clear and evident throughout the process at Northwestern. The only area perceived as weak by participants is in the area of capital budgeting, and there is an effort underway to correct this shortcoming and establish a more significant budget review process for the future.

Summary

It is quite clear from the interviews and review of materials in this case study that Northwestern has developed a very strong facility planning process that meets the goals and objectives for future facility development as outlined in their campus plan. Both the organizational framework and the process of planning, programming, budgeting, design and construction are geared to build this long term vision for the campus.

A number of major strengths exist in the Northwestern facility planning and development process. The influence and role of the Associate Provost and the University Architect are extremely important. The relationship that exists between the two individuals and their representation of the plan throughout the process provide ownership and influence for the plan. The effort invested in developing the Program of Requirements document provides a sound basis for review and decision-making with regard to a project, as well as for the design phase. The role of the Building Program Committee and the Building Design Committee give the clients or program representatives a strong voice in the process but one that is heavily influenced or educated by the Associate Provost and University Architect. The role of the trustee's through the review of the Educational Properties Committee provides an excellent check and balance to the system. Lastly, the influence of the University Architect during the design phase through the development of a close

working relationship with the project architect is significant and has been one of the major reasons for the achievement of the campus "ethos".

There are also a number of weaknesses or shortcomings in the Northwestern process. The fact that the plan has focused on a portion of the campus, albeit a major one, has left the remainder of the campus in the area west of Sheridan Road without guidance or direction. Planning for the few projects that have been constructed on this part of the campus since that time have been undertaken individually, this can be seen in the dormitory and administrative complex. The fact that the plan has existed so long without being better documented or formally reviewed is leading to problems. Without better review in the near future and also documentation that is well publicized experiences like the siting of the recreation and aquatics center will be repeated. In addition, the plan in its current state is heavily tied to the tenure of the Associate Provost and University Architect. Their departure or retirement would put the plan in jeopardy. Lastly, a process of capital budgeting, funding approval for individual projects in the context of overall university priorities has not been present at Northwestern. In terms of capital budgeting and reviewing and documenting the plan, the administration is taking steps to correct these shortcomings. These are steps that will help insure the future integrity and success of the process.

In summary, the Northwestern University case study provides an excellent example of how an organization approaches the facility planning and development process. A sound team approach has been put into place and effectively implemented much of the original campus plan. The need for certain improvements or corrections to the process are well recognized and being made.

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1 Northwestern University Catalog, Evanston, Ill. 1986-87.

2 Wild, Payson S., and Williamson, Harold F., Northwestern University: A History 1850-1975 (Evanston, Ill,: Northwestern University, 1976), p. 274.

3 Interview: Gabor Zsolnay, University Architect, September 14, 1987.

4 Ibid, Wild, and Payson, p. 279.

5 Zsolnay op. cit.

6 Interviews: Gabor Zsolnay, University Architect, & Jeremy Wilson, Associate Provost, September 14, 1987.

7 Wilson, Jeremy, Procedure in Planning the Development of a building or Major Renovation at Northwestern University, Unpublished Memorandum, January 30, 1987, p. 2.

8 Zsolnay, op. cit. , Wilson, op. cit.

9 Interview: James Elsas, Assistant Vice President for Budget Planning, Analysis and Allocation, September 14, 1987.

10 Elsas, op. cit.

11 Elsas, James; Report on Capital Planning Process, Unpublished Memorandum, February 16, 1987.

12 Wilson, Jeremy; Procedure in Planning the Development of a Building or Major Renovation at Northwestern University, Unpublished Memorandum, January 30, 1987, p. 2

13 Klauder, Charles Z. and Wise, Herbert C., Collegiate Architecture in America (New York, Charles Scribner's Sons, 1929), p. 25.

14 Zsolnay, op. cit.

Chapter 5

Massachusetts Institute of Technology -- A Case Study

Introduction

This case study presents the organizational structure and process utilized for facility planning by the Massachusetts Institute of Technology. The case study demonstrates a successful approach to facility planning and a process for implementation of plans focused on the functional design of facilities . MIT's success is based upon the development of key principles for facility planning; the creation of an organizational structure that concentrates responsibility for planning, decision-making and implementation essentially under one key vice president; staff continuity; and the development of a process in place for a very long period that is both well structured and adhered to.

Institutional Profile

The Massachusetts Institute of Technology was founded in 1861 and opened its doors to its first class in 1865. Its founder, William Barton Rogers, served as its first president and brought to MIT a fresh academic mission and vision: MIT would be a new kind of educational institution relevant to the times and to the nation's needs, where students would be educated in the application as well as the acquisition of knowledge.[1]

MIT is located along the Charles River Basin in Cambridge, Massachusetts across the river from Boston. Today MIT, one of the leading academic and research institutions in the world, is a member of the American Association of Universities and noted for the magnitude and scope of its research and graduate programs. MIT is an independent, coeducational, privately endowed university organized into six major academic units. The School of Architecture and Planning; the School of Engineering; the School of Humanities and Social Science; the Sloan School of Management; the School of Science; and the Whitaker College of Health Sciences, Technology and Management. Enrollment totals approximately 9,500 students, half of whom are undergraduates. The total faculty and

teaching staff is approximately 1,900. The annual budget for research alone approximates $300 million.[2]

The existing campus extends for more than a mile along the Charles River and encompasses 146 acres divided by Massachusetts Avenue which is perpendicular to the Charles. The area east of Massachusetts Avenue has been developed as the main academic and research section of the campus. The area to the west contains the recreational facilities, housing , student union, chapel and Kresge auditorium. Planning and programming for the original campus on this site was undertaken by John Freeman and construction began in 1916. Welles Bosworth was the design architect for the original set of campus buildings. Both men were MIT graduates.[3]

The plan for the original buildings was drawn in part from Jefferson's model at the University of Virginia with four continuous lines of interconnected buildings flanking a lofty central dome.[4] The original buildings form the Killian Court which faces the Charles River and is a major open green space on the campus. Over the years a number of additional buildings have been added and interconnected to these original buildings. Some of these include Center for Life Sciences, the Karl Taylor Compton Laboratories, and the E&GG Education Center, among others. A current map of the MIT campus is provided in Appendix F.

The Massachusetts Institute of Technology is considered one of the outstanding leaders in the field of higher education. The campus, facilities, process for facility planning and development, and the organization of the Institute provide an excellent basis for a case study.

Campus Facility Planning / Master Planning

Planning and programming of the original set of facilities on the MIT campus was based upon the adoption of a number of principles. The two major principles included the interconnectivity of the buildings and the desire for flexibility of use in order to accommodate change. The original buildings, planned and programmed by John Freeman

and designed by Welles Bosworth, were built during the period between 1916 and 1938 and reflect the implementation of these principles. Facility planning for the expansion of the campus since then has also relied on these principles.

These principles grew from the goal of developing a sense of institutional unity and interchangeability in order to support a highly interdisciplinary organization.[5] Flexibility in the use of space has become part of the culture at MIT. The structural bay system of interior bearing walls, for example, allows for maximum adaptability of spaces. Spaces and facilities are initially programmed with the intent that the occupants will be the first and not the only users of the building.[6] The following excerpt from the East Campus Master Plan outlines the Institution's success in adopting these principles:

> "Immensely adaptable, the old campus has taken on the mantle of a continuous and interconnected entity. The planning and structural bay chosen by Bosworth has adapted to shifts in use and purpose as they have been altered through the years. The result has been a physical environment that encourages interdisciplinary interaction between staff and student. Believing that physical proximity enhances the potential for creativity and intimate exchange between department and disciplines, MIT planners have always sought to translate this ideal into reality. The philosophy of overlapping department locations, of designed mixed use buildings and interconnected flexible spaces has largely continued to this day."[7]

Exterior design as expressed by John R. Freeman in 1910 as one of the basic planning goals was also a major principle for the original buildings of the Institute:

> "... Recognition of the visual pleasure derived from the architectural details and proportions of the Greek Classical Style.
> A simple dominating mass with uniform cornice height which shall invite attention to the many thousands who past the basin over the two great bridges."[8]

These original buildings designed by Bosworth followed this plan and reflect this objective. Over the years the primary principles of interconnectivity and flexibility have survived but Bosworth's exterior design style has not, instead each building added to the campus has taken on its own distinctive character. Nonetheless, the acceptance of these two primary principles has allowed MIT to achieve a genuine sense of community among buildings, although not in exterior design as much as in actual use.

Especially after the completion of the original campus in 1938, facility planning at MIT has focused on areas, sections or specific sites. MIT has not developed a comprehensive plan for the future development of the total campus but rather has since the 1960's undertaken more detailed sectional planning. This policy grew from the fact that by that time MIT did not own large amounts of undeveloped land and therefore planning for future facilities was driven by opportunities to acquire property in proximity to the existing campus. Since property acquisition is so important to future development, MIT views such options within a fifty year frame.[9] Facility planning, however, has evolved into the development of master plans for particular sections or areas of the campus that serve a ten to fifteen year time frame. The process and organization for the development of facilities at MIT has essentially been in place for this period.

The East Campus Master Plan, completed in the 1978 is an example of this type of planning and included the development of 14 acres on the eastern portion of the campus of which eighty percent of the property was owned by MIT at the time. The plan covered the land area bounded by Ames St. on the west, Amherst on the south, Main St. to Kendall Square on the north and Wadsworth St. on the east. The planning was driven by the immediate need for two facilities, the Whittaker College of Health Sciences, Technology & Management and a facility for the Institute's health services. The development of a visual arts facility was planned as part of a second phase. Another major objective of this plan was to emphasize and extend circulation patterns of the main campus area into this complex. In fact the development of these facilities were to be designed to serve as a major gateway both into the campus and out to the nearby Cambridge community. The architectural firms of Mitchell/Giurgola and Gruzen & Partners developed the East Campus Master plan.[10] Similar area planning is just beginning for the development of a biological sciences facility building on campus.

Responsibility for facility planning rests primarily with the Planning Office at MIT and this office coordinated the East Campus Master plan project. The director of the

Planning Office reports to the Senior Vice President for Operations who is the executive at MIT that is ultimately responsible for facility development. The director utilizes team approach to planning in order to gain broad input into the process as well to achieve a balanced perspective in terms of program and design issues. The Planning Office works closely, with the Provost's Office in order to understand academic program needs, with the Finance Office in terms of the development of capital budget estimates and priorities, and with the Architecture, Engineering and Construction Office in terms of site, design, systems, and construction issues. [11]

The Planning Office is also responsible for contracting with outside consultants, architects, and planning or engineering firms for the development of area plans. The general development plan for a particular site or area includes alternatives with and without existing structures since acquisition is a key to future planning. Targets of opportunity play a role in determining how the area or site is developed.[12]

Given this central role, the Planning Office is the key actor in terms of communicating the major principles for future facility development to both internal and external parties. The continuity of facility planning from site to site or program to program is one of the primary responsibilities of this Office. The Planning Office effectively becomes the main proponent of these principles to the clients, the facility users, as well as to the outside designers responsible for implementing plans in terms of individual building projects. This is an especially challenging role when it comes to educating outside architects with regard to these overall principles. These principles have focused on functional requirements of facilities where design considerations, especially relating to building exterior and style have been left to the project architect.

Staff continuity has also played an important role in the facility planning process at MIT.[13] The Planning Office director has served in this role for twenty-seven years . The Senior Vice President for Operations has been involved in various facility development

positions, including the position of director of Physical Plant, for over twenty five years. These two individuals with their extensive tenure and key responsibilities for facility planning and development provide an effective mechanism for insuring the successful implementation of the planning efforts and the adoption of the fundamental principles of the plan.

Organization and Administrative Environment

For the purposes of this case study it is useful to review the organizational alignments and responsibilities as they relate to facility planning and decision-making processes at MIT. Figure 5-1 presents the relevant organizational arrangement. (In order to assist the reader Figure 5-1 on page 98 should be viewed as one reads the next section.)

At the executive level the President, the Provost, and the Senior Vice President for Operations form the policy setting and decision-making group. The Provost carries the main responsibility for academic and research issues while the Senior Vice President is primarily responsible for operations of the Institute, which include facility planning and development. Decisions with regard to building projects in terms of program justification, funding availability, property acquisition and final approvals are made within this group. The group serves as an executive body in that recommendations are brought to it by either the Provost in the case of academic facilities, or the Senior Vice President in all other cases. The three individuals will review the recommendations, examine background information and make the necessary decisions.

Since the Senior Vice President is charged with the primary operating and support functions of the Institute, almost all of the functions related to facility planning and plan implementation fall under him. The primary areas are physical plant operations, architecture, engineering and construction, finance, and planning. These offices are essentially responsible for all facility development functions of the Institute.

The Planning Office is responsible for facility planning and development of specific area or site plans. In addition, the Planning Office carries prime responsibility for initial

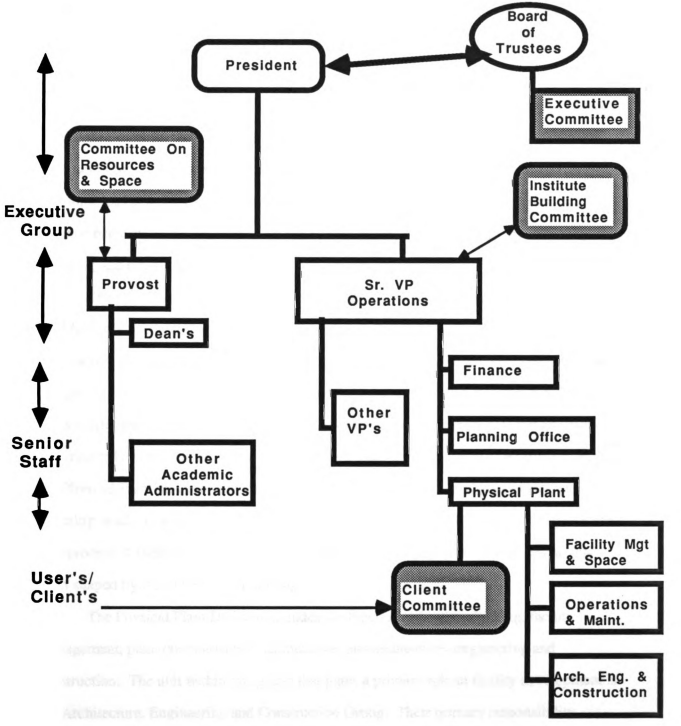
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Figure 5-1

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Organization Chart

Campus Facility Development Responsibilities



analyses and program development for individual building projects. Support for the academic planning process, the development of five year program plans, and general institutional research functions are also part of the Planning Office's responsibility. These latter responsibilities require a close relationship with the Provost's Office and the various academic units. Involvement in the development of the five year academic program plans is a key role for the Director of Planning in terms of providing a future perspective and warning system for potential facility needs. It is this academic planning process that drives facility needs and from which the East Campus Master Plan was created. Also the Director of Planning works closely with the Director of Finance to investigate financial prospects and alternatives for projects as well as developing the annual capital budget plan. These relationships between the Director of Planning, the Provost staff and the Director of Finance place the Planning Office in a key central position with regard to future facility planning and development.[14]

The Planning Office with its creation in the 1960's has played a central role in the total facility development process at MIT. At one time, this office was responsible for not only facility planning but for such functions as space planning, facility management, and design and construction activities. These functions were developed and staff hired in these areas during this period as the overall process for facility development was put into place and matured. In the last ten years these functions have been shifted to other offices within the Physical Plant division, allowing the Planning Office to concentrate primarily on planning, analysis and the programming functions during the first stages of a project's life. The process of facility planning and development in place during this period has largely been shaped by the Director of Planning.[15]

The Physical Plant Division includes the functions of space planning; facility management; plant operations and maintenance; and architecture, engineering and construction. The unit within this group that plays a primary role in facility development is the Architecture, Engineering and Construction Group. Their primary responsibility

involves design and construction activities although they are an important partner with the Planning Office in terms of promoting and developing facility plans. This Group, through the director of Physical Plant, is involved in the selection of architects, detailed program development, preliminary design and project construction. The director of Physical Plant or his designee acts as chairperson of the client teams that are eventually established for each building project.

The Director of Finance whose broader duties include institutional budgeting and financing is primarily responsible for the review of financing alternatives of capital projects and the development of the capital budget. The Planning Office provides input to the Finance Office with regard to programs and plans for capital projects and therefore has formed a link between the planning and budgeting process for facilities.

In order to work with the potential users of a facility, a Client Team is established for each project after the architect has been selected. The Client Team consists of representatives from the Planning Office, Architect, Engineering and Construction Group, and representatives of the program areas to be housed in the facility. The client team works with the architect during the programming and design development phase. The representative from Physical Plant is charged with administrative responsibility for this group. The Client Team plays a role in the process through the schematic plan design phase.[16]

In addition to the responsibility of the operating units, three committees play a role in this process. The first of these is the Executive Committee of the Corporation (Board of Directors or Trustees). This committee meets monthly with the President and the senior officers of the Institute and provides final project approval. The Executive Committee acts upon the recommendations of the President and does not involve itself with any of the intermediate steps in the process, such as architect selection or design review.[17]

The Institute's Building Committee provides oversight for major project development. This committee is chaired by the Senior Vice President for Operations and

includes as its members, the President, The Provost, the Dean of the School of Architecture, the Director of Planning, the Director of Physical Plant, the Treasurer, and a representative of the particular program that the project will house. This committee meets on an as needed basis to review conceptual design during the schematic phase and then again near the completion of working drawings. The committee's role is to deal with major issues and problems and to make trade-offs whenever appropriate or necessary.[18]

The Committee on Resources and Space Planning is a group chaired by the Provost, with the vice-chair being the Senior Vice President for Operations. Committee membership also includes the deans of Science, Engineering and Architecture, the Vice President for Research, and the directors of Planning, Finance and Physical Plant. The Committee is staffed by the facility management group within the Physical Plant division and meets twice a month to decide issues with regard to space planning and allocation and to authorize funding for renovation projects. Much of the design work for such projects is done within the Architecture, Engineering and Construction Group of the Institute.[19]

The organizational structure in place at MIT is hierarchical with significant authority and responsibility in one area, that of the Senior Vice President for Operations. These set of responsibilities and organizational arrangements have been in place for an extensive period of time. These responsibilities include planning, programming, financing, design, and construction. Only limited, but yet important input comes from outside this group through the existence of the client teams. Interactions between the key staff groups are enhanced through the single reporting line to the Senior Vice President. The role of the Planning Office is also important in achieving input and perspective through its association with the Provost's Office in the five year academic planning process.

Capital Project Process

The process and procedure used by MIT for the construction of new buildings and major renovations is outlined in Table 5-1. The major phases of the process include preliminary analysis, planning, budget/resource allocation, design,and construction. For each of the major phases, the primary functions are identified along with the administrative unit or group responsible for these activities. For each activity the relevant review or approval group is also identified. The remainder of this section will describe each phase of the process in detail.

Table 5-1
Massachusetts Institute of Technology
Capital Project Process

Phase:	Activity Type	Responsible Organizational Unit	Approval/ Review Body
Planning & Analysis	Initial Concept/ Idea	Initiating Department	Dean/VP, Provost, Sr. VP
	Preliminary Analysis, Facility Plan, Program, Costs, Funding	Planning Office Coordinates	Provost, Sr. VP
	Capital Project Plan	Planning Office	Provost, Sr. VP
Budget/Resource Allocation	Capital Budget Priorities Project Funding, Fundraising	Finance Office Planning Office	Sr. VP, Pres.
Key approval point for moving ahead to design phase.			
Implementation Phases:			
Design	Architect Selection	Planning Office Physical Plant Sr. VP Committee	Sr. VP, Provost, President
	Preliminary Design- Program Development Floor Layouts, Exterior Design	Physical Plant AEC Group Outside Architect Client Team	Sr. VP, Institute Building Comm.
Key approval point for moving ahead to detailed design phase			
	Definitive Design, Working Drawings, Final Cost Estimates	Outside Architect, Physical Plant- AEC Group	Sr. VP, Institute Building Comm. Corp.-Exec. Comm.
Final approval point for authorization to begin construction.			
Construction	Contractor Selection, Project Oversight/ Supervision, Project Completion	Physical Plant AEC Group Contractor(s)	Sr. VP

Planning and Analysis Phase

The planning and analysis phase of the MIT capital project process is the period when key decisions are made. The project becomes well defined. It undergoes extensive scrutiny by the central administration. Issues are reconciled with regard to the area plan. Finally funding is clarified. This phase includes the development of the initial project concept, a detailed project analysis, and the creation of an overall project plan.

A capital project can be initiated by an academic or administrative department. A request for consideration is submitted through the appropriate Dean to the Provost in the case of an academic need or through the appropriate Vice President to the Senior Vice President for Operations for non-academic facilities. Upon acceptance of the concept, the project is referred to the Planning Office for preliminary analysis.[20]

The preliminary analysis phase is an important step in the life of a project at MIT. During this phase data are collected to develop an analysis that will provide supporting information to the senior administration for decision-making purposes. The Planning Office is largely responsible for coordinating this step in the process. The result of this work is the creation of a Capital Project Analysis document which has four main components. These are the facilities plan, the education/research program, construction/project costs, and the financial program.

The facilities plan section of the document is prepared by the Planning Office and includes a project description and information concerning the project's status, schedule and siting details. The status information provides the basic space and floor layouts for the project and an outline of where the project stands in terms of review and approval points. The description is a brief summary of the project. The schedule summarizes each of the steps from preliminary analysis to completion of construction, with an estimate of the number of months required and the expected dates for each step. The siting detail reviews

site alternatives and provides a mechanism for relating the individual project to the overall area or section plan. Both this review and the area plan are the responsibility of the Planning Office, therefore insuring that the overall plan has an opportunity to influence and guide individual projects. The Planning Office will include a recommendation on siting in the Capital Projects Analysis document.[21]

The education/research program information is provided by the originating department. This information outlines the current and projected staffing and enrollment needs of the program to be served by this facility. Space information is included and describes current and future needs in square feet by each major use category -- classroom, office, laboratory, etc. Operating budget information for the current and future program is included as well as estimates of how the particular project is to be funded in terms of revenue sources and time frame. Finally, the originating department identifies any special program characteristics that must be addressed such as, computer support, impacts on other programs, the nature of interactions with other units, etc. This section of the document provides the foundation for the future development of the design program for the facility.[22]

With both the plan and program sections of the Capital Project Analysis document completed the information is sent by the Planning Office to the Architecture/Engineering/Construction Group. This group provides a detailed breakdown of estimated costs by each major category of the project -- construction, site development, fees, utilities, etc.[23]

The last step in the development of the Capital Project Analysis document is completed by the Finance office and provides the supporting financial information. This includes estimates of revenue to be recovered by research overhead, project expenditures and cash flow resulting from construction, analysis of funding sources, a review of costs related to vacated spaces, requirements for support services, and any changes in year to year tuition revenues resulting from the program.[24]

The Capital Project Analysis document provides a comprehensive and detailed summary of the proposed project. The document serves as the basis for review and decision making by the senior administration, primarily the Senior Vice President for Operations and the Provost. The review focuses on such issues as program scope, scale/size, costs, funding, and relationship to the area plan. The Planning Office is again responsible for coordinating any changes that result from the review step.

Upon approval of the Capital Project Analysis document, the Planning Office is authorized to develop a project outline and schedule based upon the information gathered in the previous step. This outline developed in conjunction with the Director of Physical Plant is called the Capital Project Plan is submitted to the senior administration for approval prior to beginning the program design phase.[25]

The total planning and analysis phase at MIT provides extensive information and review prior to any significant financial commitment to the project, other than the time and energy of the staff involved in this step in the process. The nature of these analyses as presented in the detailed Capital Project Analysis document and the summary Capital Project Plan, provides the senior administration at MIT with broad and comprehensive background information upon which to base resource allocation decisions.

Budget, Program & Resource Allocation Decisions

The primary responsibility for the Institute's capital budget also rests with the Senior Vice President for Operations with appropriate staff support and development of the annual capital budget provided by the Finance Office. The Finance Office is responsible for overall financial analysis, an example of which is the role played in the development of the financial program in the Capital Project Analysis document. This office also monitors the Institute's overall financial position for both the operating and capital budgets. Given this responsibility, the Director of Finance puts together the annual capital budget plan with input in terms of project details from both the Planning Office and the Director of Physical

Plant. Review and input also come from the Vice President for Development who is responsible for fundraising activities. Ultimately the Senior Vice President for Operations is responsible for final capital budget decisions. The Senior VP reviews these decisions with the President and Provost prior to finalizing the annual capital budget.[26]

In terms of an individual project, inclusion in the capital budget authorizes the project to move ahead to the implementation phase. Such approval is a key point in the project's life and allows for design and program development to proceed. The implementation phase is viewed as a routine tightly structured and scheduled process that is internally managed.[27]

Implementation - Design Phase

The design phase at MIT includes the process of selecting an outside design architect, final program development, preliminary design, and development of working drawings. This aspect of the process is the primary responsibility of the Director of Physical Plant with senior administration review and decision making resting with the Senior Vice President for Operations and the Institute Building Committee.

The initial step in this phase involves the selection of an architect for the project. The Senior Vice President for Operations establishes a committee to make the decision. The committee consists of himself as chairperson, the Director of Physical Plant, the Director of the Planning Office, the dean or senior administrator of the program area to be housed in the facility, and the Dean of Architecture. A list of firms for consideration will be developed based on overall experience with a project of this type. The list will be quickly narrowed to five to ten firms which will then be invited to an interview with the committee. After the interviews the committee recommends two firms to the Senior Vice President. Criteria that are important in the review process are experience of the firm, ability to successfully complete a project of this type, and a commitment to the principles of campus facility planning that have been adopted and implemented over the years at MIT. The Senior Vice President for Operations takes the recommended set of two firms to the

Provost and the President, for final decision making. Typically the Senior Vice President makes a recommendation of one of the two firms for the project.[28]

MIT has utilized a number of approaches to hiring architects over the years. In the early years between 1911 and 1938, one architect W. Bosworth was commissioned to design all of the buildings of the original campus. Since that time architects have been hired to do sectors or areas of the campus as well as individual buildings. At one time only MIT graduates were selected for jobs on the campus. While this was not a fixed criterion, given the large pool of successful MIT educated architects, it just happened.[29] Today firms other than those of MIT graduates are selected for projects, but the key criteria remain experience, ability and acceptance of MIT's planning principles. Responsibility for education project architect's with regard to these principles rests with the Director of Planning.

After the architect has been selected, a Client Team is appointed by the Senior Vice President for Operation to carry the project through the program development and preliminary design stages. The Client Team is headed up by the Director of Physical Plant and includes representation from the Planning Office, the users or groups that are to be housed in the facility, and the Architect/Engineering/Construction Group of Physical Plant. The day to day management of the project is the responsibility of the Physical Plant division and follows the specific schedule and time frame established in the Capital Project Plan.[30]

The Client Team works with the chosen architect to first develop the detailed program and then the preliminary or schematic design drawings. The final program is based on the initial work done in the Capital Projects analysis phase in terms of overall space and functional requirements. The user or project "client" plays a significant role at this point in the project in terms of communicating program requirements to the design architects. From this process results the floor layouts that reflect relationships between

program functions, circulation patterns, support systems and general building designs that encompass the preliminary design.

At the completion of this step the work of the Client Team is forwarded to the Institute Building Committee for review and approval. This Committee is chaired by the Senior Vice President for Operations and the membership includes the President, the Provost, the Dean of Architecture, the Director of the Planning Office, the Director of Physical Plant, the Treasurer and the client. The focus of the committee's review is to resolve outstanding issues or problems and to insure that the work meets the overall project objectives and campus planning principles. Approval of the preliminary design authorizes the project to move into the detailed design stage.[31]

The detailed design stage involves the preparation of definitive design and working drawings upon which bid documents may be issued and contracts awarded for the construction of the building project. During this step the project architect takes the lead and works with the staff of the Architect/Engineering/Construction group. The client's or users are involved only to the extent that program clarification is required. Final cost estimates are also developed at this stage.

Occasionally MIT has hired a contractor to join with the architect and the Client Team during the design phase in order to minimize issues that may result in conflict between design and cost matters. This arrangement was utilized for the construction of dormitories on the West Campus. The objective was to minimize cost related problems that might develop during the later design and construction phase. The success of such an arrangement relies heavily on the style of the architect and supersedes the more traditional bidding approach for the selection of contractors.[32]

Upon completion of the detailed design drawings and preparation of the final cost estimates, the project is once again reviewed by the Institute Building Committee. The Committee continues to focus on problem or issue resolution, project objectives and planning principles. At this point the project is also taken to the Corporation's Executive

Committee for review and approval. Upon approval the project is authorized to enter the construction phase.[33]

Implementation - Construction Phase

The construction phase carries the project to completion and occupancy. The Physical Plant division through the Architect/Engineering/Construction group provide the internal management of the project for the Institute. The preferred approach at MIT is to select the construction contractor on the basis of bids developed after the completion of working drawings and essentially manage the construction process in-house. Hiring a contractor early in the design phase and utilizing a fast-track approach to construction has generally led to problems, especially in terms of cost and project scope. The other option, selecting a contractor to work during the design phase with the architect in a partnership arrangement, has been more successful.

The environment for contractor selection either through bidding or a review process is very competitive in the greater Boston and New England area. Many qualified firms exist to choose from. The principle that MIT prefers to use in term of managing their own construction gives the Institute the greatest control over the project, increases the chances for avoiding problems with contractors and enhances the Institute's ability to meet the overall program goals and objectives.[34] Such a strategy requires a staff with significant construction experience. This experience exists at MIT from the staff in the Architecture/Engineering Group through to the Senior Vice President.

Case Study Observations:

In general, based upon the interviews and the review of documents, the process at MIT is well developed, staffed with individuals with great experience and tenure at MIT, and documented so that the broader community can quickly pick up the critical steps. Facility planning is based upon key principles related to the functional performance of facilities that drive the process of planning, decision-making, design and construction. The participants are all well versed in the process and have a strong commitment to both the

process and the overall facility planning objectives of the Institute. Following are a series of more detailed observations regarding the organization and process at the Massachusetts Institute of Technology.

Organization

The organizational chart presented in Figure 5-1 exemplifies a hierarchical structure with a typical pyramid type chain of command. The role of the Senior Vice President for Operations is a dominant one in the process. All of the key actors involved in planning and implementation report directly to him. Decision-making with respect to the capital budget is also heavily influenced by him with only summary review and approval roles for the Provost and President. This concentration of responsibility gives the Senior Vice President significant impact on capital planning and priority setting.

The Planning Office, while also reporting to the Sr. Vice President, plays a key role in terms of interacting with other parties in the process. The role of the Planning Office becomes even more central to the process and to the success of facility planning objectives due to this fact. One of the key relationships is with the academic community which nominally is outside the organizational chain but facility needs become identified through the involvement of the Director of Planning in the five-year academic planning process. The role of program development both in preparing the Capital Projects Analysis document and during the preliminary design development stage is an example of how academic needs become addressed in a particular project. The Planning Office's role in assisting the Provost in the five year academic planning process is another example of how the Office's influence spans organizational boundaries to the advantage of the process. Relationships with the Finance Office are also very important in terms of the financial viability of a project and the setting of annual capital budget priorities. The ongoing interaction with the Physical Plant division is most important in terms of protecting the overall facility planning

objectives of the Institute by making sure that all the key parties adhere to the principles established by the plan.

The Institute Building Committee is a powerful internal executive review and decision making body. This is a mechanism for insuring that all of the key executives at the Institute participate in the critical decisions regarding a building project. It is also an effective mechanism for gaining wide acceptance of the facility plan and its principles. Interestingly, there is no real or substantial involvement of the Director's of the Corporation (Trustees) in the process. Their role is limited to approval of administrative recommendations late in the process and therefore the Director's do not provide significant support for this process.

Campus Facility Planning / Master Planning

In terms of the facility planning, master planning, process at MIT there are four main points to be made. These include the role of the Planning Office, the section or area approach to planning, the adoption of key principles upon which future planning and development are based, and the tenure of the two key individuals charged with facility planning.

The Planning Office is central to the facility planning process since its main responsibility is the maintenance and development of facility plans. Primary responsibility for the creation of sector or area plans rests with this Office. Through the development of the Capital Project Analysis document, the Planning Office enhances this role by allowing the overall planning to influence and be represented in each building project. Therefore the plan and the plan principles have a home, someone placed in a key spot within the organization to promote and advocate the plan.

Facility planning at MIT has not attempted to take a broad look at all property owned by the Institute but rather focused on key sections or areas for future development. This has been a result of the fact that land acquisition has been such an important

component of campus facility development. Breaking campus planning down into smaller areas or sections has allowed a shorter time frame for implementation. Usually an area plan is generated by the need for at least one building project. In addition such plans usually are limited to specific program areas and do not require mobilizing the total campus, as would be the case for a more comprehensive plan. This type of planning concept has allowed for great flexibility both within each area and for the campus as a whole. On the other hand the campus has developed rather incrementally over the last fifteen to twenty years without a larger more comprehensive view of the potential for the campus. This shortcoming has been offset somewhat by the strength and tenure of the key staff person, the Director of Planning and the strong commitment to the overall planning principles that have been in place throughout the Institute's history.

The principles of interconnectivity and flexibility within a structural bay system have been widely adopted and implemented throughout the main area of the campus. These principles have served as the basis for facility planning at MIT since the planning of the original campus and as a result have allowed MIT to establish a significant community of uses and order within its facilities. The focus of facility planning has been on use almost to the exclusion of external design. In fact the order and flexibility achieved at MIT is functional and a direct result of the continued application of these principles to individual building projects. This is also an example of how Klauder's "order" can be achieved through internal development of space versus the more typical view which focuses on external design.

The last main point regarding facility planning is the tenure and experience of the two key individuals charged with this overall responsibility, the Director of the Planning Office and the Senior Vice President for Operations. Both are MIT graduates who have had extensive careers at MIT in this general area. Their tenure and influence over the process have produced significant success in formulating plans, promoting facility planning

throughout the process and guiding plan implementation through individual building projects.

Planning and Analysis

The planning and analysis phase is a key step in both the development of a particular project and in promoting the concepts outlined in a particular area plan. This comprehensive document covers all of the main components of information for a building project and is the primary responsibility of the Planning Office. Given its comprehensiveness the document serves as the foundation for decision-making and future development. MIT invests significant effort in this preliminary step prior to making any formal commitments to the project. In essence what follows in terms of design development is a matter of detail and not a matter of substantive program or financial consideration or decisions.

The role of the Planning Office in terms of the coordinating and development responsibility is a major opportunity for promoting the facility planning principles. This is a key factor since much of the critical information and resulting decisions with regard to a particular project are finalized at this point in the process.

Capital Budgeting

The capital budgeting process is a well developed annual process for establishing capital priorities and implementing projects. The interaction of the head of the Planning Office with the head of the Finance Office assists in implementing plans and promoting a long term view of the capital budgeting process. The fact that both individuals report to the Senior Vice President insures his dominance and influence over the process.

Design and Construction Phases

The design phase focuses on the use of a Client Team, the role of the Institute Building Committee and key approvals. The Client Team is a method for insuring input

from the user's of the facility. User input comes into play in a general way in the development of the Capital Project Analysis document, but at this stage the involvement leads to the final program characteristics that allow the architect to develop a design for the facility.

The Institute Building Committee plays a key role in solving program conflicts and/or making decisions with regard to trade-offs between design and program matters. The Committee also plays a role in insuring that the principles of the facility plan are being lived up to by the architect and the client team.

During this stage the Institute makes its first real financial commitment to the project. All previous work during the preliminary planning phase is essentially done in-house without significant capital outlays. The Client Team and the project architect under the direction of the Physical Plant division are charged with implementing a plan for a building and do not play a role in developing the overall area or section plan. The fulfillment of a particular piece of the area plan process was completed in the previous stage.

The construction phase at MIT is quite straightforward and again viewed as an implementation step. This phase of a project's life is managed by the Architecture/Engineering/Construction Group who act as the in-house construction managers. A detailed project schedule is developed which resulted from the earlier planning phase and is outlined in the capital project plan and monitored by this group. The executive role and past experience of the Senior Vice President for Operations make this a strong component of the MIT process.

Review and Evaluation

There are a number of key approval points in the process but all are basically internal to the executive group at MIT and come at typical decision points, such as budgetary decision-making and after preliminary and working design development.

Essentially the process is delegated to the administration and to the Senior Vice President specifically by the Directors of the Corporation. The existence of the Institute Building Committee is a strategy for including the key MIT executives in the process. The fact that reviews include so much significant development of the project concept from all standpoints during the planning and analysis phase provides a powerful mechanism for decision making, plan implementation and project development. The cursory role of the Director's in this overall process is a function of the operating style of the Institute but is a missed opportunity for providing wider acceptance to these principles than the current administration.

Summary

The MIT case presents a well structured and developed process for facility planning, decision-making, and the design and construction of individual building projects. A number of major strengths are evident as a result of this case review. The process and especially the principles utilized in facility planning have been in place for a very extensive period, are well documented and accepted. Staff continuity has also enhanced both planning and implementation processes. In addition strong working relationships exist between the Director of Planning and other important actors in the process such as the Director of Physical Plant, the Director of Finance and the Provost. These relationships solidify and institutionalize the facility development process. Significant effort is put forth in terms of the early development of a project -- the planning and analysis phase -- when the key components of the project are developed and ultimately decided upon. This programming effort serves as the foundation for the further development of the project. Once the initial planning phase and initial decisions are made, the process becomes one of detailed implementation, a routine schedule or process for which monitoring is necessary at the Architecture/Engineering /Construction Group level but only occasional problem resolution is necessary at the executive level. The organizational structure enhances this

and allows for the process to be essentially the responsibility of the Senior Vice President for Operations.

There are also a few shortcomings that are evident at MIT. The focus on function versus form or design considerations is heavily skewed to the former with the latter being primarily left to the project architect. This is visibly evident as one views the campus in terms of buildings materials, exterior design and placement. Functional order and flexibility have been achieved where design order has not been an institutional priority. This is also reflected during the design phase given the strong role of the architect. Lastly, the Director's play little if any role in helping shape the future of the campus. This essentially leaves the future of the campus in the hands of the administration and therefore subjects facility development to risks present with turnover or changes in administration.

The MIT case provides an excellent example of how to structure a process and an organization to implement key facility planning principles. The nature of the facilities at MIT stand a testament to this concept.

1 Massachusetts Institute of Technology Bulletin 1987-88, Courses and Degree Programs Issue, (Cambridge, Ma.) Volume 123, No. 1, August 1987, p.8.

2 Ibid., p.8.

3 Gruzen & Partners, Mitchell/Giurgola, East Campus Master Plan , Unpublished Internal Document, p. 7.

4 Ibid., p.7.

5 Ibid., p. 7.

6 Interview, O. Robert Simha, Director, Planning Office, September 22, 1987.

7 Gruzen, op. cit. p. 7.

8 Ibid., p.7.

9 Simha, op. cit.

10 Gruzen , p. 159.

11 Ibid.

12 Ibid.

13 Ibid.

14 Ibid.

15 Ibid.

16 Interview William Dickson, Sr. Vice President for Operations, September 22, 1987.

17 Ibid.

18 Ibid.

19 Simha, op.cit.

20 Internal MIT Planning Office Memoranda, Coordinating the Planning Process, The Scheduling and Analysis of Capital Projects, Unpublished.

21 Ibid.

22 Ibid.

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23 Ibid.

24 Ibid.

25 Ibid.

26 Dickson, op. cit.

27 Simha, op. cit.

28 Ibid.

29 Simha, op. cit.

30 Dickson, op. cit.

31 Internal MIT Planning Office Memoranda, op. cit.

32 Dickson, op. cit.

33 Ibid.

34 Ibid.

Chapter 6

University of Rochester -- A Case Study

Introduction

This case study presents the evolving nature of the facility development process at the University of Rochester. The case study demonstrates a transitional state of affairs and provides evidence of a commitment to adopt a more rational and formal process as compared to past ad hoc procedures. The initial steps have been put into place and include the creation of a long term campus facility development program which serves as the foundation for a master plan, the establishment of key organizational responsibilities, and the formalization of decision-making and priority setting processes to assist overall capital planning efforts.

Institutional Profile

The University of Rochester, located in the city of the same name in upstate New York, was founded in 1850 as an independent, nonsectarian, coeducational institution. The University was created by a combination of forces that included the interests of the city of Rochester in promoting education, the desire of a group of professors and trustees of Madison University to move their school to a new location, and the intentions of various Christian denominations to protect the interests of their communities.[1]

The University has grown to become one of the leading private universities in the country. Programs range from undergraduate to postdoctoral in eight schools and colleges. These academic units include the College of Arts and Sciences, the College of Engineering and Applied Science, the Eastman School of Music, the Graduate School of Education and Human Development, the School of Medicine and Dentistry, the School of Nursing, the Simon Graduate School of Business Administration, and the University College of Liberal and Applied Studies. Based on the breadth of program offerings, both undergraduate and graduate, the number of professional programs, and the magnitude of research activities the University of Rochester has been granted membership in the American Association of

Universities.[2] The 1987 total enrollment of the University is approximately 8,800 of which 4,600 are full time undergraduates, 2,300 are full time graduate students and the remainder are part-time students. There are approximately 1,200 full-time faculty and 5,800 full-time staff employed by the University.[3]

The University was originally located on the eastern side of the city of Rochester. The main academic functions moved to the current location along the Genesee River as a result of efforts by two local businessman, Richard Todd and George Eastman. Eastman became the single most significant benefactor of the University. The new campus construction began in 1927 and was completed during the 1930's. Plans for the new River Campus were developed by McKim, Mead, and White of New York City, and Gordon and Kaebler of Rochester. The buildings were designed in the Greek revival style popular during this period.[4]

The University facilities have grown to encompass four main areas. The ninety acre River Campus supports the major academic functions of the University and includes thirty-five facilities in addition to athletic areas. The Medical Campus houses the medical program, a library and a hospital and is adjacent to the River Campus. Approximately one-quarter mile south of the Medical Campus is the South Campus which includes research facilities, a housing complex and available land for future expansion. In addition to these areas the facilities of the Eastman School of Music, including the Eastman theater and the Memorial Art Gallery, are located in downtown Rochester on the original properties of the University.[5] A current map of the University of Rochester Campus is provided in Appendix F.

Campus Facility Planning -- Master Planning

Campus facility planning is in a state of transition at the University of Rochester. In the recent past facility planning has been ad hoc at best and the University is now in the process of undertaking more serious planning efforts.[6] Construction of facilities in the recent past was accomplished without the guidance or vision of a comprehensive plan for

the campus. The recent addition to the athletic building, the Zornow Sports Center and the Wilson Student Commons designed by I.M. Pei and constructed in 1976 are examples of facilities built independent of an overall plan. The siting, design characteristics and circulation patterns of both facilities ignore the rest of the campus.

This new interest in planning is driven by a number of factors all of which make the need for such planning important to the future of the University. Due to growth over the last ten years in enrollments and research, the main academic area, the River Campus, has become crowded. Only one or two reasonable building sites that would not destroy the quality, character, or open spaces of this section of the campus remain. In addition a number of new facilities are needed for which programs are being developed and funding sources identified. The location of these facilities constitutes a major planning and policy question for the University. Finally recent land acquisitions, enables the University to integrate the South Campus with the River and Medical campuses, with a transportation link that will reduce the travel time between these areas which are separated by one-quarter of a mile. This opportunity raises major issues for siting and developing future facilities and support functions.[7]

In light of these factors responsibility for facility planning has recently been transferred to the Vice President for Administration. Formerly such responsibilities rested with the Vice President for Budget and Planning whose retirement provided impetus for this transfer of functions. Recognizing the need for planning, the Vice President for Administration has moved quickly in the two years for which he has had responsibility for campus planning and put together a campus development program. While the Vice President does not view this campus development program as a definitive master plan, he does consider it the foundation for such a plan. The development program consists of four sections which include, policies, program assumptions, needed facilities and proposed land use zones.

The policy section of the development program lays out a set of principles and objectives which are intended to guide future facility development. Policies are identified that provide for flexibility in the design and use of space, the protection of green spaces and campus ambiance, the establishment of guidelines for renovation and new construction, the development of a comprehensive energy management program, a system for repair and renewal of existing facilities, the creation of safe and accessible environment, the implementation of a comprehensive landscape strategy, a circulation and transportation program, and the protection of the historic character of its facilities.[8]

The document includes a set of growth assumptions, developed by the Vice President for Administration, which identify the major planning parameters that will affect the need for facilities over the next decade. The major parameters that influence future facility needs for which future growth assumptions are provided include research, undergraduate and graduate enrollments, and faculty size. Growth in research and graduate enrollments are expected while undergraduate enrollments will remain stable. Faculty size will grow in a few selected areas. New facilities are assumed for business, opto-electronics, and nursing with the first two being sited on the South Campus. The location of academic facilities on the South Campus is a major planning assumption and necessitates integrating this area with the River Campus via a transportation link. Current planning involves the development of a rapid transit system to provide the integration of the River, Medical and South Campuses.[9]

The list of needed university facilities for development identifies renovation and new construction projects through 1995. Included in this list of needed facilities are projects that will provide for road and intercampus drive improvements along the River Campus corridor. South Campus construction will include service facilities, facilities for opto-electronics and laser research, and the new Simon Graduate School of Business Administration. The Medical Campus is scheduled for renovation and construction projects with the primary emphasis being expansion and improvements to the Nursing program.

The Eastman Campus plans call for improvements to the library, the living center and the parking garage. Finally, on the River Campus projects are planned that include renovations to residential, athletic, and academic facilities in addition to a new residence hall and performing arts center. The total cost of all of these facilities if completed amounts to approximately $250 million.[10]

The critical section of the campus development program is the proposal for the establishment of land use zones. The adherence to the zoning concept will allow the university to achieve a number of a facility planning goals. They include a coherent plan for its facilities which are based upon compatible uses, a plant which maximizes the natural beauty of the campus, efficiencies of operation and transportation throughout the campus, and the opportunity for growth and change. All these goals if achieved would lead to a "coherent campus plan in which compatible uses can be concentrated together insofar as possible and in which desirable adjacencies can be accommodated".[11] The proposed zones include all of the major functions of the academic community including residential, teaching, research, medical, and support activities.

The Campus Development Program provides a significant foundation for future campus facility planning by establishing goals, policies, constraints, and program assumptions and identifying future needs and land use zones. The creation of this Program was accomplished primarily by the Vice President for Administration. He undertook this effort because of the need for future facility planning. The process for developing this Program was limited to the Vice President, his staff and an outside architectural firm, Sasaki Associates. The architectural firm was familiar with the campus due to their involvement over the past twenty years in a variety of facility planning consulting roles. In this case the firm acted as a sounding board for ideas and concepts advanced by the Vice President, mostly about questions of siting, area densities and circulation. No input was sought from the broader community of the University during this initial stage of development. Executive review by the President, Provost, Executive Vice President, and

the Facility Committee of the Board of Trustees has begun. In essence the process of developing a comprehensive plan for future facilities at the University of Rochester is just beginning. Reviews and input will be sought from the Deans and academic and administrative community in the near future. Change and evolution of the plan is expected.[12]

The University of Rochester is entering a period of serious facility planning during which the course of future facility development will be set. While planning is a new responsibility for the Vice President for Administration, he and the other executives recognize the importance of this activity and have a strong commitment to planning and the future development of campus facilities. The placement of the Vice President for Administration in the organization and the wide scope of his responsibilities from planning through design and construction allow him to have significant influence over both the future success of the planning efforts and the implementation of those plans.

Organization and Administrative Environment

For the purposes of this case study it is useful to review the organizational structure and responsibilities as they relate to facility planning and decision making processes at the University of Rochester. Figure 6-1 presents the relevant organizational arrangement. (In order to assist the reader Figure 6-1 on page 126 should be viewed as one reads the next section.)

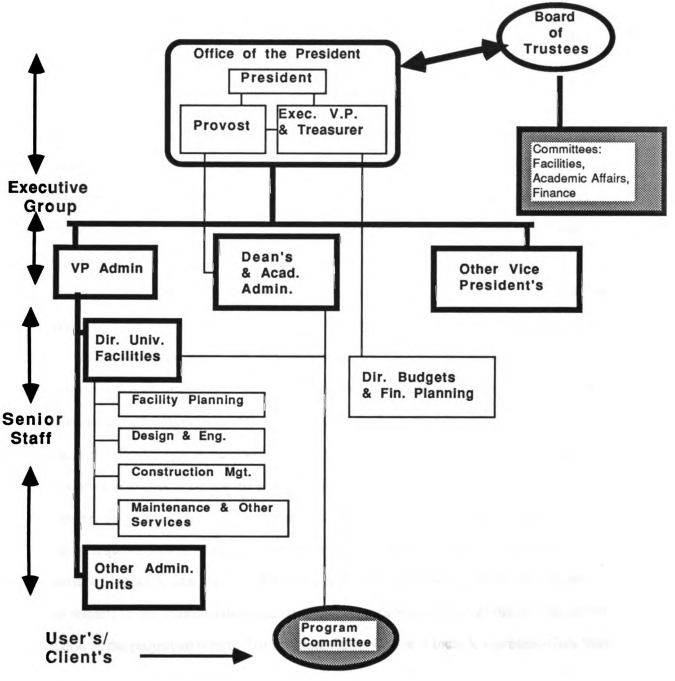
The executive level is formed by the Office of the President and the various vice president's and dean's. The Office of the President includes the President, the Provost and the Executive Vice President/Treasurer. These three individuals are the chief officers of the institution through whom policy and operating decisions are made. The Provost is responsible for academic and research functions, and the deans and other academic administrators of the institution report to him. The Executive Vice President/Treasurer is the financial officer and carriers responsibility for budgeting, investment and financial operations. The other vice presidents and deans of the various schools and colleges are at

Figure 6-1

UNIVERSITY OF ROCHESTER

Organization Chart

Campus Facility Development Responsibilities



the executive level. The Vice President for Administration is the individual charged with the full set of responsibilities for facility development in addition to responsibilities for federal relations, campus auxiliary activities, research administration and personnel.

The facility development responsibilities of the Vice President for Administration include facility planning, design and engineering services, construction management, and facility maintenance/operations. The Director of University Facilities is the senior staff administrator responsible for these functions and reports directly to the Vice President for Administration. In practice the facility planning functions are shared with the Vice President. The remaining functions rest primarily with the Director of Facilities and therefore are under his direct supervision.[13] The Design and Engineering Office is responsible for program definition and the development of preliminary architectural and engineering plans in conjunction with the project architect. In this role the Design and Engineering Office works with the various program committees during the early developmental stages of a project. The Construction Management Office is responsible for a project during the development of working drawings and the actual construction period.

All of the key planning and implementation activities are responsibilities of the Vice President for Administration and the Director of University Facilities. Programming and decision-making functions rest with the Deans and the Executive Vice President, respectively. Programming functions, those activities that lead to the specification and definition of activities to be housed in a facility, are decentralized at the University of Rochester. As heads of the academic units, the various deans have responsibility for initiating requests and developing programs to address facility needs. A Dean will establish a Program Committee that has fairly wide ranging authority for developing the initial request to the administration and upon project approval plays a significant role in the selection of the project architect. The Program Committee will include representatives from the program areas to be housed in the facility and from the Design and Engineering Office.

In cases where the facility has university-wide use or does not fall under the responsibility of a dean, the Vice President for Administration establishes a committee.

Central administration review and decision-making about requests for facilities begins with the Director of Budgets and Financial Planning. All requests are submitted to his Office for initial review. In practice the Director reports to the Office of the President through the Executive Vice President/Treasurer. This reporting relationship also provides access to the Provost and the President regarding capital budget issues.[14] The Director of Budgets and Financial Planning reviews financing options and funding availability for a given request. Ultimately responsibility for decision making and priority setting are shared among the three executives in the Office of the President and the other vice presidents, especially the Vice President for Administration, with the Director of Budgets and Financial Planning providing the key staff analysis role.

Through their committee structure the Board of Trustees is involved in various reviews and approvals throughout the process. These committees include the Facility, Finance, and Academic Affairs Committees. The Facility Committee is most directly involved in the review of long range campus planning issues, the review of architectural plans at appropriate points and the selection of the construction contractor. The Finance Committee is involved in the development of the University budget which entails the establishment of priorities and funding plans for capital projects. The Academic Affairs Committee is involved only in review of facility projects where the program has significant bearing on the academic mission of the University

The organizational structure at the University of Rochester provides a mix of centralized planning, decision-making and implementation with decentralized responsibilities for program development. The most significant interactions take place at the executive review and decision-making levels. Three of the key personnel within the organization are relatively new to their position or responsibilities. The Vice President for Administration has taken on the responsibility for facility development within the last two

years and has been responsible for changing the attitude of the organization towards facility planning. The Director of University Facilities came to the University in July 1987 while at the same time the Director of Budgets and Financial Planning was promoted to his position. These personnel changes reflect the University of Rochester's commitment to planning and the future development of facilities.

Capital Project Process

Table 6-1 outlines the process and procedure used by the University of Rochester for the construction of new buildings and major renovations. The major phases of the process include preliminary analysis, planning, budget/resource allocation, design,and construction. The table identifies the primary functions of each of the major phases, along with the administrative unit or group responsible for these activities. For each activity the relevant review or approval group is also identified. The remainder of this section will describe each phase of the process in detail.

Table 6-1
University of Rochester
Capital Project Process

Phase:	Activity Type	Responsible Organizational Unit	Approval/ Review Body
Program Development	Initial Concept/ Establish Committee	Initiating Dean /VP	
	Program Need, Space Use,Siting Costs, Funding,Schedule	Program Committee	
Budget/Resource Allocation	Capital Budget Request Submitted to Budget Office	Dean/VP	Exec. Staff Provost, Exec. VP Board of Trustee's -Facility & Finance Committees
Key approval point for moving ahead to design phase.			
Implementation Phases:			
Design	Architect Selection	Dir. Univ. Facilities Design & Eng. Group Program Committee	Provost, VP Admin.
	Preliminary Design- Program Development Floor Layouts, Exterior Design	Project Architect, Design & Eng. Group, Program Committee	Provost, VP Admin. Board of Trustee's -Facility Committee
Key approval point for moving ahead to detailed design phase			
	Definitive Design, Working Drawings, Final Cost Estimates	Project Architect, Design & Eng., Group	Provost, VP Admin. Board of Trustee's - Facility Committee
Final approval point for authorization to begin construction.			
Construction	Contractor Selection, Project Oversight/ Supervision, Project Completion	Construction Mgt. Group Contractor(s)	VP Admin, Board of Trustees -Facility Committee

Program Development

The program development stage includes the initial concept for a project, the establishment of a Program Committee and program definition. In Rochester's decentralized mode the responsibility for these functions rests primarily with the originating unit, the dean in the case of an academic facility and the appropriate vice president in the support areas. Projects serving a university-wide or support function would be initiated by the Vice President for Administration.

The Program Committee consists of representatives from the units to be housed in the facility and from the Design and Engineering Office. The Dean's Office provides the leadership of the committee. The Program Committee provides justification for the project, a description of program need, space use information, and general siting, project cost, funding and schedule information. The work of the group takes the form of a request to the central administration for support and authorization to proceed.

The amount of interaction between the central administration and the originating unit regarding programming or overall planning issues varies with the size of the project, with the greater interaction characteristic of larger projects. Involvement by the central administration in understanding the program content and scope has been ad hoc and somewhat at the discretion of the appropriate dean. Similarly the Program Committee's understanding of overall facility planning or design issues is limited. This process of program definition results in a high probability of future changes to the program during the design phase of the project. Both the Vice President for Administration and the Director of University Facilities recognize the need for greater coordination and interaction between the originating unit and the central administrative offices responsible for facility planning and design.[15] No formal reviews or approvals take place during this initial program development phase of a project. The product of this step is a request for review and approval by the central administration.

Budget, Program & Resource Allocation Decisions

With the work of the Program Committee completed, the appropriate Dean or Vice President submit the project outline in the form of a request to the Budget Office where the first significant institutional review begins. The Director of Budgets and Financial Planning coordinates the review, insuring that all aspects of the project are reviewed by the proper parties. The review is comprehensive and includes financial, program, and facility planning perspectives. At this point major issues of campus facility planning are considered, primarily by the Vice President for Administration and his staff. They give consideration to such items as location, relationship to other facilities and programs, site utilization, circulation, and support systems. They also review project details such as space utilization, cost estimates and the schedule at this point. The Program Committee and the Vice President for Administration resolve issues or conflicts prior to final review of the project by the executive group.

The Director of Budgets and Financial Planning undertakes financial review and focuses on the analysis of funding sources for the project. In the past capital budgeting processes and procedures have also been approached in an ad hoc fashion. Project approvals have been granted based on a review of an individual project without consideration of the complete set of capital needs or requests. The University proposes to develop a more formal set of budgetary procedures for determining priorities and authorizing project approvals in order to reduce the number of ad hoc requests. This approach will also improve the University's ability to undertake longer range facility planning.[16] With such a procedure the Director will be responsible for folding requests for individual projects into an overall institutional capital budget plan for review and decision making by the executive staff. A plan which lays out annual capital project priorities, funding sources and time frames will be developed annually in conjunction with the Vice President for Administration.

With the appropriate reviews and analysis completed, final decision making authority rests with the executive staff which includes the President, Provost, Executive Vice President and other vice presidents where appropriate. In terms of facility decisions, the Vice President for Administration is part of this group.

After approval by the executive group, the project proceeds to the Finance and Facilities committees of the Board of Trustees for their consideration. Again past practice has been somewhat ad hoc with the involvement of the Board committee being more for information than for approval. With clarification of procedures for establishing and developing the capital budget plan in conjunction with the recently completed campus facility development plan, the opportunity exists for greater input from these committees. How the role will actually develop is still unclear, however.[17] After review by the Board committees, the approved project is ready to move to the implementation phase.

Implementation-Design Phase

Project implementation involves two steps, the design phase and the construction phase. The design phase consists of selection of the project architect, further refinement and definition of the facility program, preparation of preliminary designs, completion of detailed working drawings, and final cost estimates. The construction phase involves the selection of a construction contractor and supervision of the actual project construction.

The Program Committee comes into play during the design phase for the selection of the architect. For larger projects the Dean or his representative take the lead in this step of the process with significant involvement of the Design and Engineering Office. On smaller renovation or technical projects, the Design and Engineering Office takes the lead. In either case the Design and Engineering Office prepares an initial list of architects for consideration by the Committee. A consensus decision-making process is used to narrow the list to a dozen or so firms to which a formal request for a proposal will be sent. Upon receipt of material from firms interested in being considered, the Committee will again

through a consensus process select three to five firms to be invited for interviews. Interviews will be held and the consensus choice will be recommended to the Provost and Senior Vice President for Administration. Upon approval at this level, the Design and Engineering Office will be instructed to enter into a contractual agreement with the chosen firm. No strong university wide criteria exist for the selection of the architect, and the process is very much a function of the nature and scale of the particular project.[18]

The development of schematic plans and the refinement of the facility program follow the selection of the architect. The Design and Engineering Office plays a key role on design issues during this phase. A project manager is assigned to the project and this individual has authority to direct the architect and influence the design. This is a fairly powerful role and these project managers are trained as architects and engineers.[19] Issues that require further program specification are the purview of the users representatives on the Program Committee. The project manager takes conflicts or issues that require significant tradeoffs to the executive level for resolution. With the leadership role resting in the Design and Engineering staff, emphasis in the past has been on university's needs primarily in the area of mechanical and infrastructure systems rather than user needs. For any project that has a major impact on the campus, the preliminary designs are reviewed at the executive level and by the Board of Trustee's Facility Committee.[20] Upon approval of the preliminary designs the project moves into final design development.

During this phase working drawings are completed and the project is placed under the direction of a project manager from the Design and Engineering Office. The Program Committee's role is essentially completed. The project manager supervises the internal review of the detailed architectural plans by the technical staff in the Design and Engineering Office. Also during this stage executive review is required to resolve any major conflicts between the design and the program. Final documents are prepared and cost estimates developed that will serve as the basis for sending out bids for the selection of

the project construction contractor. Executive level and Trustee review takes place one final time prior to authorizing the start of the construction phase.

Implementation--Construction Phase

The construction phase involves the selection of a contractor and the supervision of construction. The selection of the contractor is based on competitive bidding through an informal pre-qualification process. Contractors who are identified as being qualified to undertake a project of this scope and magnitude are invited to bid on the project. The selection of the firm with the lowest bid is a matter of practice more than explicit institutional policy. The Vice President for Administration provides executive approval of this step and the Facility Committee of the Board of Trustee's is notified of the contractor selection as an information item.[21] This phase of the project is managed by the Construction Management Office comprised of engineers and inspectors with construction experience. Their role in overseeing the construction phase is to provide a quality control service to the University.

Case Study Observations:

In general the organization, staff and process for facility planning and development is in a state of transition at the University of Rochester. The administration recognizes the need for facility planning and is committed to developing not only a better plan but a process for decision-making and priority setting in support of the plan. The project implementation steps are rather straightforward and standard but exist somewhat independent of the institutional facility planning objectives. Other than the personal involvement of the Vice President for Administration, few mechanisms exist for allowing the overall plan to influence individual projects. The University is now attempting to put into place a more orderly process for planning, decision-making and implementation, however.

Organization

The University's organization is based on a strong executive team starting with the Office of the President and the role of the Provost and Executive Vice President. The role of the Vice President for Administration is important both for involvement as part of the broader executive team of the University and as a result of his extensive set of facility development responsibilities. These responsibilities, ranging from facility planning to construction supervision, provide the Vice President with significant influence over the process.

Interactions between the central administration and the program representative, especially the academic users, is limited. This is especially so with regard to overall campus facility planning and program development. Facility planning is the sole responsibility of the Vice President for Administration. Program development for a given project is dominated by the user through the Program Committee with little influence from the central administration. This lack of structure ultimately increases the probability of conflict or serious changes in program scope once the central administration's needs and concerns are represented in the process. These conflicts generally arise as a result of major differences in the cost estimates for the projects between the program and design phases. The Program Committee is an example of decentralized power and influence. It also represents a missed opportunity to have significant central input early in the process for an individual project especially with regard to overall campus planning issues.

The tenure of the staff is relatively short in their current positions. This fact is another example of the transitory state of affairs. On the other hand the particular staff recognize the need to make improvements in the process and are taking steps to do so.

Campus Facility Planning -- Master Planning

The process of campus facility planning and the development of a long range campus master plan is in the initial stages at the University of Rochester. The development of such a plan is driven by the need for new facilities, the opportunity offered by available

land and the crowding of the main academic area. Efforts to develop this type of long range plan have been the responsibility of the Vice President for Administration with little or no input from the broader community. For this reason the plan is in the initial stages and will likely be the subject of much debate and quite possibly some change as this review takes place. The Vice President for Administration views such input as appropriate and necessary if the plan is to eventually achieve widespread acceptance on the campus .

The plan sets forth an excellent basis for future discussion, especially in the establishment of goals, policies, and land use zones. Since the plan is new and has not had the opportunity for broad input, especially from the academic colleges and schools, it has yet to achieve a significant toehold within the University. Acceptance of the ultimate plan will come only after a broader review has taken place and when the process for the development of individual projects is more established so as to allow the plan to have greater influence, especially in the early phases.

The use of an outside architectural firm as a sounding board for the development of the initial plan provides an excellent perspective. It also provides a level of expertise and experience absent from the existing staff.

Program Development

The leadership role and power of the Program Committee during the initial project and program definition stage is significant. This important step takes place almost entirely at the discretion of the user or program representative without real input from the central administration. This situation seriously reduces the influence of the overall plan of facilities development. The lack of guidance, and failure to establish goals or principles, especially as they relate to the overall campus plan, increases the probability for conflict in later stages.

The fact that much of the program is developed in this way makes the efforts required during the preliminary design phase more difficult. Program issues and conflicts must be worked out later which lead to the potential for significant changes in overall

program scope and cost at a point after the project has been through budget approval. This can lead to major problems with the financial viability of the project and with the schedule.

Budgeting/Resource Allocation

The budgeting process is also in a state of transition. It is changing from basically an ad hoc process where projects were reviewed independently of overall institutional capital priorities to one that attempts to be both more formal and more rational. The formalization of the review, priority setting and decision-making processes has great potential. Budgetary personnel now report to both the Provost and the Executive Vice President/Treasurer.

The budget review point is the first significant involvement of the central administration in academic based facility projects. The Vice President for Administration, the executive group and the senior staff recognize the need for earlier involvement by the central administration as an important and necessary improvement to the process. Interest and commitment in establishing a more rational approach and therefore eliminating the ad hoc nature of the past process also exists with the key executive and his senior staff.

Implementation-Design Phase

Procedures for the selection of the project architect reflect the lack of strong university principles and of involvement with the Program Committee. In the absence of specific institutional criteria for selecting architects, consensus rules. But consensus arrives without much guidance and opens the selection process to the vagaries of an inexperienced and unqualified committee. An intervening influence is the role of the Design and Engineering staff who due much of the support work for this step, and the approval role of the executive staff, especially the Vice President for Administration.

The role of the central administration becomes dominant during the design phase primarily after the selection of the project architect. Through the Design and Engineering Office the interests of the University become very influential in the development of preliminary designs. Also due to the nature of the program definition process, potential

exists for conflict and change during this phase. Otherwise the design process and the work of the project architect are effectively managed by the internal staff.

Implementation-Construction Phase

In house supervision of the construction process provides a significant measure of protection and quality control for the University. Supervision requires a staff with experience in this field; it also increases the institutional control and influence over the project.

Review and Evaluation

Review and approval mechanisms exist regularly throughout the process at the University of Rochester. The strength and centrality of executive review at important steps is evident. The role of the Board of Trustees is less clear and, like much of the process, is in a state of change where involvement will be clarified as the process is developed and the Board becomes comfortable with its role. The potential for positive and influential input of the Board exists especially with the role of the Facility Committee. The potential influence of this committee in terms of promoting the long term campus development plan is significant.

Summary

The University of Rochester case presents an organization and process in the midst of change, moving in the direction of more systematic planning and decision-making. Emphasis is on the development of a more orderly and structured process. A strong basis for influence of the plan on individual projects does not yet exist primarily due to the fact that campus facility planning is relatively new and is not part of the culture, and ownership of the plan is not widespread.

The strengths evident in this case are relatively few. The campus plan is quite comprehensive and provides and excellent roadmap for future facility development. The commitment on the part of the administration to the concepts of master planning and the

desire to develop a process for implementation is apparent. The Trustees seem supportive of this direction but have not provided leadership for the process. The overall organization is streamlined and the Director of University Facilities has significant influence during the design phase.

Due to the obvious transition taking place at Rochester a number of weaknesses are evident. The control and authority of the clients or program representatives during the program phase is a problem recognized by those interviewed. There are no immediate plans or strategies for correcting this situation. Strong ties do not exist between the central staff and the academic community and there are no readily available mechanisms for promoting the campus plan. Capital budgeting procedures have also been lacking.

Clearly the recognition of the need for such efforts and the commitment of the University to develop this process is present. The organizational alignments, staffing, and delegation of responsibilities are evidence of this commitment. While much of the focus has been on the creation of the plan and the development of a process for decision-making, continued analysis and efforts will be required to find mechanisms for implementing and gaining wide acceptance of the plan. Finalizing the plan and adapting the process to give the plan the maximum chance for influence will take a number of years to accomplish.

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3 Brochure, "A Walking Tour of the River Campus" University of Rochester, 1987.

4 May, op. cit., p. 219.

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6 Interview Donald Hess, Vice President for Administration, October 26, 1987.

7 Ibid.

8 Campus Development Program, VP for Administration, University of Rochester, October 1987.

9 Ibid. p. 22.

10 Ibid. pp. 16-18

11 Ibid. p. 19

12 Interview Donald Hess, Vice President for Administration, October 26, 1987.

13 Interview William Daigneau, Director University Facilities, October 26, 1987.

14 Interview, Ronald Paprocki, Director of Budgets and Financial Planning, October 26, 1987.

15 Interviews, Hess and Daigneau, October 26, 1987.

16 Paprocki, op. cit.

17 Hess, op. cit.

18 Daigneau, op. cit.

19 Ibid.

20 Ibid.

21 Ibid.

Chapter 7

University of Pennsylvania -- A Case Study

Introduction

This case study presents the evolving nature of the facility development process at the University of Pennsylvania. The University of Pennsylvania is expanding its facilities while it attempts to protect its urban character and achieve its academic objectives by establishing a master plan and a process for capital planning and budgeting that will support the plan. The case study is timely in that the University is grappling with the problem of finding mechanisms to improve the effectiveness of its master planning effort.

Institutional Profile

The University of Pennsylvania, one of the original colonial colleges, was founded in 1740 by Benjamin Franklin. Franklin envisioned that young people would study all subjects that led to "wisdom and virtue", but they also would be trained in the useful arts and sciences.[1] Today, the University of Pennsylvania is a member of the prestigious "Ivy League" and is also a member of the Association of American Universities. The University combines emphasis on undergraduate education with research, graduate studies and interdisciplinary opportunities all on a single campus, giving meaning to the concept of a unified set of programs in "One University".[2]

The University of Pennsylvania is a coeducational, private university with undergraduate offerings in four units; the College of Arts and Sciences, the School of Engineering and Applied Sciences, the School of Nursing, and the Wharton School of Business. In addition to these undergraduate programs, the University has twelve graduate and professional schools which include medicine, law, dentistry, veterinary medicine, communication, fine arts, social work, and education.[3]

The University enrolls just over 9,000 students in undergraduate programs and over 10,000 in its graduate and professional schools. There are approximately 3,400 faculty members. The campus is located along the west bank of the Schuykill River less

than two miles from the center of Philadelphia in an area that has come to be known as University City. The first building, College Hall, was constructed at this site in 1872.[4] Today the University consists of a single campus comprised of 276 acres and 128 buildings in an urban setting of ivy covered buildings, landscaped yards and brick walkways.[5] The current map of the University of Pennsylvania campus is provided in Appendix F.

In the first century of its existence the University occupied two different sites in the central Philadelphia area. Growth and expansion of both the central city and the University led to the decision to purchase a ten acre farm across the Schuykill River in 1870. College Hall was constructed shortly thereafter and was followed by the construction of Medical Hall. The Library, now named Furness Hall, was built next to College Hall in 1888. Other important facilities were built during this period and included the Museum and the Residential Quadrangle.[6] While these buildings were constructed without the guide of a grand plan so common during this period, the administration became convinced of the need for a comprehensive plan and assigned the task to Paul Phillipe Crete, a professor of design at Penn. Crete's report published in 1913 focused on the need to remove Woodland Ave. which at that time ran next to College Hall. The plan also called for the creation of open spaces enclosed by buildings and a major north-south axis emanating from College Hall.[7] Although not much of the plan was implemented, it influenced the direction of future plans.

A 1948 plan called for the creation of a Women's College and led to the construction of Hill House designed by Eero Saarinen in 1961. Today the facility serves as a coeducational dormitory. That plan called for the creation of a major east-west axis across the front of College Hall, possibly leading to the demolition of the Library (Furness Hall). In the late 1950's Woodland avenue was removed when the trolley line was replaced by an underground subway, providing the opportunity to create a major green space in front of College Hall. By 1962 a plan was developed that called for the establishment of the east-west axis, Locust Walk. It stated as an objective that future

construction should respect existing historical facilities, and maintained Furness Hall as an important facility in unifying the east-west spine of the campus.[8] Many buildings were built during the 1960's as the University experienced a period of great expansion. In 1976 a landscape plan was developed to improve the campus' open spaces and walkways.[9] Today the University of Pennsylvania is an outstanding institution that is attempting to build upon its urban heritage as it moves into another period of facility expansion.

Campus Facility Planning -- Master Planning

Over the last ten years campus facility planning at the University of Pennsylvania has evolved through a number of stages. The evolution of facility planning has been directly related to building needs. In the mid to late 1970's there was little construction activity, and the focus of campus planning was on landscape development. In 1977 the Landscape Architecture Master Plan was completed. Much of this plan was implemented as a result of the personal interests of Martin Myerson, the University President at the time.[10] Landscape improvements included the creation of Branch Levy park in the center of the campus, the closing of a street in order to establish the major east-west axis along Locust and Smith Walk, and the general upgrading of landscaping along the north-south pedestrian ways between 34th and 38th streets and throughout the campus in general.

During the period between 1980 and 1985, the University undertook a number of special analyses or studies related to future facilities, but none of these included a comprehensive view of the campus. Plans were developed for such areas as campus utilities, athletic facilities, engineering facilities, expansion, location of the fieldhouse and specific academic and research renovation projects. These studies and plans were developed for the University by a faculty member and students within the Architecture department. The faculty member and his students acted as project consultants to the University, primarily to the Director of Facility Planning. Also during this period, demands for additional buildings were on the rise which led to construction of new facilities for the schools of business (Wharton), and medicine and a major retail and office

complex(Walnut and 34th Street). These facilities were built without the guide of an overall campus plan. The administration viewed existing review mechanisms as ineffective in significantly influencing the character of these new facilities. For these reasons, and due to interest on the part of the Board of Trustees, the University made the decision to develop a campus master plan.[11]

The tasks of developing the campus plan was given to the same faculty member in the Architecture Department who had been working with the University as a consultant on facility planning problems. The draft of a plan which has been developed over the last twelve to eighteen months is now being reviewed by a number of administrators. The Architecture faculty member has worked closely with the Chief Planning Officer, the Vice President for Finance, and the Director of Facility Planning to understand overall campus facility needs and areas of future growth. The plan will also serve as the basis for an upcoming fundraising campaign. The Chief Planning Officer and the Vice President for Finance have helped the master planner to obtain appropriate input to the plan from the academic and broader campus communities. These two individuals have also provided focus, perspective and an overall sense of institutional priorities for the plan. [12]

The 1988 Campus Master Plan states that its aim is:

> "to provide direction on a wide range of immediate and short range problems, and to serve the longer range needs for growth and change: to provide a vision of Penn's future." [13]

The master plan intends to provide a guide to the future development of the campus in a way that is flexible and allows for responsiveness to future change. The plan envisions a University that will develop a strong relationship with the central city to the east of the campus and with community of West Philadelphia on its immediate west. It also proposes to continue its role in the development of the University City area of which it is a part, along with Drexel University and the Science Center. The plan calls for the University of Pennsylvania to play a cooperative but influential role in the development of these areas

which surround the campus. The primary connection for the University will be the development of the Walnut and Chestnut Street corridors running east and west from West Philadelphia to the Central City through the northern portion of the campus.[14] Land acquisition, especially to the south and east of the campus will also be important in facilitating the development of the campus towards the central city.

Another major tenet of the plan is the enhancement, rather than any major alteration, of the basic campus structure which is organized about a central core of academic facilities surrounded by housing and support functions, including parking.[15] The master plan includes objectives or principles for the development of each major precinct (central, north, south, east and west) of the campus and entails recommendations for circulation, landscaping and site development.

Other major principles include strengthening campus boundaries and gateways; improving the major north-south and east-west axes, primarily along 34th Street, 36th Street and Walnut street; continuing the improvement of landscaping; and historical preservation. The master plan also outlines a broad set of specific program needs and identifies alternative site locations for meeting these needs. Examples of programs which require additional facilities include the Physical and Engineering Sciences, Psychology, Music, Education, the Law School and Medical schools. In addition a number of student and faculty activities, such as recreation, athletic events, housing, retail stores and parking facilities are also required. The plan identifies alternatives for meeting these needs.[16]

The master plan includes two additional significant features. The first is a statement of principles and objectives concerning the character and scale of campus development. The following statement from the master plan summarizes the situation:

> "The current campus of the University of Pennsylvania has a clear order, a well defined formal system. It is perceived as a unified "place", distinguished from its surroundings but clearly part of the University City community. The consistent architectural character of its individual buildings contributes greatly to this sense of unity"[17]

The historical buildings of the campus are built from a dark, red brick material with a limestone trim; many of the newer additions have followed this pattern. Those newer buildings that have not followed that pattern, such as the Graduate Towers, the International House, the Annenberg School of Communications and the retail development on 34th and Walnut Street, have not destroyed the overall sense of unity, however.[18] The plan states clearly the objective of maintaining and protecting the sense of character and unity present on the existing campus.

The last major feature of the plan is a recommendation that major review efforts should be undertaken to insure that individual building projects are consistent with and live up to the expectations of the plan. This role can be achieved through the efforts of the existing Design Review Committee. The plan also calls for the establishment of a Campus Master Plan Review Committee charged with the responsibility of regularly updating, modifying and revising the master plan in order to keep the plan as current as possible.[19]

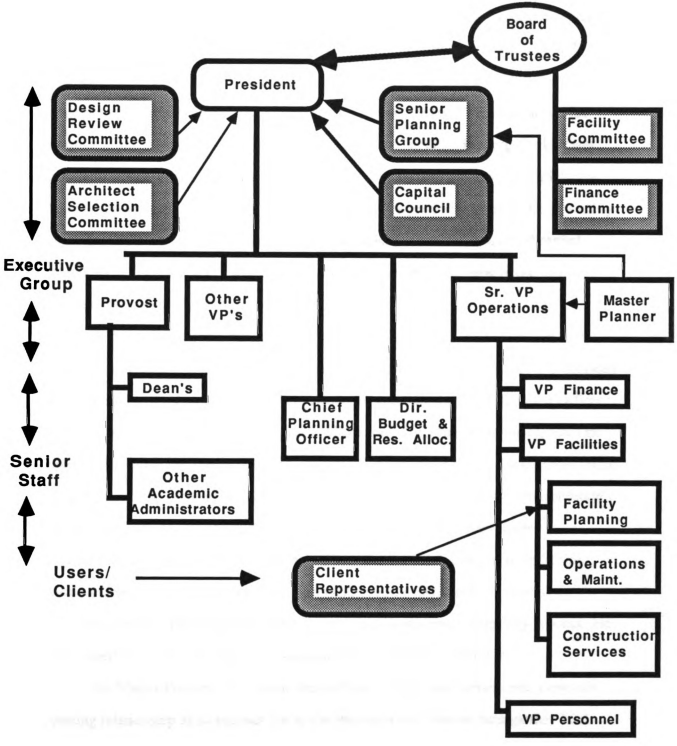
The master plan is in the final stages of review prior to being submitted to the Trustees for formal adoption. The faculty member in Architecture, who is now also the chairman of the department, views his reporting line to the President and the Senior Planning Group through the Chief Planning Officer and the Vice President for Finance. Ultimately the Campus Master Plan will be approved by the administration through the Senior Planning Group and the Trustees through the Facility Committee.

Organization and Administrative Environment

For the purposes of this case study, it is useful to review the University's organizational structure and responsibilities as they relate to the facility planning and decision making processes. Figure 7-1 presents the relevant organizational arrangement. (In order to assist the reader Figure 7-1 on page 148 should be viewed as one reads the next section.)

The three key actors at the executive level of the University of Pennsylvania are the President, the Provost and the Senior Vice President for Operations. As the chief academic

Figure 7-1
University of Pennsylvania
Organization Chart
Campus Facility Development Responsibilities



officer, the Provost oversees the academic units of the University and is involved as a member of all the key decision making bodies concerning facilities but has no direct operational responsibilities in this area.

Responsibility for facility development is primarily delegated to the Senior Vice President for Operations. Her duties include overall responsibility for the physical plant, finance, capital budgeting, facility planning, design development and construction.[20] Three vice presidents report to the Senior Vice President. The Vice President for Finance is charged with capital budgeting and finance, in addition to overall responsibilities for institutional financial operations. The Vice President for Facilities is charged with plant maintenance, housekeeping, facility planning and construction. The Director of Facility Planning reports to the Vice President for Facilities and is primarily responsible for facility planning and the supervision of the design development process for individual capital projects. The Director of Construction Services is responsible for supervising and managing the construction of building projects.[21]

Of the remaining individuals who report to the President, two play critical roles with respect to facility development by virtue of their responsibilities and their membership on key executive level committees. These two individuals are the Chief Planning Officer and the Director of Budgeting and Resource Allocation. The Chief Planning Officer also serves as the director of the Institute for Research on Higher Education, a semi-independent research arm of the University. As the chief planner, he is responsible for the institution's planning process and focuses on the long range needs of the University, both programmatic and capital. He is a member of both the Capital Council and the Senior Planning Group. The Director of Budgeting and Resource Allocation is primarily responsible for the operating budget and the corresponding annual budgetary process. He too is a member of the Capital Council and the Senior Planning Group.[22]

The Master Planner, who also is chair of the Architecture Department, views his reporting relationship as an indirect line to the President and Provost through the Chief

Planning Officer and the Vice President for Finance.[23] This reporting arrangement is accomplished through the Senior Planning Group which is the body that will ultimately review and approve the master plan. The Master Planner works closely with the Chief Planning Officer, the Vice President for Finance and the Director of Facility Planning. The Master Planner's reporting relationship applies to his master planning duties only.[24] Administrative responsibility for the master plan rests with the Senior Vice President for Operations and is consistent with her overall responsibilities for facility development.[25]

A number of key committees play a significant role in the facility development process at the University of Pennsylvania. These include the Senior Planning Group, the Capital Council, the Design Review Committee and the Architect Selection Committee. These committees operate by consensus; all report to the President and are a means for wide involvement and participation in planning and decision making regarding facilities.

The Senior Planning Group includes as its members the President, the Provost, the Senior Vice President for Operations, the Vice President for Finance, the Executive Vice President for Medicine, the Vice President for Development, the Director of Budgeting and Resource Allocation, and the Chief Planning Officer. This committee functions both as an operational short term issues management group and a long term visionary strategic group. The final review and approval of the campus master plan will take place within this group.[26] The Chief Planning Officer is the key staff member to this group with regard to addressing long term strategic issues and agenda setting for the University.

The Capital Council is a decision-making body with respect to facility projects and therefore is the focus for priority setting and the annual capital budgeting process. The committee reviews and acts upon building project requests and financing plans and oversees the capital planning and approval process. The Capital Council consists of the President; the Provost; the Senior Vice President for Operations, who is the chairperson; the Vice President for Development; and the Secretary of the Corporation (Trustees). This council is served by a staff group which includes the Deputy Provost, the Vice President

for Finance, the Chief Planning Office, the Director of Budgeting and Resource Allocation and the Director of Facility Planning.[27]

While the above two committees serve as the basic planning and decision-making bodies, two other committees play a role in the process. They are the Architect Selection Committee and the Design Review Committee. The Architect Selection Committee membership includes as chair the Dean of the Graduate School of Fine Arts, the Director of Facility Planning and representatives of the client or program group that the project will serve. The Architect Selection Committee recommends the hiring of an architect for an approved project to the President and the Board of Trustees.

The Design Review Committee has responsibility for overseeing the design of building projects by assisting the Director of Facility Planning in his relationship with project architects. The Committee represents the University to the firm hired to do the design of a particular project. In the case of disputes or disagreements, the Committee will make recommendations to the President and the Board of Trustees. The Design Review Committee has broad membership which includes the Dean of the Graduate School of Fine Arts, the Chairman of the Architecture Department (also the master planner), a faculty member from the Architecture Department, the Chairman of the Landscape Department, the Provost or a member of the central administration, the Vice President for Facilities Management, a member of the Board of Trustees' Facilities Committee, the client, students, faculty, and the Director of Facility Planning as the key staff person.[28]

The Board of Trustees are involved in the process through the Facilities Committee. This committee gives approval to individual building projects, selection of architects, design development,and the award of construction contracts and will eventually review the campus master plan. The Trustees' Finance Committee approves financing plans for capital projects. The recent initiatives to undertake a campus master plan and the development of a more structured capital planning and approval process have been encouraged and supported by the Trustees.[29]

The organizational structure with regard to project implementation is hierarchical and concentrated within the sphere of responsibilities of the Senior Vice President for Operations. In terms of overall facility planning, decision-making influence and responsibilities are greatly dispersed. They rely upon rather wide participation at the upper levels of the organization and are rooted in a consensus type committee decision-making structure. Recent initiatives to develop the campus master plan and to provide more formal structure to the capital planning and approval process for individual building projects have been developed within this existing organizational structure.

Capital Project Process

Table 7-1 outlines the process and procedure used by the University of Pennsylvania for the construction of new buildings and major renovations. The major phases of the process include program development and capital budgeting/resource allocation, design development, and construction. The table identifies the primary functions of each of the major phases, along with the administrative unit or group responsible for these activities. For each activity the relevant review or approval group is also identified. The remainder of this section will describe each phase of the process in detail.

Table 7-1
University of Pennsylvania
Capital Project Process

Phase:	Activity Type	Responsible Organizational Unit	Approval/ Review Body
Capital Planning & Approval Process	Initial Concept/ Program Need, Space Use,Siting Costs, Funding,Schedule	Dean /VP Capital Council Staff Group	Capital Council,
	Key approval point for moving ahead to design phase.		
Implementation Phases:			
Design	Architect Selection	Dir. Facility Planning & Client	Architect Selection Committee, President
	Preliminary Design- Program Development Floor Layouts, Exterior Design	Project Architect, Director Facility Planning, Client	Design Review Committee, President
	Key approval point for moving ahead to detailed design phase		
	Definitive Design, Working Drawings, Final Cost Estimates	Project Architect, Director Facility Planning, Client	Design Review Committee, Capital Council, Board of Trustee's -Facility Committee -Finance Committee
	Final approval point for authorization to begin construction.		
Construction	Contractor Selection, Project Oversight/ Supervision, Project Completion	Construction Services Group Contractor(s)	Capital Council, Board of Trustee's -Facility Committee -Finance Committee

Capital Planning and Approval Process

With the increase in the demand for additional and renovated facilities over the last three to five years and given the opportunity to fund capital projects through the bond markets, the University of Pennsylvania determined that a more rigorous process of capital budgeting was required. This process was designed to develop institutional capital priorities that were consistent with the institution's five year academic planning process.[30] Previously capital projects were reviewed independently of each other without the context of overall institutional priorities and heavily influenced by the financial fortunes of the unit requesting the facility. Examples of this were the cases of the Medical School and of the Wharton School of Business. Both units were able to proceed with facility projects somewhat independently of central university planning or programming requirements primarily as a result of the fact that funding was being provided from other than central university sources.[31] The capital planning and approval process which is essentially an annual capital budgeting mechanism is designed to provide institution wide decision making and priority setting for capital projects. This move, along with the efforts to create a campus master plan, were supported and encouraged by the Board of Trustees.

The stated purpose of the capital planning and approval process is to ensure that scarce university resources are allocated to those projects that best serve University and school objectives. Such a process will enable the University to improve forecasting of capital expenditures and to develop both an annual and a five-year capital budget for Trustee review and approval.[32]

The guidelines established for this process require that units in need of additional facilities or renovations which will cost in excess of $100,000 must submit annual requests to the Capital Council. The Capital Council assumes that the submission of a request is based upon careful review and analysis and that the project is part of the units overall five

year plan. The basic program and its facility and financial requirements are to be developed prior to forwarding the request for approval to the Capital Council.[33]

The individual schools, colleges, or administrative units are free to develop this basic project information in any way they feel appropriate. The staff and resources of the University's Facility Planning Office may be used or outside consultants may be employed to develop the required information. The request or proposal must outline the relationship this project has with overall institutional objectives and the unit's own five year plan. Information must be provided that includes the location or site of the proposed facility, a project history, a project description and approximate square footage, a schedule and necessary completion dates, estimated costs, source of funds, project purpose and justification, and any impact the project might have on the operating budget. The completed proposals are submitted to the Director of Facility Planning who is the key staff person for the Capital Council.[34]

A group of staff from the key offices that provide support to the Capital Council will organize the requests from the various schools, colleges, or administrative units. The Capital Council review focuses on four areas:

1. the extent of project development and evaluation at the unit level,
2. the extent to which the project advances University and unit objectives,
3. the priority ranking provided by the requesting unit, and
4. the extent to which funding sources are identified.

The Capital Council will meet with the deans, directors and administrative heads to discuss the individual requests. Approval at this point by the Capital Council allows the project to proceed to the design development phase.[35]

Implementation-Design Phase

The design phase at the University of Pennsylvania entails three major steps: the selection of the project architect, the preparation of the preliminary designs and the completion of final designs or working drawings. The Director of Facility Planning provides the key staff coordination and project leadership during this phase of the project. The Architect Selection Committee has the responsibility to choose the project architect. The client or representative of the program area to be served by the facility plays a key role in this step of the project. In the past, donor's who have provided important financial support for a given project have also been very influential at this stage. Requests for proposals are sent to a number of firms seeking their potential interest in the project. Based upon the responses, the Committee will narrow the list to a few firms to be interviewed. As a result of the interviews, the Committee will recommend to the President the hiring of a firm to be the project architect.[36]

The project architect working with the Director of Facility Planning and representatives of the client begins by further developing the project program into a set of specific space and facility requirements. The program definition that preceded this stage did not include a full set of program specifications upon which architectural designs could be based. Based upon this detailed program, the project architect develops preliminary designs and revised cost estimates. The Design Review Committee oversees the development and provides input and reaction to the work of the project architect. Any problems with the design, program, project scope or overall budget will necessitate the review and approval of adjustments by the Capital Council. With the completion of the preliminary design step, more detailed designs and working drawings will be prepared. Again the Design Review Committee provides input throughout this stage.[37] When working drawings are completed and final cost estimates developed, the project is sent to the Capital Council for final review and approval. Upon approval the project will be

forwarded to the Board of Trustees' Facility Committee for review and approval. Recently the Trustees have been assigning one of their members to work with the University during the implementation phase.[38]

The Design Review Committee plays an important role in the design development phase of a project and includes a number of key staff as members. Past experience has met with limited success primarily due to the fact that the Committee has been unable to significantly influence the design where they disagreed with the project architect. Examples of this include the Wharton School project and the recently completed retail development on 34th and Walnut Street. Among those interviewed, there is a desire to increase the effectiveness and influence of this group.[39]

Implementation--Construction Phase

During the construction phase the project is supervised by the Director of Construction Services for the University. The Design Review Committee and the Director of Facility Planning are not involved in this phase. It involves the selection of a construction contractor and the actual construction of the project. The Capital Council and the Trustee's Facility Committee will approve the hiring of a construction contractor. If the construction phase proceeds without problems in schedule or cost, no other reviews or approvals are required. If problems exist the Capital Council and the Trustee's Facility Committee will become involved in resolving the problem or making the necessary choices to move the project forward.

Case Study Observations:

The University of Pennsylvania is currently in the midst of major building activities which have followed a period of relatively little building on campus. Major improvements have been made to the campus in the area of landscaping, open spaces and campus walkways as a result of the 1977 Landscape Architecture Plan. Those interviewed agree that improvements to the process of planning and decision-making for facilities are necessary. Past planning and decision-making for facilities has been on a project by project

basis without a comprehensive view of the total campus or a clear set of institutional priorities. The recent master planning effort in conjunction with the implementation of the capital planning and approval process are relatively new and are viewed by the administration as important steps in achieving these improvements. They also recognize that more effort, experience and discipline are required to make these processes fully effective. The staff are moving in the direction of strengthening these processes and are aware of the areas that require improvement. Following are a series of detailed observations regarding the organizational structure and facility development process at the University of Pennsylvania.

Organization

The organizational structure at the University of Pennsylvania delegates most of the implementation responsibilities from project facility planning to construction to the Senior Vice President for Operations. Master planning responsibility has been given to a faculty member who acts as a consultant to a group of administrators primarily through the Senior Planning Group. The fact that the master plan is being developed in-house is a major advantage and viewed quite positively by all involved. The role of a consultant, however, leaves some confusion as to who is ultimately responsible for ownership of the plan. While the Senior Planning Group will approve the contents of the plan, this group cannot serve to promote the plan on a day to day basis. The Senior Vice President for Operations is in a central position to affect the plan's influence through her role as chair of the Capital Council and her operating responsibilities for facility development projects. The fact that there is significant overlap between the Senior Planning Group and the Capital Council is an advantage in this regard.

The Director of Facility Planning plays an important role during the design development stage of any project. Since much of the detailed program development takes place during this stage, the Director should be in a very influential position to insure that facility programs are responsive to the objectives and visions presented in the master plan.

The master plan is still in the development stage; therefore, it is somewhat premature to expect the plan to influence current facility programming. Recent experience, however, points to a significant strength on the part of certain colleges and schools of the University in developing their own facility programs with minimal influence on the part of the central administration or the Director of Facility Planning. This has been the case with the medical school, hospital, business school and retail development projects where primary funding was being provided by other than central university revenue sources. It is recognized by those interviewed that this is a step that must be tightened up and that facility planning for individual projects regardless of their source of funding must be consistent with the overall institutional plan. Given his position within the University, the role of Director of Facility Planning as staff to the Capital Council and the Design Review Committee, and his relationship to the master planner puts him in an ideal position to make sure that individual projects are consistent with the master plan.

A result of this situation where facility programs have been developed independently of the central administration has been problems and disagreements over project cost estimates and program scope. Recent experience in the Engineering school where there have been significant differences in cost estimates between those developed by an outside architect hired by the school and those of the central administration is an example of this lack of coordination in program development.

The existence and makeup of the two planning and decision-making committees provides great potential for the success of master planning. The Senior Planning Group views the institution from a visionary standpoint focusing on broad issues and is an ideal forum for review, discussion and approval of the master plan. The fact that all of the key executive and senior staff participate in this group is important. The Capital Council is more of a budgetary and project approval body. The potential strength and power of the Council is significant in terms of the potential for the master plan since it reviews and approves all projects and is now responsible for developing the capital budget. The fact

that there is an overlap in membership is also a major advantage. The importance of the role and responsibilities of the Capital Council is recognized by those interviewed. It is also recognized that the Council in the past has not been extremely influential when faced by a strong school or college with funding in hand for their project. The Capital Council is an important actor in terms of the future success of this process.

The Design Review Committee and the Architect Selection Committee also have great future potential but have had less than maximum influence in the past. The Architect Selection Committee has worked well in the past. Among those interviewed there is satisfaction with this approach that is enhanced by the fact that the Director of Facility Planning plays a key role in the selection process. The Design Review Committee works closely with the architect during the design development stage. The committee is viewed as having great potential but interviewees thought that it might be unable to deal with a strong independent client. The Design Review Committee has had little power to influence or overcome a client/project architect that it disagrees with. Recent examples of this are facilities constructed for the Wharton School and the retail development on 34th and Walnut Street. The fact that the Master Planner is a member of this committee and that it is staffed by the Director of Facility Planning are major advantages. The fact that the committee lacks influence in critical design decisions is a major shortcoming, however.

Both Committees make recommendations to the President. Reporting to the President removes their role and the review of their recommendations from the purview of the decision-making group, the Capital Council. A mechanism for strengthening the design review process, especially the role of the Design Review Committee, would be to have that committee answer to the Capital Council, a move that might strengthen both committees.

The role of the Trustees, primarily the Facility Committee, has grown to the point where an individual trustee is now assigned to each project to provide oversight and to report on progress. The Trustees have also been a driving force in the move to develop a

master plan and to improve the capital budgeting process. The support and effort of the Trustees in this regard is a major advantage in terms of further developing the process.

Campus Facility Planning -- Master Planning

The master plan as it has developed to the final draft stage is an excellent document that outlines a vision and set of objectives for the future development of facilities. One of its major strengths is that it provides a number of alternatives for solving particular facility needs or for dealing with building sites. The plan is comprehensive and includes building needs, circulation systems, open spaces, historical preservation and recommendations concerning the character and scale of, new facilities. The plan also recognizes the need for and recommends the establishment of a continuing process for review and updating. This recognition is extremely important and is shared by the key staff, but the plan makes no specific suggestions on how this objective might actually be accomplished.

As mentioned above, there is some uncertainty regarding ownership of the plan. This is a shortcoming that needs to be improved upon. The fact that the master planner's role is viewed as a consultant and is not institutionalized within the organizational structure only adds to this uncertainty. As with the Design Review Committee, a relationship to the Capital Council on the part of the master planner would strengthen the process of master planning.

The strategy of using a person both internal to and familiar with the university is a major advantage in the development of the master plan. The fact that the master planner evolved into the role as a result of past experiences working on specific facility projects provided an excellent background for the master planning effort. In addition, the relationship that developed between the Chief Planning Officer, the Vice President for Finance and the Director of Facility Planning with the Master Planner is a major advantage. Both of these factors, the experience with the University and the relationships with other key staff, are difficult to develop when using an outside consultant as master planner.

Capital Planning and Approval Process

The capital planning and approval process is a key decision making process in the life of a project. The primary focus of the process has been financial, and recently this step has been expanded to include the development of the institution's capital budget. The evolution into the more formal capital planning and approval step has resulted from the need to have more control of facility projects, to identify institutional priorities, and to develop a longer term capital budget. This process is also viewed by the administration as consistent with the creation of the campus master plan, a mechanism for achieving orderly growth and development of facilities. Through the role of the Capital Council, greater control of the project approval process is also possible. The combination of these two processes provides great potential to relate the master plan to capital budgeting and decision-making. The processes are still relatively new and only time will tell if they will become truly effective. It is clear that the administration and the Board of Trustees are committed to these improvements.

The detailed step in this process that involves the development of the capital expenditure proposal provides the Capital Council with a basic program description and justification. While this is not a full facility program, it does serve as the basis for initial cost estimating and hence decision-making about the project. Although the intent of the process is to have this information provided in cooperation with the Director of Facility Planning, there have been problems in the past where this has been developed independently by the client usually working with an outside consultant. The potential exists for problems in both program scope and the resulting cost estimates primarily during the design phase if not sooner. The fact that some aspects of a project proceed without the close cooperation or even approval of the central administrative staff who have responsibility for such activities is a major weakness that is recognized as such by those interviewed.

Implementation-Design Phase

The architect selection process works quite well and is well accepted by all parties. Past experience and reputation are important attributes that any potential project architect must have to be considered for work at the University. The process is heavily influenced by the desires of the representative of the program, the client. Selection can not be described as an open process but rather one where a number of highly regarded experienced firms receive consideration. The Architect Selection Committee functions to assist the client by insuring that the potential firms are able and competent to undertake the work at hand. The process is well accepted and no unusual constraints exist, such as requirements that project architects be either from Philadelphia or be graduates of the University of Pennsylvania.

The existence and role of the Design Review Committee, on one hand, is a major strength and on the other, is a weakness. The strength comes from its role in reviewing designs throughout the design development stage, its broad representation and its potential tie to the master plan vision through the participation of the master planner and the Director of Facility Planning. The potential influence of this committee is significant. The weakness comes from the fact that the Committee has been unable to carry significant influence in the past on a number of projects, and in the opinion of those interviewed, the designs suffered. There is no apparent advantage, and in fact it is a disadvantage, for the Design Review Committee to report to the President since this provides opportunity for influence outside the context of the facility decision-making process. The role of the Design Review Committee could be strengthened if it reported to the Capital Council.

The role of the Director of Facility Planning in the facility program development step is important but limited due to the influence of the client. This is true whenever the client attempts to develop the program independently of the central facility planning staff and especially in cases where the client's project is funded without reliance on university sources of revenue. As mentioned above this may lead to problems of scope and cost.

This independence on the part of the client is a recognized weakness of the existing process and one that the capital planning and approval process is attempting to address.

Implementation-Construction Phase

The construction phase is an implementation step that is managed or supervised with in-house staff and functions well in the opinion of those interviewed. There is a close working relationship with both the facility planning staff and the finance staff all of whom are in the same chain of command. The Capital Council and the Board of Trustees oversee this stage. Since this phase is basically one of implementation, there is very little chance to make adjustments to the design or program. Therefore the result of the design phase is what will actually be built, regardless of whether the Design Review Committee agreed with the design or not.

Review and Evaluation

Numerous review and evaluation points exist in the process starting with the Senior Planning Group's role in the master plan and including during the life of a project the Capital Council, the Design Review Committee and the Board of Trustee's Facility Committee. The fact that such checkpoints exist is a major advantage for the University in its desire to improve the process. The Design Review Committee and the Capital Council, with their roles strengthened could significantly increase the effectiveness of the facility development process. Those interviewed recognize this and are committed to strengthening the influence of these two groups.

Summary

The facility development process at the University of Pennsylvania is in a gradual state of transition evolving to more centralized and controlled planning, decision-making and review. This is a conscious strategy that has grown out of dissatisfaction with the past approach that has been a project by project type of process without the benefit of an overall view of the future or a clear set of institutional priorities. The Board of Trustees has both encouraged and supported the move in this direction.

With the creation of the master plan, the establishment of the capital planning and approval process, and the existence of the Capital Council and the Design Review Committee the key components are in place. To be successful the University will have to continue its strategy of educating the campus community, develop greater institutional discipline with respect to strong schools and colleges, and strengthen the roles of the critical decision-making and review bodies.

A number of strengths are evident as a result of this case review. The existence of the master plan, the comprehensive nature of the plan, and the emphasis on the need for a review process are major strengths. Also the recent implementation of the capital planning and review process is an attempt to bring order to the facility decision making process. Multiple review mechanisms are in place and are staffed with key personnel. The potential of the Design Review Committee is particularly great. In addition the possibility of the Capital Council playing a more influential role in the review process as well as the existing role in budgeting and project approval is significant. The role of the Trustees, both their interest and support, is a major advantage to the administration as they attempt to make improvements to the process. Lastly, a major strength is the fact that the administration is gradually moving, to replace its project by project approach with a more centralized and rational system of planning and decision-making.

A number of weaknesses or shortcomings also are evident. The clarity of the organizational arrangements with respect to the master planning responsibilities are somewhat confusing. This problem is influenced by the consulting nature of the master planner's role. The Master Plan is too new to have become widely accepted or entrenched within the organization. The Capital Council's role has also been limited to project approval and budgeting and lacks both authority during the review process and a strong tie to the master plan. Another weakness is the lack of strength of the Design Review Committee in terms of its ability to influence final building designs. Facility programming

is often dominated by the client rather than the central administration and is evidence of decentralized power in a process that seeks more central control over decision-making.

It is quite clear that prior to these recent developments the process at the University of Pennsylvania lacked structure. Projects were developed and approved on a one by one basis without the context of an overall set of goals or objectives. Decisions were made without the value of a clear sense of institutional priorities and therefore made on an individual basis. Project implementation took place without key checkpoints and those that existed were ineffective. It is also clear that as a result of the demand for more buildings, the University administration recognized the need for a more rational approach and is in the process of establishing one. The creation of a master plan, the capital planning and approval process, and the various review mechanisms are key components of this strategy. By strengthening a number of the existing mechanisms, the University of Pennsylvania has the potential to develop an effective facility planning and decision-making process.

1 University of Pennsylvania Undergraduate Application and Admissions Catalog, 1987-89, p. 1.

2 Ibid., p. 1.

3 Penn: A Profile, The University of Pennsylvania Admissions Brochure, 1987 p. 8.

4 Myerson, Martin and Winegrad, Dilys Pegler, Gladly Learn and Glady Teach, Franklin and His Heirs at the University of Pennsylvania, 1740-1976,(Philadelphia:The University of Pennsylvania Press, 1978) p. 205.

5 Ibid., p 8.

6 Myerson, op. cit. , pp. 201-209.

7 Ibid., p. 214.

8 Ibid., p. 216.

9 Ibid., p. 216.

10 Myerson, op. cit. , p. 9.

11 Interviews, Al Levy, Chairman Department of Architecture/Master Planner and Robert Zemsky, Chief Planning Officer and Director of the Institute for Research on Higher Education, February 5, 1988.

12 Interview, Al Levy, Chairman Department of Architecture/Master Planner, February 5, 1988.

13 1988 Campus Master Plan-Draft, University of Pennsylvania, January 17, 1988, p. 1.

14 Ibid., pp. 28-31.

15 Ibid., p. 4.

16 Ibid., pp. 5-31

17 Ibid., p. 18.

18 Ibid., p. 18.

19 Ibid., p. 19.

20 Zemsky, op. cit.

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21 Interview, Marna Whittington, Vice President for Finance, February 5, 1988.

22 Zemsky, op.cit.

23 Levy, op. cit.

24 Levy, op. cit.

25 Zemsky, op. cit.

26 Zemsky, op. cit.

27 Zemsky, op.cit.

28 Levy, op. cit.

29 Whittington, op.cit.

30 Whittington, op.cit.

31 Zemsky, op. cit.

32 Capital Planning and Approval Process -Purpose & Guidelines, Unpublished Internal Document. p.2.

33 Ibid., p.3.

34 Ibid., pp. 5-6.

35 Ibid., p. 8.

36 Levy, op. cit.

37 Ibid.

38 Whittington, op. cit.

39 Levy, and Zemsky, op. cit.

Chapter 8

Case Comparison and Conclusions

The central question of this research effort has focused on how an institution that desires a sense of order and community among its facilities can develop and implement a master plan in order to achieve this goal. It was designed using case studies to investigate the ways in which four institutions approached the process of designing and implementing campus facility plans. Two of the four major purposes of the study -- identifying significant organizational and process factors for each of the institutions and noting their major strengths and weaknesses -- have been completed. This chapter focuses on the remaining two major purposes of the study. First, by comparing the cases, organizational and process factors that enhance the effectiveness of campus facility planning are identified. Second, the conclusions that result from this analysis serve as the basis of a proposed model for designing and implementing campus master plans and the facility development process.

The comparative analysis concentrated upon matching patterns and replicating processes or organizational structures among the four institutions. This analysis identified approaches that were critical to or improved the implementation of campus master plans. Particularly effective approaches, even though they may not have been replicated elsewhere, were also noted. The following analysis provides comparisons and conclusions for each variable in the inquiry structure: facility master planning, organizational structure, project initiation/program development, capital budgeting/decision-making, capital project implementation stages, and review and evaluation procedures.

Campus Facility Planning - Master Planning

The comparative analysis of campus master planning focused on the types and styles of plans in use, the longevity of the various plans, the assignment of responsibilities for plan development, and staff relationships. Conclusions that can be drawn from this analysis are also presented.

The types of facility master plans in use ranged from area plans at MIT to comprehensive campus-wide plans at the other three institutions. All but the Northwestern plan were well documented or in some final stage of documentation. Northwestern recognizes the need for better documentation and are considering reviewing and updating their plan. All of the plans in one way or another established a set of objectives or principles for facility development. These principles included such concepts as the interconnectability and flexibility of space uses at MIT, the identification of boundaries and the relationship to the central city at Penn, the concepts of zones and the creation of a campus character or ethos at Northwestern, and the land use pattern for the River and South campuses at Rochester. These principles, goals and objectives provided direction to future development of the plans and individual facility projects. None of the plans mandated specific design or detailed program requirements, but all included general program considerations for areas of the campus. All of the plans included statements regarding the desire to respect and build upon the overall campus character. The campus plan at Penn was especially strong on this point. Those interviewed at each of the institutions felt that it was important that the campus community review and accept the principles and concepts of the plan.

In terms of longevity the twenty-five year old Northwestern plan is by far the oldest. The Northwestern plan has become subject to increasing pressure for change and this is another reason the University is considering updating and revising the campus plan. The concept of area planning at MIT has existed for a similar period with the most recent

such plan, the East Campus Master Plan, being ten years old. Overall plans for campus development are in the final stages of preparation at Penn and Rochester.

At each of the institutions ultimate responsibility for developing the campus plan was assigned to a vice presidential executive officer. Responsibility for plan development also carries with it a sense of plan ownership or sponsorship. With executive ownership and sponsorship the plans achieved, or would soon achieve in the case of Rochester, a high degree of visibility on campus.

Except at Rochester, actual responsibilities for developing the plan were delegated to central staff. The central staff also became involved in promoting and supporting the plan. The staff that served this role were the University Architect and the Associate Provost at Northwestern, the Director of Planning at MIT, and the Chairman of the Architecture Department, the Chief Planning Officer and the Vice President for Finance at Penn. At Rochester, the Vice President for Administration kept this responsibility to himself but relied on the Director of University Facilities for assistance. Only at MIT and in the original plan at Northwestern were outside architectural firms actively involved in the development of the plans. In both cases central staff personnel supervised the process. Penn utilized faculty from the Architecture Department while Rochester's plan was basically developed by the Vice President for Administration with review being provided by an outside firm.

A master plan's acceptance and potential influence is also improved by the supportive role and involvement of staff responsible for the actual programming and design of individual facility projects. This is especially so at MIT and Northwestern where the central planning and design (architect/engineering) staff play important roles both in the initial development of the building program and during the design stage.

The length of time that key staff have been directly involved in these activities exceeded twenty-five years at both MIT and Northwestern. At Penn, however, the master planner's role evolved over a period of seven years, while at Rochester the role of the Vice

President for Administration is relatively new.

In three of the cases -- Penn, MIT, and Northwestern -- there was an important relationship between the staff responsible for campus master planning and the academic community. At Northwestern this relationship evolved between the University Architect and the Associate Provost. At MIT the Director of Planning worked closely with the Provost's Office on the five year academic planning process. At Penn the master planner's relationship to the Chief Planning Officer and the direct line to the Senior Planning Group provided this important tie. The planning staff at each institution viewed such a relationship as important for a number of reasons. These included the opportunity to inform the academic community about the plan and to receive input. Most significantly this relationship also provided an early warning mechanism with regard to future academic facility needs and plans. Only Rochester has not yet formally developed an arrangement of this type.

A number of conclusions can be drawn that identify factors that influence the process of master planning. These conclusions are summarized below:

1. The best plans have a set of clear principles and objectives that can ultimately be accepted throughout the campus community and which influence future facility programming and building designs. These plans are well documented and easily accessible for review.
2. The plans need not include specific design criteria or detailed building program requirements but they do present clearly the goals of the institution with regard to the character of facilities and open spaces. They also identify general programmatic intentions for areas of the campus.
3. Flexibility and alternative approaches to building sites and programs are important ingredients to master plans.
4. The type of plan selected tend to fit the culture of the individual institutions. The particular style whether it is comprehensive or area

based, medium or long term reflects the needs of the institution.

5. Responsibility and therefore ownership of the plan are directly tied to the executive level of the organization. The plans become more credible, have a greater chance of influencing individual building projects, and win wider acceptance if they are linked to clear and obvious executive level sponsorship. The plans' development are controlled and supervised with internal staff.
6. Staff continuity and length of tenure are major advantages to improving development and implementation of master plans. This is especially true when the long serving staff are directly responsible for either the programming or design phase in the development of an individual building project.
7. A link or relationship between the master planning staff and the academic administration/community is critical in order to account for academic program requirements and to provide opportunities for promoting and explaining the plan.

Organization and Administrative Environment

The comparative analysis of the organization and administrative structure focuses on the role of institutional executives, the assignment of responsibilities for facility development, relationships between staff offices, and the involvement of presidents, trustees, and clients or program representatives. Conclusions that can be drawn from this analysis are also presented.

The organizational arrangements and administrative environments at the four institutions demonstrate a number of common patterns as well as a few unique features. The general hierarchical nature of the administrative organization is common to all of the institutions. Major decisions are made at the executive level among a few line officers who

have important responsibilities related to the development of facilities. Line responsibilities are delegated to subordinate staff. This pyramidal organization is most apparent at MIT where the executive group is the smallest and includes the President, the Provost, and the Senior Vice President for Operations. At the other extreme the largest group is at Penn with the Capital Council and the Senior Planning Group forming the main decision-making bodies. Northwestern and Rochester fall between these two extremes in terms of the size and breadth of involvement at the executive level.

The assignment of facility development responsibilities among the executive groups are also similar. In each case a vice presidential officer is responsible for facility development activities ranging from planning for individual buildings through the design phase to construction. At MIT, Northwestern and Penn, a vice president is responsible for all of these activities in addition to institutional financial operations, maintenance of physical plant and budgeting. At Rochester the financial and budgeting functions are assigned to a separate Executive Vice President.

There are contrasts in the assignment of facility planning responsibilities especially as they relate to master planning. At Northwestern overall campus master planning is shared between the Associate Provost and the University Architect who reports to the Vice President for Business. This split organizational arrangement has been in place for a very long time and works well. At Penn a more complex arrangement exists. The master planner reports to both the Senior Vice President and the Senior Planning Group through the Chief Planning Officer. At Rochester and MIT, master planning responsibility falls within a single vice presidential line.

The relationship between staff with facility planning responsibilities and those with design or construction supervision duties is also critical. The fact that these functions are totally within the same reporting line at MIT and Rochester is an example of the importance of this relationship. Even at Northwestern and Penn where these functions are not part of the same reporting line excellent working relationships have been developed between the

planning and the design and construction staff members.

The role of the President at each institution is confined to review, priority setting and final decision-making within the executive structure of the organization. None of the presidents become involved in a detailed way in the process.

Trustee involvement varies from a very limited one of review and approval of administrative recommendations at MIT to more active participation through committee structures at the other three institutions. At Penn the Board has encouraged, supported and actually become involved in the facility development process as a result of some dissatisfaction with past projects. At Rochester the Trustee Facility Committees' role is still evolving while a similar committee at Northwestern is more mature and experienced in their review and approval of projects.

The clients or representatives of program areas play important parts in the development of individual projects at each of the institutions. At Northwestern the client and the administration join together to form a Building Program/Design committee that is involved in the project from programming through the design stage. At MIT the client's participation is supervised and somewhat controlled by the Director of Planning in the early stages of a building's life. At both Rochester and Penn the clients, especially those representing academic units, often are in charge of the project at least through the facility programming stage.

A number of conclusions can be drawn from this comparative analysis of organizational and administrative arrangements. These conclusions are summarized below:

1. Decision-making is concentrated at the executive level and shared among a small set of vice presidential officers in addition to the President.
2. Line responsibilities for the facility development functions tend to be concentrated in one vice presidential area. The same vice president generally also has responsibility for other operating and financial affairs. This concentration of responsibilities helps to coordinate effort especially

during the implementation phase of a building project.

3. The responsibility for master planning is placed at the executive level so that it will have broad visibility and be viewed as an important function in its own right. Executive sponsorship helps the plans win wide acceptance throughout the campus.
4. Acceptance of the plan can be achieved through either shared responsibilities, close working relationships, or informal reporting lines between staff responsible for facility planning and those whose duties include design and construction activities.
5. The acceptance by the academic community of the overall plan is critical to the plan's future influence.
6. Relationships between the academic organization and individuals responsible for the campus master planning are important in promoting the plan.
7. The client or program representatives are actively involved in the development of an individual facility program. Through this involvement comes opportunity to educate a particular client group about the master plan and to promote the principles and vision of the plan as it relates to an individual project.
8. Facility responsibilities are basically internal with important review functions being provided by Trustee groups. The role and interest of Trustees is increasing. Given the permanence of facilities, the oversight role of the Trustees is important. Trustee support for the concept of campus master planning and interest in facility development has become more intense where there have been perceived problems with past building projects.

Project Initiation/Program Development

This aspect of the comparative analysis focuses on the first step in the life of a single facility project. The analysis of the program phase concentrates on the nature of the information developed during this step, staff responsibilities, and review and approval mechanisms. Conclusions drawn from this analysis are also provided.

The initial steps in the life of an individual facility project are critical with respect to the potential influence of the overall master plan. Major issues of program definition, scope, siting, relationships to open spaces, circulation and costs all begin to be analyzed during this phase. The four institutions provide two distinct styles and approaches to this phase. MIT and Northwestern invest significant effort on the part of the central planning and /or design staff in concert with that of the client or program representatives to analyze and develop the building program information. Much program detail is developed prior to an institutional decision to approve funding for the project. Alternatively, Penn and Rochester often allow the initial stage to be controlled by the client with much less central staff involvement prior to initial budgetary approval.

Both MIT and Northwestern hold an initial review at the executive level regarding the importance and likely funding potential of an individual capital project. A positive review immediately triggers significant program development and analysis essentially controlled by the central staff -- the Director of Planning at MIT and the University Architect at Northwestern. In both cases the client plays an important role in developing the necessary program information. The Program of Requirements document at Northwestern and the Capital Projects Analysis document at MIT serve as significant guides for the future development of the project. These documents include detailed programmatic, cost and schedule information upon which funding and capital budgeting decisions will be based. After funding approval has been granted the document also provides the foundation for the design phase. Given that central staffs play such an important role at this step and are responsible for the development and promotion of the

broader campus or area plan, this approach promotes an excellent opportunity for insuring the influence of the plan on the individual project.

At Penn and Rochester the initial program, cost and schedule information are developed by the client -- the initiating department -- and are presented to the executive group as a capital budget request. Unlike the case at MIT and Penn, the more detailed program is developed after budgetary approval as part of the schematic design phase. The central planning and design staff act as advisors or consultants at the request of the client and therefore exert much less influence on the project during this initial step. The combination of the role of the central staff with the fact that master plans are in the developmental stage at both institutions reduces the potential influence the plan might have on an individual building project.

In all cases the executive group has responsibility for the review and approval of the building program and the project cannot move beyond this stage without such approval. The critical factor for approval is funding potential and therefore the review concentrates on program priority and financing. Given the fact that approval at this level is necessary the opportunity exists for the executive group to require that the building program be consistent with the overall campus plan.

An additional by-product of this step is the potential for significant guidance to the project architect. The documents produced at MIT and Northwestern serve this purpose quite naturally. A well prepared building program that is consistent with the master plan provides direction to the project architect and has the value of carrying the master plan concepts into the design stage.

A number of conclusions can be drawn from this comparative analysis of the project initiation and program development stage. These conclusions are summarized below:

1. The program definitional step is essential in developing a sound basis for a building and provides the mechanism for adapting the principles of a

master plan to a single project. Once the plan is successfully avoided or ignored at this point, the probability that the plan will influence the project at a later stage is significantly reduced.

2. The central planning staff plays a significant role in promoting the plan principles during program development. Central staff control or coordination of the program development stage is important if the plan is to become influential. The potential impact of the plan is strengthened when the person responsible for the campus master plan also controls the program development step.
3. The executive group provides important support to the influence of the master plan in their review and approval of individual building programs.
4. There is significant opportunity for ignoring or avoiding the plan, especially where the clients or program representatives are influential or control the program development step.
5. When working with the clients during the program development stage, there are significant opportunities to broaden the knowledge, visibility and acceptance of the plan. A strong relationship between the central planning staff and the client or program representatives is important not only to the development of a thorough building program but also in insuring consistency with the principles of the master plan.
6. Input on the part of the client or program representatives is critical in defining the individual facility program.
7. When the client or program representative control the program development step the potential for future disagreements with the central staff and the executive group over the building program and project costs are high.

Capital Budgeting/Priority Setting/Decision-Making

The capital budgeting and decision-making step is the second major stage in the life of an individual project and follows the program development stage. It is the point where institutional capital priorities are determined and approval granted for the continuation of the project. The comparative analysis focuses on the nature of capital budgeting processes at the institutions and the organizational relationships between budgeting and planning. Conclusions resulting from the analysis are also presented.

The capital budgeting process allows the institution to realize important program objectives through the approval of plans for future facilities. Because of the importance of such issues, the large potential investments involved and the long term relative permanence of facilities, capital budget decisions at each of the institutions are made at the executive level. All of the institutions also allow for ultimate review and approval by the Board of Trustees.

In general, with the exception of MIT, the capital budgeting processes have been historically weak or non-existent; yet all of the institutions had strong operating budget processes. On the other hand, Penn, Rochester and Northwestern are in the midst of strengthening and formalizing their capital budget processes. This is a recent development in the case of Penn; Rochester and Northwestern are now only beginning such a move. In the past, facility projects at these three institutions were reviewed, approved or rejected on an ad hoc basis without a sense of overall institutional capital priorities or financing requirements. A number of factors have led to their interest in capital budgeting. These include the increasing competition for donations for facilities, the opportunity for debt financing and the related concern of the appropriate amount of debt burden, and a significant increase in the demand for additional facilities.

At MIT capital budgeting has served to support and give reality to the campus area plans. Organizationally there is a close working relationship between the facility planning

staff and the staff responsible for developing the capital budget. At the executive level both functions are the responsibility of the Senior Vice President. Similarly close ties have been developed at the other three institutions between those responsible for facility planning and the executives and staff who are in the process of improving or implementing capital budgeting. At Northwestern and Penn both facility planning and capital budgeting staff report to the same vice president, where Rochester has these activities split between two vice presidents.

All of the individuals interviewed for the case studies felt that the capital budgeting process was a key mechanism in supporting and implementing the campus master plan. Whereas the master plans were more long range in their focus, the capital budget was a way to provide a realizable shorter range perspective. Budgetary decisions and approvals essentially gave form to the concepts of the plan over a one to five year period.

There is considerable continuity and overlap at the executive level in terms of the individuals involved in determining capital budget priorities, approval of campus master plans and approval of individual capital projects. Essentially a rather small group of executive officers and central staff members are the decision-makers and therefore have significant ability to control the process. The movement to improve capital budgeting processes at Penn, Rochester, and Northwestern testifies to the perceived importance of this step.

A number of conclusions can be drawn from this comparative analysis of the capital budgeting and decision-making stage. These conclusions are summarized below:

1. The budgeting process is a critical step in implementing and giving meaning to a plan. In general capital budgeting has been a missing link in the facility development process and may very well be one of the reasons campus facility master planning has failed in the past.
2. Capital budgeting processes provide regular mechanisms for review of the campus master plan. Annual capital budgeting provides an

opportunity to evaluate and compare the compatibility of individual facility projects with the overall plan. Budgeting provides discipline, identifies priorities, and allows decision-making to take place within the larger context of the total campus.

3. Capital budgeting is an important executive level responsibility which provides additional opportunity to support the concepts and principles of the master plan.
4. At the staff level close working and reporting relationships between facility planning and budgeting personnel are important.
5. The combination of a detailed program analysis and a formal capital budgeting process provides a significant basis of support for the campus master plan. Unless the program and the capital budget are clearly related, a campus master plan has little chance to influence a particular building project. When the program and the capital budget are related, however, the course of the future development of a project becomes well established, is likely to be consistent with the campus plan, will become a high institutional priority, and will be ready to move ahead to the implementation phase.

Implementation: Design Phase through Construction

After a project has received program and budget approval it is ready to move ahead to the implementation phase which includes, the selection of a project architect, the development of building designs, and finally construction. The analysis that follows provides comparison of the methods and processes utilized by the institutions for each of these implementation steps. Conclusions relative to all of these steps are presented at the end of the analysis.

Architect Selection

As major criteria for the selection of a project architect all four of the institutions rely basically on firms' experience with similar projects, reputation, past relationship with the university, and the specific personnel that will be assigned to the project. The perceived ability of the firm to work well with the university team is critical in the selection process at each institution. Only Northwestern limits its selection to local firms as a matter of policy. MIT and Penn have schools of Architecture but do not by policy reserve selection to their own graduates.

Since only MIT relies in any significant way on outside firms in the development of its overall plan, the influence of outside architects is limited to individual projects. Even at MIT, the firm that was involved in the development of an area plan is not guaranteed a contract for a particular project. The potential of a single outside architectural firm having significant influence on the development of a campus plan and then being involved in the design of individual building projects was not an option at Penn, Rochester or MIT. Only at Northwestern in the 1960's, when the firm of Skidmore, Owings, and Merrill, developed the campus plan and also designed a number of buildings, did an outside firm have significant influence.

The responsibility for educating architects hired for individual projects with regard to campus master planning principles and objectives is assigned to central planning and design staff at Northwestern and MIT. At these institutions this educational role is consistent with the responsibilities of these two staff members and provides a logical transition from the detailed program development phase to the beginning of the design phase. No provision for this educational responsibility has developed at Rochester since the master plan is not yet completed, but the Vice President for Administration and the Director of Facilities recognize the importance of this activity. At Penn the master planner has recommended that this responsibility be given to the Architect Selection Committee, of which he is a member, and be included as the final step in the selection process. This

committee would meet with the selected firm and describe the nature of the project and its relationship to the campus plan.

The central planning and design staff and the client or program representative at each of the institutions share the actual interviewing and selection process. The role and influence of the client varies among the four universities. At MIT the client is more or less a minor member with the central staff team primarily controlling the process. At Northwestern, the University Architect plays a key role in a shared arrangement with the members of the Building Design Committee. At Rochester the client uses the central design staff as consultants or advisors, while at Penn the client is a member of the Architect Selection Committee and has significant influence in the selection process.

At each of the institutions architect selection is reviewed and final approval is granted by the executive group. At MIT the staff group recommends two firms to the Senior Vice President who then makes the final recommendation of a single firm to the executive group. Again with the exception of MIT, the various trustee facility committee's review and approve the administration's recommendations.

Design Development Phase

The design development phase involves the translation of the building program into the actual architectural design for the individual project. This phase involves three levels of increasingly more detailed and technical building designs. These three design steps are called schematic plans, definitive design, and working drawings that become the basis for the construction phase. Within the actual building designs the principles of the master plan related to such concepts as siting, circulation patterns, open or green spaces, building size and character are realized.

The sequence of design steps are similar at each of the institutions. The only significant difference involves the development of the detailed building program during the schematic design step at Penn and Rochester. Both institutions have cited problems with

this approach since program and the resulting projects costs developed at this point can differ significantly from what had been previously approved during the budget phase. Such problems were not present at MIT and Northwestern due to the fact that the detailed program information was prepared in an earlier phase. MIT and Northwestern only require a review and confirmation of the program during this step.

During the design phase the role of the project architect requires a good working relationship with the university team. In all cases the client or program representative and central design (architect/engineering) staff participate in this process. The responsibility for promoting and insuring the influence of the master plan falls to the central design staff.

At Rochester, MIT and Northwestern, the design phase is supervised by the central design staff who function as project managers. At Penn the Director of Facility Planning supervises this phase, but his role is more that of a designer than that of a planner. All of the institutions view the design phase as the first implementation step and therefore none of the central planning staff act in a supervisory role. The University Architect at Northwestern, and to a lesser degree the Director of Facility Planning at Penn, come close to playing a dual role by virtue of their involvement in the development of the overall campus plan. At MIT and Rochester the relationship between the planning staff and the design staff are close from both a personal and organizational standpoint.

All of the institution's utilize a team or committee approach during the design phase. The membership of these committees includes the client or program representatives, the project architect, the central design staff and occasionally the central planning staff.

At the completion of each of these design steps, all of the institutions require executive review and approval. At MIT an executive level Institute Building Committee performs this function while Penn uses the Design Review Committee and the President. At Rochester and Northwestern the full executive group is involved in this review. This is an important point in the process in that the actual building design, site placement, materials, building program and updated cost estimates are reviewed. MIT includes Board

of Trustee approval only at the final design stage when working drawings are complete, while the other institutions involve the Trustees at each of the intermediate design steps as well.

Beyond these formal review points, the central design staff acting as project manager has the authority in each institution to seek guidance from the executive level at critical junctures. Guidance is sometimes required as a result of potential cost overruns, program difficulties, or scheduling problems. Oftentimes important decisions involving program or design tradeoffs will be made in attempting to resolve these problems. Such decisions can have significant impact on a building and therefore on the overall campus plan.

Construction Phase

With the completion of designs and approval at the executive level, the project moves into the construction phase where in-house construction staff either manage the construction process or supervise an outside construction manager who is responsible for the day to day progress of the project. The process of selecting general contractors or construction managers is very similar at each of the institutions and all require executive level review and approval.

The construction phase is the final implementation step. All key programmatic, financial and design decisions have been made prior to this point. There is little opportunity to influence the project's overall direction during this phase. Only if unforeseen problems develop with regard to constructability will the construction staff seek guidance from the appropriate vice president. And only if those problems are severe will the major program and design decisions be revised.

A number of conclusions can be drawn from this comparative analysis of the design through construction implementation stages. These conclusions are summarized below:

1. The design development phase is a critical step in sustaining the overall

vision of the campus plan. Many opportunities exist for ignoring the plan.

2. The design phase is essentially the last point in the process where the overall plan can influence the final product. Executive and central staff review and control of this step is required. When the client or an outside architect controls this step, the campus plan will almost certainly be ignored.
3. Given extensive participation during the design phase by the client, central staff and the project architect there is a significant opportunity to adopt the principles and objectives of the campus plan within the design of a particular building project.
4. The involvement and relationship between the central planning and design staffs is extremely important to insure consistency and compatibility between the overall plan and the individual building project.
5. Outside architects have little influence on the overall plan but major influence on individual buildings, requiring internal supervision and management of the design process. The design phase presents an important opportunity for acceptance of the plan principles by the project architect. The project architect plays a significant role in fulfilling the objectives of the plan through the design of individual buildings.
6. Internal responsibilities of the central staff are extensive during the design phase and have a marked impact on facility development.
7. Delaying the development of the detailed program until the design phase can lead to major misunderstandings with regard to the scope of the program as well as differences in cost estimates from what had been agreed to at the budgetary approval stage.

8. The participation of the client or program representative decreases and the role of the central design staff and project architect increases as the project proceeds through the design phase.
9. Executive review during the various design steps is critical, especially when decisions require tradeoffs between program and design in order to stay within an overall budget. Trustee review during the design phase only enhances and enforces the overall campus plan.
10. Since all key decisions have been made prior to beginning construction there is little opportunity for major change and virtually no chance for further influence of the campus plan on the project.

Review and Evaluation Procedures

Specific comparisons regarding review and evaluation procedures have been identified throughout the various sections of this chapter. In summary, extensive mechanisms exist for both executive and trustee review and approval at numerous points during the process. As a result of these review opportunities, the ultimate responsibility for the facility development process and for the implementation of the overall facility master plan rests with the executives and trustees. This of course is as it should be in a hierarchical organization that attempts to make choices and resolve issues in a rational decision-making mode.

It is clear from these case studies that executive review has been lacking in the budgeting area at three of the institutions and that major efforts are underway to correct this shortcoming. Trustee involvement essentially begins with approval of an individual project after the program and financing have been established. Only at MIT does trustee involvement wait until the design phase is complete. Earlier review by trustees is anticipated as part of the master plan development by Penn and Rochester.

Summary

The comparative analysis of the case studies pointed out numerous areas in both organization and process that were evidence of common approaches and patterns in the planning, approval, design and construction of facilities. Yet each institution provided its own unique aspects and styles. Strengths and weaknesses were present in each case. Also the group of institutions demonstrated serious interest and effort in their own facility development process. Weaknesses were not only recognized but the administrator's were attempting to make the necessary corrections and improvements to the process.

These conclusions summarize the complex nature of university facility planning and decision-making and point out the critical components in the facility development process for campus master planning. To be successful, a disciplined and complex set of relationships must be put into place to support the concept of master planning. Regular reviews and checkpoints at the executive level of the institution are necessary to enforce and support the plan. Due to the complexity of these processes, many opportunities exist for disregarding the plan. The achievement of master plan implementation requires deliberate strategies regarding organizational arrangements, the development process of individual facility projects and appropriate review and approval checkpoints. These case studies, the comparative analysis, and the resulting conclusions identify the significant points for master plan implementation in both the organization and the facility development process.

Chapter 9

Proposed Models and Areas of Further Research

The findings, as outlined in the previous chapter, serve as the basis for the presentation of a proposed model for campus master planning and for a model facility development process geared to the implementation of the overall campus plan. This chapter presents two models, one for campus master planning and one for facility development processes, reviews the role of Peterson's rational model in this investigation and identifies five potential areas for further research .

A Model Process for Campus Master Planning and Facility Development

A proposed model for campus master planning can be derived from the conclusions presented in Chapter 8. The model, presented in Figure 9-1 identifies the critical components, procedures, and organizational responsibilities that result in a master plan for a campus. This master planning model needs to be in place prior to developing a second model that addresses the central question concerning the process for implementing such a plan.

The second model, presented in Figure 9-2 outlines the process by which an individual project can successfully be influenced by the campus master plan, therefore leading to the realization of the plan. The facility development process model presents the necessary steps in the life of a building project, identifies the critical points for master plan input, and suggests a set of organizational responsibilities in combination with the process that are designed to strengthen the role of the plan.

Figure 9-1
Campus Master Planning Model

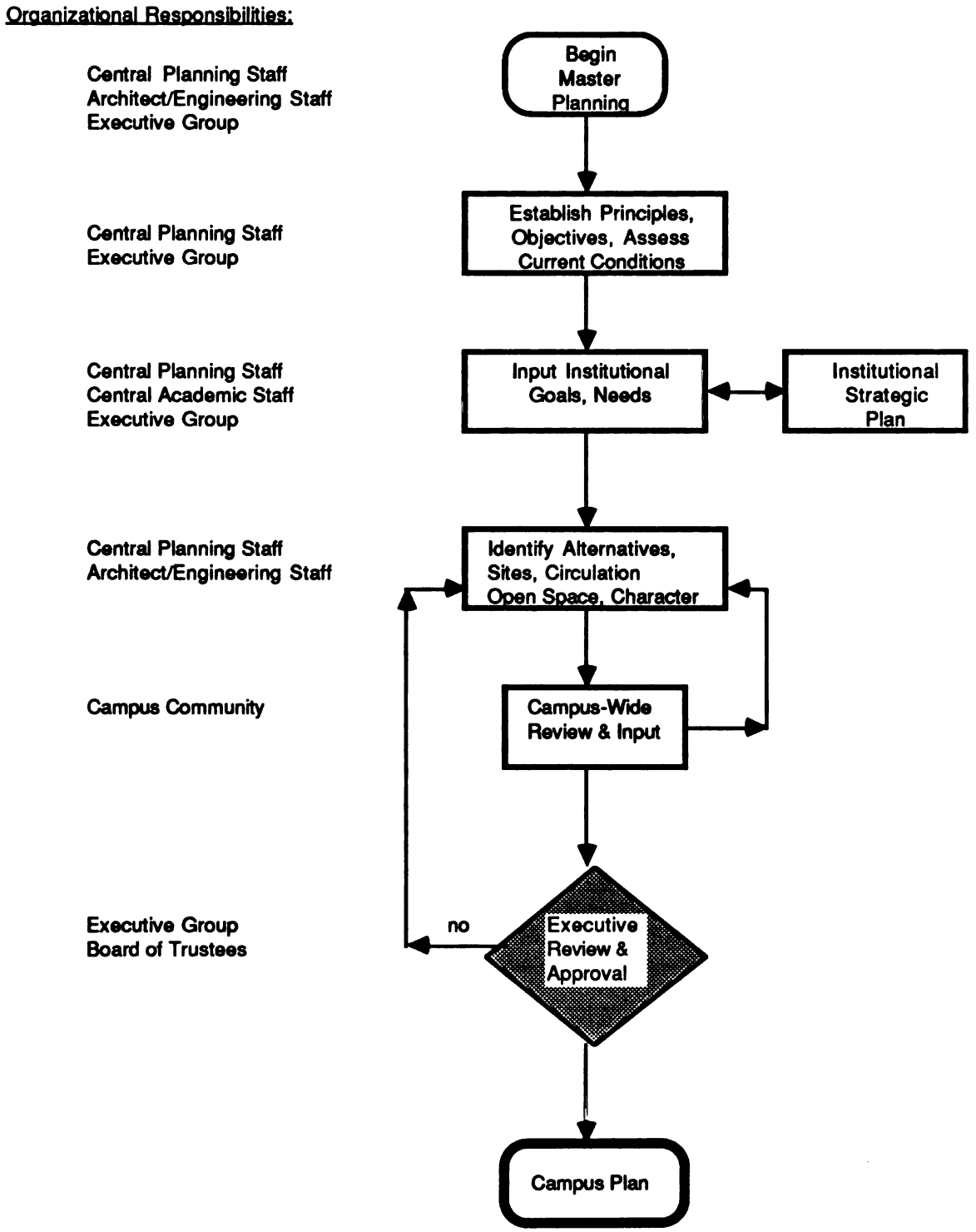
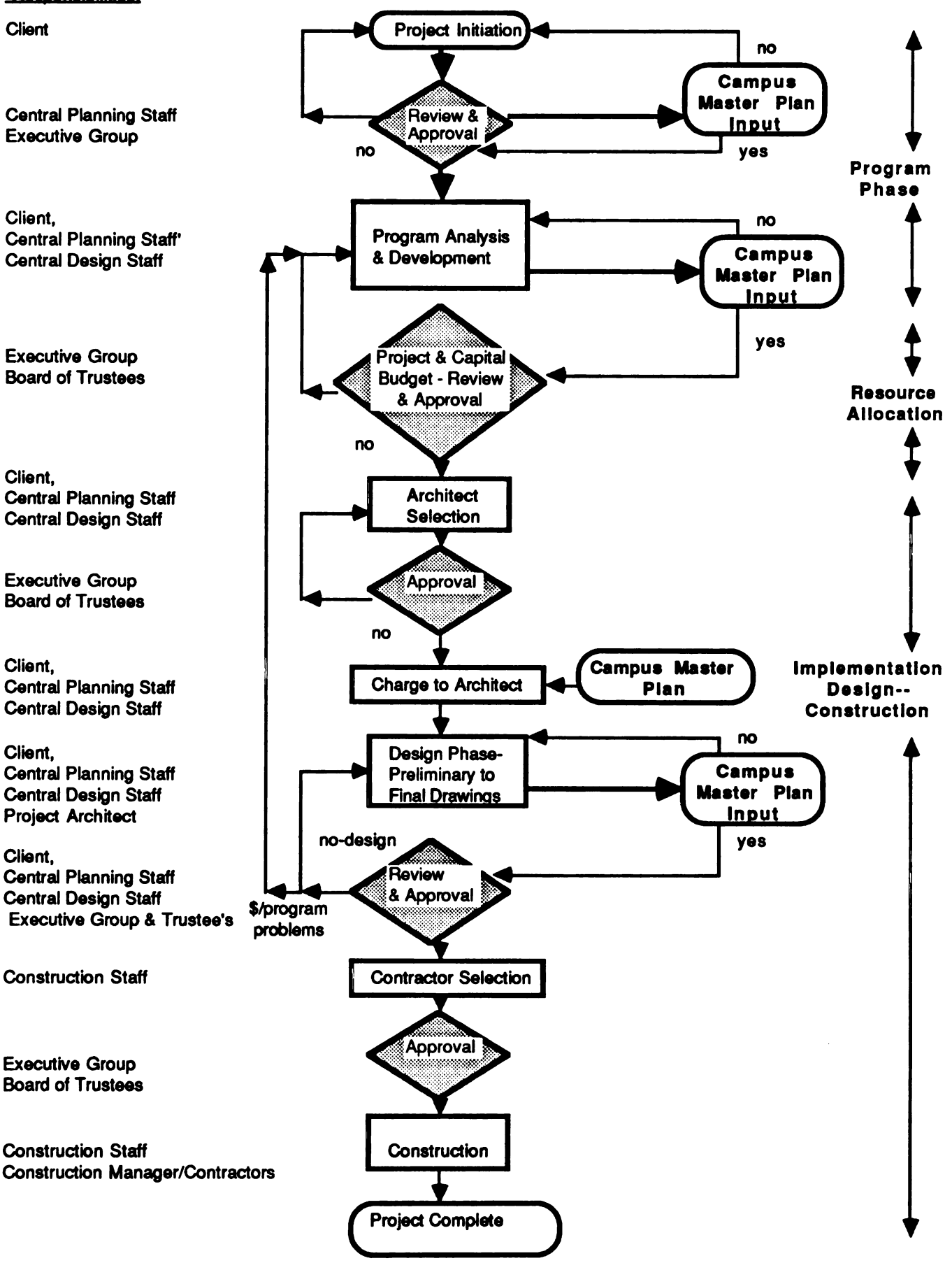


Figure 9-2
Facility Development Process Model



Campus Master Planning Model

Figure 9-1 graphically presents the important steps and organizational responsibilities for the campus master planning model.

Master Planning Steps/Components:

The campus master planning process either for total campus or an area should be centrally initiated and controlled. The steps in the development of the master plan involve establishing principles and objectives for the physical environment of the campus, analyzing current conditions, and identifying institutional programmatic goals and needs. The input of programmatic goals and needs come from the institution's overall strategic or long range planning process. Linking institutional goals, principles for the physical development and existing conditions should lead to alternatives for the organization and placement of buildings, functional uses of space, circulation patterns, open spaces, and options for enhancing or protecting the character of the campus. Review and input from the campus community will be an important step in assuring the relevance of the plan. Ultimately executive review and approval can allow the plan to become adopted and take on meaning within the institution.

Organizational Responsibilities:

Organizational responsibilities with regard to master planning are extremely important. Staff responsibility must be located in a central planning office where strong ties exist between the central design staff and the central academic administration. As evidenced from the case studies, various reporting relationships are possible, but the link, between these staff positions is important whether it is formal or informal. The central staff responsible for master planning must also have a direct tie to the executive level of the

institution, thereby providing support and sponsorship for the process. The impetus, support and promotion of successful master planning activity can only come from the executive level of the institution.

Review and Approval:

Lastly, in order for a plan to be responsive to the changing and dynamic nature of universities, constant review and updating must be considered normal. Such a review process can be accomplished in two ways. One way is by simply repeating this set of steps at some regular interval. A second approach is to link the master plan to the facility development process for individual projects in a regular and formal way. Such an approach allows a plan to grow and change but more importantly it also provides an effective means to insure the plan's influence on each individual facility project. The following facility development process model is a proposed mechanism for achieving this linkage between the campus master plan and individual building projects.

A Facility Development Process Model

The key to the effective implementation of a campus master plan is the process utilized by an institution to develop an individual facility project. Figure 9-2 presents the model which identifies the steps, responsible personnel, and points of interaction with the campus master plan for such a process.

Program Initiation:

The program phase of the process should be initiated by the client and require initial review and approval by the executive group and the central planning staff. The review should include a number of considerations such as overall program priority, potential funding sources, and the relationship of the project to the campus plan. The central

planning staff must take the leadership role in making sure that master plan considerations are taken into account by the client at this initial step. Approval of the initial project concept authorizes the project to proceed into a much more detailed program development and analysis effort.

Program Analysis and Development:

The preparation and analysis of the detailed program will provide the foundation upon which all future steps in the process are built. In conjunction with the central design staff, the central planning staff must work cooperatively with the client to develop the necessary program information. This information should be comprehensive and cover all aspects of the project from space needs to cost estimates, funding sources and schedules. The role of the master plan is important at this early point in the process. Again the central planning staff and the central design staff should make sure that master plan concepts are taken into account. In terms of the potential influence of the master plan on the individual project and also the plan's general acceptance by the campus community, the program development phase is the first of two critical steps.

Project and Capital Budget Reviews and Approval:

Approval of the program and the financing plan allows the individual project to proceed to the implementation phase. In addition approval at this point assumes that the project has been or will now be included in the institution's capital budget. The executive decision-making group must take responsibility for this step by requiring that approval be part of an overall capital budgeting process and by making sure that the building program is consistent with the principles and concepts of the campus master plan. Review and approval by the institutional trustees can serve to enhance the process and provide an opportunity to strengthen both the budgeting and master planning processes.

Architect Selection:

The first step in the implementation phase should be the selection of an architect. The central design staff should take the lead in the process at this point and include the client and the central planning staff as part of the selection team. The selection process should involve reviewing and interviewing potential firms with the focus on experience, capabilities and the actual makeup of the firm's team as the key criteria. Recommendations from the central staff to the executive group should serve as the basis for the final selection. Review and approval by the trustees can give credibility and additional support to the overall process and serve to keep the selection process aboveboard and honest.

Charge to the Architect:

Informing the architect about the project and how it fits into the overall campus plan constitutes an important step in the introduction to the design phase. The responsibility for presenting a "charge" to the architect should rest with the institution's central design staff. Assistance in this role can be provided by the central planning staff. Such a step provides an opportunity to further emphasize the campus master plan and establish the importance of the plan at the beginning of the design phase.

Design Phase:

The design phase which translates the project program into architectural drawings upon which construction is based is the most extensive segment of this process. Design should proceed through three steps.

1. The first is the preparation of preliminary or schematic designs which provide a very general outline of space and building conditions.

2. The second step, design development, is a more detailed presentation of the building spaces, infrastructure systems, circulation, materials to be used, and exterior design.
3. The third step is the preparation of working drawings which includes detailed designs used by the contractors as blueprints for the construction of the facility.

Since this phase brings the building from the conceptual program to a definitive design, the impact on the potential influence of the campus master plan can be significant. At this point the key principles and objectives of the campus master plan are either accepted, modified or ignored. From the institution's standpoint, the responsibility for this phase should rest with the central design staff along with the project architect. The project architect should work with the client and the central design staff during this phase. Supervision of this step should also come from the central design staff.

The design phase not only provides a key test of the plan; it also provides an opportunity to revisit and, where appropriate, revise or update the plan. The detailed design study may serve to identify ways the overall plan can be improved that were not apparent during the development of the broader plan. Utilizing the design phase to review the details of the overall plan provides a mechanism for improving the relevance, general acceptance and influence of the plan on the campus.

The design phase should consist of three iterations of reviews and approvals at the end of each of the design segments. Also detailed cost estimates should be developed at each step of the design phase. Any major problems that lead to imbalance between the design and the previously approved program and budget will require a return to the program development step for reassessment and adjustment. The review and approval of each of the design steps ideally should include the central staff at one level, the executive group at another, and the trustees at the final level. An approval mechanism of this type can provide the strongest possible support for both the design phase and the role of the

master plan in influencing a building's design. Key programmatic, financial, and design decisions concerning the project should have been made by this point. In terms of the master plan's ultimate influence the design phase is the second and last critical step.

Construction:

After approval of the design phase the project should move into construction. At this point the project should become the responsibility of the in-house central construction staff to either manage directly or to provide supervision of an outside construction management firm. Contractor selection should be approved by the executive group and the trustees in a process similar to the one used for architect selection. The construction process should be monitored by the construction staff.

Summary

These models of campus master planning and the facility development process together provide a mechanism for an institution to successfully create and implement an overall facility plan. The organizational responsibilities, the required steps, and staff resources required to make such a process work are significant. The process involves complex interrelationships between the staff and significant interaction of groups involved in the various steps of the process. The effective implementation of a campus master plan requires conscious effort on the part of the institution since numerous opportunities exist for ignoring such a plan. The payoffs for achieving order in the physical development of the campus are high. The energy expended on the part of the four institutions investigated to develop and implement such processes provide supporting evidence of the importance of master planning and facility development processes. The proposed models outline the key relationships, responsibilities and necessary steps for such a process and serve as a guide to institutions interested in developing effective mechanisms for campus master planning and facility development.

Peterson's Rational Model

The rational planning and decision-making model as outlined by Peterson and presented in Chapter 3 has served as a useful framework for structuring and completing this investigation. While the purpose of the investigation was not aimed at testing or evaluating the rational model, it became clear during the case visits that the institutions were in general attempting to form their planning and decision-making processes in a way that was quite consistent with this model. There was no direct evidence that any of the institution's had actually utilized this model to shape their processes or organization.

MIT's efforts fit the rational planning and decision-making model most directly. Area plans reflected institutional goals and strategies and were integrated into a capital budgeting and decision-making process. Implementation activities were tightly tied to both the budget and overall plans. Review and feedback mechanisms existed at key points in the process although these evaluations were basically internal to the organization. Northwestern's approach was also similar to the rational model but a major gap existed in the capital budgeting and decision-making area. Past processes at both Penn and Rochester did not fit the rational model as well as MIT or Northwestern. The lack of an overall master plan approach that represented institutional goals and strategies, non-existent capital budgeting, and decentralized decision-making with much initial authority at the college or departmental level were all factors that led Penn and Rochester to actively pursue a more formal and rational process. This situation resulted, at least in part, from the absence of an overall campus plan. Both institutions are in the process of creating a plan, improving capital budgeting and developing processes for implementing the plans in a way that exemplifies the rational model.

The proposed models for campus master planning and the facility development process that result from the case comparisons and conclusions exemplify the rational approach. The strategic components include the overall plan which presents institutional

objectives and strategies. The tactical components involve the various plan alternatives, individual project objectives, institutional decision-making and review mechanisms. The operational components are present in the implementation phases of architect selection, design and construction.

Areas of Further Research

During the course of this case study, five related questions surfaced that by themselves, while outside the scope of this effort, are worthy of further study and research. Three of these questions which relate to master plan styles, staff tenure and review procedures arose directly from the case study investigations. The remaining two questions involve the use of historical case studies to investigate the impact of capital budgeting procedures on master planning and to study the nature of past successful master planning processes.

Master Plan Styles:

One question involves studying the relationship between particular master plan styles and facility development processes, in effect controlling for particular types of master plans. The case studies found three different types of master plans in use: the documented formal comprehensive plan, formal area plans and the informal zone or land use approach. A study that isolates one of these particular types with a focus on the processes used might provide clues to effective master planning styles and implementation processes.

Staff Tenure and Turnover:

A second question for further study is the relationship between the tenure and experience of central planning or design staff with a focus on the impact of turnover on the process. This question relates to whether or not effective master planning processes are

unduly influenced by the length of tenure of central staff. Can the master planning process survive turnover of staff with extensive tenure and control of the process?

Review Processes:

Finally, the role of review, especially during the design stage is worth further research. Design stage reviews must necessarily be technical; yet they should involve taste, style, and interpretation and involve a variety of expert and executive level staff. The complexity of different design review mechanisms and the relationship of the review to the campus master plan are variables that deserve further inquiry.

Capital Budgeting:

The conclusions of this case study point to two factors that a historical review may illuminate. One is the relative lack of structure and formality in the capital budgeting processes among the case institutions. It is quite possible that this absence of budgeting may have been a major reason that campus master planning was deemed ineffective in the past. A historical study of the role of capital budgeting during these periods would shed light on this hypothesis.

Past Successful Master Plan Implementation:

A second historical approach would involve a case study investigation of institutions that were successful in implementing campus master plans in the early years of this century. During this period, the heyday of campus master plans, many plans were implemented. Such a study would also focus on organization and processes to attempt to determine what the critical variables and factors were that led to successful implementation of the plans.

The analysis and models resulting from this case study investigation help to identify mechanisms for enhancing the effectiveness of campus master planning in private research universities. These questions point to areas in which additional insight might be obtained regarding the role and influence of campus master planning on the physical development of the campus.

Appendices

Appendix A

American Association of Universities - Profile
(Private Institutional Members)

Institutions	Endowment Value[1]	Research Expenses[2]	Total Enrollment[3]
Brandeis	$120,536,000	$15,274,000*	3,539
Brown	$222,300,000*	$28,134,000*	7,099
California Institute of Tech.	$366,193,000	$65,810,000	1,816
Carnegie Mellon	$228,768,000	$60,292,000	6,251
Case Western Reserve	$307,250,000	$51,598,000	8,352
Catholic	N.A.	$5,019,000*	6,780
Chicago	$802,500,000	$79,929,000	9,287
Clark	$23,501,000*	$2,968,000*	3,185
Columbia	$1,266,640,000	$136,577,000	17,017
Cornell	$673,848,000	$203,226,000	18,946
Duke	$252,071,000*	$68,899,000	10,025
Harvard	$3,435,010,000	$137,653,000	19,997
Johns Hopkins	$491,543,000	$388,553,000	10,586
Massachusetts Institute of Tech.	$971,000,000	$242,966,000	9,608
New York	$519,965,000	$83,896,000	33,014
Northwestern	$709,236,000	$72,337,000	15,829
Pennsylvania	$540,084,000	$130,397,000	22,065
Princeton	$1,934,010,000	$46,027,000	6,277
Rochester	$576,642,000	$86,650,000	8,599
Southern California	$361,784,000	$97,282,000	30,373
Stanford	$1,371,870,000	$199,185,000	13,947
Syracuse	$112,625,000	$22,397,000	21,044
Tulane	$179,765,000	$17,023,000	10,232
Vanderbilt	$446,458,000	$34,180,000	9,046
Washington	$958,461,000	$80,233,000	10,610
Yale	$1,739,460,000	$107,245,000	10,749

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[1] National Association of Colelge and University Business Officers, College and University Endowments Comparative Performance Study 1986 (Note: *=1985 data).

[2] National Science Foundation, Fiscal Year 1985 Research Expenditures, Reported in the December 10, 1986 issue of The Chronicle of Higher Education.

[3] U.S. Department of Education, FAll 1984 Enrollments, Reported in the july 23, 1986 issue of The Chronicle of Higher Education.

Appendix B
American Association of University (Private Institutional Members)
Facility (Master) Planning Survey

Institutions	Master Plan Exists	Facility Planner	Univ. Architect	Const. Mgr.	Review Comm.
Brandeis	No	Yes	No	Yes	BOT
Brown	Yes--1986	-----Combined---		Yes	BOT Subcomm
California Institute of Tech	Yes -Preliminary	--------Combined----------			BOT
Carnegie Mellon	Yes-1986	Yes	Yes	Yes	BOT Subcomm
Case Western Reserve	Not Current-Mid 60s	Yes	No	Yes	BOT Subcomm
Catholic	Not Current-'75	Yes	No	Yes	Campus Design Comm
Chicago	Yes -- 1979	Yes	Yes	Yes	BOT
Clark	Yes--General	Yes	Yes	Yes	BOT Subcomm
Columbia	No	Yes	Yes	Yes	BOT Subcomm
Cornell	Not Current	Yes	Yes	Yes	BOT Subcomm.
Duke	Yes-1987	Yes	Yes	Yes	Envirn'l Facilities
Harvard	No	Yes	Yes	Yes	Adm&Harv Corp
Johns Hopkins	Yes--'86	Yes	Yes	Yes	BOT Subcomm
Massachusetts Institute of Tech.	5-yr	Yes	No	Yes	None
New York	No	Yes	Yes	Yes	VP Comm
Northwestern	Yes--1960's	Yes	-----Combined-----		Exec Comm&BOT
Pennsylvania	Continuous	-----Combined---		Yes	Admin. Comm.
Princeton	Informal-Area	-----Combined---		Yes	Pres. & BOT
Rochester	N.C.Updated	Yes	No	Yes	BOT
Southern California	Yes	Yes	Yes	Yes	
Stanford	No	Yes	Yes	Yes	BOT
Syracuse	On-going/2yrs	Yes	Yes	Yes	No
Tulane	No	Yes(PT)	-------Combined-------		Adm, Fac, BoT
Vanderbilt	Yes--1977	Yes	Yes	Yes	BOT
Washington	Yes 1986	No	No	Yes	None
Yale	Continuous	Yes	Yes	Yes	Adm & BoT

Appendix C

Interview Guide

Introduction - Purpose of study--planning/budgeting/implementation -- facilities / general description of process and understnading of organization
"how you do things and who does them"
nature of interview -- descriptive -- no quotes/taperecording if possible
contact person to review my written summary of the process

Interviewee Background: (Note: interviews include -- a key contact where all four sections (A through D)will be covered and -- a individual interview for each of the four areas
name/position/organizational placement /length of tenure in position
primary responsibility--please describe

A. Master Planning -- Facility Planning -- conceptual description of process and organization(Peterson --Strategic components of rational model)

1. Do you have a campus master plan for future development of facilities
   1 If yes, describe the nature of the plan:
      a. program content
         relationship to academic or institutional plan
         how are facility needs determined
         cost estimates established
      b. time frame of plan
      c. physical area covered by plan
      d. existence of guidelines or constraints -- design standards
      e. was the plan done by an outside/inside firm
         if outside -- how was the firm selected
      f. what was the objective of the plan--what does the plan attempt to achieve
      g. how are plan goals, objectives and content established
      h. how do campus facilities reflect these objectives
   2. if no, describe how the institution plans for future faciliites
      a. program content
         relationship to academic or institutional plan
         how are facility needs determined
         costs estimates established
      b. time frame of plan length/how often
      c. physical area covered by plan--bldg./project/area
      d. existence of guidelines or constraints -- design standards
      e. was the plan done by an outside/inside firm
         if outside -- how was the firm selected
      f. what was the objective of the plan -- what does the plan attempt to achieve
      g.. how are plan goals, objectives and content established
      h. how do campus facilities reflect these objectives
2. Describe the process used for developing these plans?
   a. how are the plans generated
   b who is involved in the development of the plan -- staff, faculty groups, students, outsiders, BOT
   c. what are the information requirements for facility planning -- who has this responsibility
   d. what is the process for review and approval
   e. does the plan have a sponsor

f. does the plan require approval by some executive or external authority authority
g. How long has this process been in place at
h. if it has changed recently --- why - what was the impetus for this change
i. is the process viewed as being successful
j are you contemplating any changes in the future -- what are the reasons for the changes

3. Describe the organizational placement of facility planning responsibilities -- (org chart)
   a. describe the responsibilities of the key people responsible for facility planning
   b. adminstrative offices -- reporting relationships -- placement
   c. relationship to other functions -- academic planning -- institutional research, construction, academic units
   d. input of faculty/student groups
   e. what are the backgrounds of the key staff
      professional training, tenure in position, size of staff

4. Please briefly describe the complete process for the construction or renovation of a major facility on campus
   a. full description beginning to end of a projects life--planning/resource allocation implementation (program development -- through construction)/review

B. Priority Setting-- Resource Allocation--descritption of decision-making process and organization (Peterson--Tactical components of rational model)

1. Describe how capital priotities are established --
   a. who is involved, at what level
   b. what is the decision-making process for the establishement of prioritites
   c. how are they communicated and to whom
2. Describe the budgetary decison-making process as it relates to facilties -- capital projects
   a. program priorities/needs -- is this different than described above
   b. cycle -- annual or longer term
   c. what is the relationship between budgeting and planning
   d. who is involved in the development of the budget -- staff, faculty groups, students, outsiders, BOT
   e. what are the information requirements for budgeting -- who has this responsibility
   f. does the budget require approval by some executive or external authority
   h. In general how are capital projects financed -- funding sources
   i. how are cost estimates developed and by whom
   j. how long has this process been in place at _____
   k. if it has changed recently --- why - what was the impetus for this change
   l. is the process viewed as being successful
   m are you contemplating any changes in the future -- what are the reasons for the changes
3. Describe the organizational placement of capital budgeting responsibilities -- (org chart)
   a. describe the responsibilities of the key people responsible for capital budgeting
   b. adminstrative offices -- reporting relationships -- placement
   c. relationship to other functions -- academic planning -- institutional research, construction, academic units, facility plannning
   d. input of faculty/student groups
   e. what are the backgrounds of the key staff
      professional training, tenure in position, size of staff

4. Please briefly describe the complete process for the construction or renovation of a major facility on campus
    a. full description beginning to end of a projects life--planning/resource allocation implementation (program development -- through construction)/review

C. **Project Implementation** --the process and organization for constructing or renovating a major facility(Peterson--Operational component of the rational model)

1. Describe the process of project implementation -- from approval through construction
    a. who is responsible for developing the building program
        user group -- input from ? -- who is involved -- prime responsibility
        what relationship does the building program have to the "plan"
        when is the program finalized
    b. describe the architect selection process -- guidelines/objectives/criteria
        long list review -- selection of a short list -- interviews
        who is involved in selection -- prequalification of candidates -- graduates
    c. describe the design and construction process --
        role of architect vis a vis construction superivision
        what is the process of construction supervision
            in house/general contractor/construction management/design build
        selection process of outside consultants
    d. do reviews exist throughout the process -- reviews in relationship to
        program, budget, plan.
        who has review responsibility/how is this monitored
    e. How long has this process been in place
    f. if it has changed recently --- why - what was the impetus for this change
    g. is the process viewed as being successful
    h are you contemplating any changes in the future -- what are the reasons for the changes

2. describe the organizational placement of project implementation responsibilities -- (org chart)
    a. describe the responsibilities of the key people responsible for project implementation
    b. adminstrative offices -- reporting relationships -- placement
    c. relationship to other functions -- academic planning -- institutional research, construction, academic units, facility plannning, budgeting
    d. who is involved in the construction of the facility-- staff, faculty groups, students, outsiders, BOT
    e. what are the information requirements for project implementation -- who has this responsibility
    e. does the project require approval by some executive authority
    f. what are the backgrounds of the key staff
        professional training, tenure in position, size of staff

4. Please briefly describe the complete process for the construction or renovation of a major facility on campus
    a. full description beginning to end of a projects life--planning/resource allocation implementation (program development -- through construction)/review

D. Review and Evaluation -- process and organization for project review and monitoring (Peterson --Tactical component of the rational model -- feeedback loop)

1. Do formal procedures exist for project reviews relating to
    a. the overall campus or project plan
    b. the project program
    c. the project budget
    d. the design process
    e. the construction process
2. Describe the nature and content of these reviews
3. Who has adminstrative responsibility for the reviews
4. What executive body or group is responsible for signing off on the various steps in the project
5. describe the organizational placement of review responsibilities -- (org chart)
    a. describe the responsibilities of the key people responsible for review
    b. adminstrative offices -- reporting relationships -- placement
    c. relationship to other functions -- academic planning -- institutional research, construction, academic units, facility plannning, budgeting
    d. who is involved in the review stage-- staff, faculty groups, students, outsiders, BOT
    e. what are the information requirements for review -- who has this responsibility
    e. does the review require approval by some executive authority
    f. what are the backgrounds of the key staff
        professional training, tenure in position, size of staff
    g.how long has this process been in place at _____
    h. if it has changed recently --- why - what was the impetus for this change
    j. is the process viewed as being successful
    k are you contemplating any changes in the future -- what are the reasons for the changes

6. Please briefly describe the complete process for the construction or renovation of a major facility on campus
    a. full description beginning to end of a projects life--planning/resource allocation implementation (program development -- through construction)/review

Appendix D

Northwestern University
Associate Provost
September 14, 1987

Interviewee Background:
Jeremy Wilson, Associate Provost -- Northwestern University: PHD- Education
-- current role responsible for program review process along with VP for Planning, facility planning responsibilities especially for academic needs, space analysis, key interaction with academic units
-- started in Admissions -- Financial Aid -- then became Planning Coordinator and reported to VP Development and Planning since facility planning was tied closely to fundraising plans.
-- Initially facility planning function included all building design functions as well and was staffed by architects. The planning function eventually split with design group breaking off and reporting to VP Business. The design group was headed by the University Architect. Facility planning responsibilities stayed with the Planning Coordinator as he moved to the Provost's Office to become Associate Provost.
-- Associate Provost has had a dominant role for 25 yrs in the facility planning process.
-- Actually hired the individual who is now University Architect. The two have a very close working relationship.

A. Master Planning -- Facility Planning --
-- Siting of new facilities is based on customs developed in 60's with the SOM master plan
-- 1960's were a major development period for Northwestern through fundraising for new buildings and the establishment of the plan
-- informal plan --based on zones for the Roscoe Miller lakefill area --such as South is Humanities, Central -- Social Sciences, North --Science & Engineering, with a student center in the middle.
-- For the siting of a given facility the Assoc Provost and UA, with possible the assistance of the chairman of the BDC will make recommendations to President.
-internal debates with Assoc. Provost , UA , program administrator on each facility over this issue
- long term institutional memory of campus plan based on tenure of Assoc Provost and UA which gives strength and power to the plan.
-- From the senior staff recommendations and options go to President. Final decisions are taken to Educational Prop Comm. for review and approval.
--Building Design Committee is established for each project to insure faculty input - have used this type of process since 60's.
-faculty committees -- develop a program document (Program of Requirements=POR) essentially in house-- POR's - strong program document which includes - academic information leading to a building concept, program justification and provides programmatic expertise. This is an important concept that eventually guides the design (project) architect. Outside consultant are used for special building programs such as theater/labs, etc.
-Costs estimates are based on this POR -- sometimes outside cost estimators are used.
- Program can be completed within 10 months but likely takes one year for a good POR.
--POR provides relationships of programs and spaces, equipment, furnishings, etc.
- process well understood by all parties -- POR is the strength of the facility planning process

--POR is given to the administration (Pres, VP Business, VP Planning, Provost, VP Research) for decision to move ahead -- if approved 1% of project cost is authorized for the development of preliminary designs.
--Facility planning (Assoc Provost) reports to Provost -- University Architect reports to VP Business
--Building Design Committee is responsible for developing the program --chaired by senior program administrator for the project with Associate Provost as a member representing the central administration.

B. Priority Setting-- Resource Allocation--
--In the past this was not well laid out - financial planning and implications of capital needs were not always considered. -- Assoc. Provost/U. Architect would identify probable costs for building -- served as basis for future fundraising.A capital budgeting or financial review process did not exist. This was a major weakness in the past process.
-- Preliminary (drawings)plans have been used to support fundraising efforts.
--Executive group makes decision to proceed with a building based on a certain percentage of fundraising in hand.

C. **Project Implementation**
--Once the administration approves the POR then architect selection may proceed in order to develop preliminary design -- primarily to support fundraising.
--Internally generated long list -- Chicago preference-- convenience of proximity-frequency of interactions. These are strong requirements.
-- Arch. Selection Comm consists of VP Bus, U Arch., Assoc Prov, Chair of BDC, administrator of bldg. Short lists usually contains 3-6 firms. Tend to use certain firms based on experience -- have they done a building of this type, past work is an important criteria.
-- NU asks to interview the actual project team including the engineer, don't want to see PR guy but actual team, at least during second interview -- decision is by consensus -- straw vote.
-- anyone can recommend a firm for consideration--usually two interviews--check out firms through client list-- recommendations taken to President and executive group then to EPC (via VP Business) for approval to proceed with preliminary design.
-- After preliminary design take another budget check -- decision point for proceeding into construction. Cost estimate presented to construction manager -- attempt to get a guaranteed max. -- requires work based on size and cost.
--Tradeoffs between exterior and interior program -- classic tradeoffs that crop up during design phase
--Faculty involved through design process -- put into place in 60's with heavy faculty input.
--Essentially the same committee (Bldg. Design Committee) -- continues during drawing phase to achieve quality bldg. -- work with project architect (also built POR).
-insure faculty interests
-all parties responsible -- key is POR -- tough choices are made during this process.
-during design phase there is great sensitivity to project budget (total estimated cost)
-Bldg. Design Comm favors program needs and is involved in classic tradeoff of design vs. program
--Univ. Arch. plays a key role on committee -- arch/construction experience -- continuity and project supervision.
--Univ. standards for equipment and mechanical systems have been recently developed.
--EPC approves at various design stages -- once definitive design is complete -- another 1.5% for design development. -- then decision point on the bldg.
- key point -- is the money there -- project can be stopped at this point
- after working drawings are complete -- tough financial questions

-- Usual time frame -- program 1-yr., drawings -- 1 yr.
-- Financial policy allows project to start construction with anywhere from 33%-50%-67% of funds raised for building--fundraising primary source for capital
-operating cost $5-15 per sq. ft.

D. Review and Evaluation

--EPC role (not program) primarily siting -- once approved along with POR the committee will review the preliminary design -- approval of design and interest -- varies etc.-- This is a thoughtful committee -- interested in price, costs and style -- others aesthetics --excellent review of key issues.
--Key role in placement of building, approval of architect selection and review of designs.

Appendix D

Northwestern University
University Architect
September 14, 1987

Interviewee Background:
--Gabor Zsolnay-Univ Architect position reporting to VP Business and Finance
--Informal but regular relationships exist with the Assoc. Provost, Pres, and Deans or chairs of Bldg Comm.
--Primary role is project coordination - service role of office. A one-stop shop where the office is involved from the inception of the project carrying it through to construction 5-7 year timeframe.
-- University Architect negotiates all fees and contracts
--Architect by training-- employed by the U in this office since early 60's

A. Master Planning - Facility Planning
--Early master plans were awful -- 1940 by Holabird and Root and 1947 by William Gambel Rogers -- gothic style.
--Major effort in 1960's by SOM coincided with expansion plans of the University. The plan, primarily for the lakefill area, suggested a number of buildings that were built and still serves the campus well--role of Wilson and Gabor as key staff insures the plans well- being.
--Views plans as a loose-leaf master plan -- includes utilities, traffic,circulation, etc. as part of original effort in 60's
-flexible in that it allows for an informal development of the campus rather than any fixed axial or Beau-Arts style. This is also a function of the natural landscape.
-Plans are referred to as loose-leaf, targeted, partial master plan and driven by academic plans that were part of the 60s program planning effort.
--Faculty Planning Committees were instituted in early 1960's and have persisted and are now called Building Program Committees.
-key role was in program planning that would serve to identify facility needs.
--Targeted studies are ways the plan is updated and revised. The plan needs to be indexed or codified. This is being considered for the future - reevaluate the pieces but maintain the ethos of the campus
--Key role of Wilson and Gabor in this process. They provide institutional memory and protection for the plan. This corporate memory has been developed over the years through the discussion and debate of the BDC's.
-New president is now questioning the concepts of the plan and the zones.
- Wilson prepares a report that describes the health and size of the institution as basis for future facility planning
-This overall view was generated from the planning process of the 1960's.
-Since that time NU has used targeted studies to update the plan generally related to a given project -- circulation, siting, utilities,etc.
-Need to institutionalize the debates regarding the overall plan - codify the plan through a process of reevaluation of the principles and concepts of the plan.
-hesitant to prescribe formal architectural styles -desire a more informal approach that maintains the ethos of the campus - continue the loose-leaf approach.
--Building location is generally influenced by Assoc. Provost and Univ. Arch.
-new pool and recreation facility is an example of problem -- more opportunistic site.
-academic buildings are more straightforward and fit the zone concept more easily.

-housing generally reserved for South and West but these are being constantly reevaluated -- master plan is good for only five to ten years.

--The POR provides and early cost estimate.

C.Project Implementation:

--Involved first with Planning committee where staff are assigned and stay on project throughout its life.

--These planning committee's write the POR -- UA plays a key role in this effort in conjunction with most senior people of the program. -- Occasionally an outside consultant is used in technical or special areas.

-- approvals by administration at this point for cost review -- if yes then to trustees for approval.

--UA office reviews designs prepared by architect rather than participating in the actual design -- provides coordination of project rather than inspection-- involved in program issues--prepares U standards such as equipment , mechanical systems etc.,-represents and promotes the design ethos of the U. -- informal nature of the campus plan and its architecture --(maintenance free exterior -use of masonry-window treatments, landscaping style, etc.)

--Bldg. Committee (similar to Planning committee -- different staff -- UA serves on this committee -- provides institutional memory -- not the chair of the committee -- senior administrator of the program area is chair--provides technical review-- and project administration during construction period. Committee is very useful with regard to resolving any major program issues or dealing with program tradeoffs.

--There is a commitment to hire architect for preliminary planning

-Chicago architects--match firm with need of the University

-UA calls the meetings as key staff not chair--reviews drawings for committee

-UA pays all bills -- role of administrator for project -- negotiates fees -contact to outside world.

--Review vs participation during design preparation-allows committee to help on program issues that architect may raise-- design standards respect ethos of campus - limestone, trim etc -- loose-leaf informal approach. use of pre-cast consistent with limestone.

-- Landscaping controlled by UA to make sure its fits the ethos --formal landscaping or fountains not part of campus.

-- Strong people interaction between committee and architects -- ethos

-dorms in brick - academic in limestone -- maintenance free

--Bldg committee helps if in a stalemate with the architect. -- meetings are formal in nature with architect presenting designs to committee for their review.

--Bldg Comm/ Senior Admin./BOT-Educ. Properties Committee all are involved in approvals of preliminary design(schematic), definitive design(design development), working drawings(contract documents).

-also that program and budget were met, schedule for project

-UA key staffer in this review process and key influence as active as Assoc. Provost is on planning side UA is on design side.

-(architect for job usually not invited to Board or executive review session -- presentation made by UA)

-UA reports to all levels at each stage.

--Construction Process -- UA great latitude in contracts with a full set of options from lump sum bidding, cost plus, to construction management

- general AIA approach inspection on a periodic basis by architect
- internal staff for day to day project manager

--role of internal project manager as field representatives in addition to contractors or construction managers

-selection process -criteria-"size" -program experience of this magnitude or similarity-interviews- hire the individuals rather than the firm

- choose from low 3 bids out of a pool of 5-6-initial consideration from a group of 50 - prequalify 5 or 6 -- for the U the UA takes over the process from this point.

--Bldg. Committee during the construction phase plays less and less of a role
--UA reports to executives managers and selects contractors.
-- reports to VP for Business for execution responsibility
-regular progress reports to EPC as long as project is within budget etc.
-- if there are problems UA must go back to senior administration for approval.
--UA responsible for informing a broad set of people regarding the project status or seeking input such as -- legal affairs, phys. plant, risk mgr,safety, telephones, computing, fundraising, purchasing.
--Office includes six staff of the project manager type where the individuals are architects with construction experience-2 drafters and 2 clerical staff.
-Looking for technical managers-- management skill-- hard to find for this type of task. Some design work is done within the office for projects that are small in size -- $50,000 or above.
--UA responsible for projects exceeding 1,000 sq. ft for labs and 2,0000 sq. ft for offices. any major systems, smaller projects are designed within the physical plant department
- some internal design depending on the project -some renovations up to $4m
--for fundraising purposes some preliminary design is done in-house by the staff - schematics as a fundraising device.

D. Review and Evaluation

--Bldg. Committee, Senior Admin, BOT-EPC review drawings, program and budget.

Appendix D

Northwestern University
Assistant Vice President for Budget Planning, Analysis, and Allocation
September 14, 1987

Interviewee Background:
Jim Elsas-Assistant. VP for Budget
short tenure -- one year
previously with Ill. Board of Higher Education

A. Master Planning -- Facility Planning --

B. Priority Setting-- Resource Allocation--
-- Currently developing a multi -year capital projects schedule with good cost estimates -- financing plans not in place yet -- need to be developed
- Tech renovations --fundraising ?--major weakness - not a clear financial tie to building program -- capital budget

--Budget decisions are made by executive group consisting of Provost, VP Bus. Pres, VP Planning, VP Research -- cabinet group -- along with Elsas
- priority setting group
-Oct-April budget process

--Order exists on operating but not yet for the capital budget
-currently receive capital requests(smaller type) from Dean's in an orderly manner
- also identifying maintenance needs

-- Currently priorities are driven by revenues
- fundraising major source -- some bond financing -- med science facility, debt service against both fundraising and general university revenues
-Tech Inst. -- multiple financing -state, federal, gifts and some university sources

-- Desired capital process -- orderly scheme although financing scheme will always be up in the air somewhat as a result of fundraising uncertainty.
-all funds will not be in hand -- cautious until financing is clearer -- work in phases i.e.
- i.e. Tech Institute.

-- Budget Schedule
Dean's make budget requests with faculty and dep't head input
these come in December
Dean's meet with Budget Team -- Jan & Feb.
allocations -- appeals made
Faculty Budget Committee of Faculty Senate
meet 5-6 times per year -- budget status including capital when process is developed
Board of Trustees -- Special Committee on Budget = 3 times per year Trustee Budget Comm.
-provide status on current and upcoming budgets
-capital budgets will become part of the purview of this committee
- they report to Executive Committee for final budget approval
Annual budget cycle -- includes outyear forecasts -- 1992

--EPOC not related to TBC yet-- may or may not be links between these two.
--Proposed budget plan requires source of funds to be identified before project becomes part of the capital budget plan

- schematics can be developed but real work won't start until funding is agreed upon.
- set up a plant fund account and authorize expenditures
- Provost has authority to fund these preliminary plans -- operating revenues but ultimately its folded back into the project cost.
- Programming/planning helps with development of cost estimates

--Priorities are influenced by fundraising -- fundraising from families and individuals.
-- Do planning to the point where you are positioned to take advantage of fundraising opportunities when and if they arise. This requires both a campus plan and a long range capital budget.
--Committing major funds into deferred maintenance $3m per year for 5 years -- university resources
Assoc. Provost is developing an inventory of projects to serve as the foundation for the capital budget plan -- requires project schedules and up to date information
--maintains plant fund accounts -- financing reviewed by Jim's office
Assoc. Provost -- primary responsible for the process

D. Review and Evaluation
--Trustee Committee on the Budget -- review and recommendations on operating budget and in the future the capital budget
--Executive Committee of Board of Trustees final action on budget.

Appendix D

Massachusetts Institute of Technology
Senior Vice President for Operations
September 22, 1987

-Interviewee Background:

--Bill Dickson -Sr. VP for Operations -- responsibilities include Facility Planning, Physical Plant, Finance, and Campus Operations

--27 years at MIT -- civil engineer with background in construction management

A. Master Planning -- Facility Planning --

--MIT does not have what one would term comprehensive master plan for the total campus but rather more detailed section or area plans that are broad and flexible for the particular area of campus.

-plans have a ten to fifteen year horizon

-the area plans are reviewed and updated as each project is built --

--Planning objectives-broad and flexible guidelines for the plan

-this overall responsibility rests with the Sr. VP.

-- This responsibility for planning for particular sites or areas of the campus is delegated to the Planning Office-- continuity of campus facility planning is based on this site planning approach.

- have used outside architects for this area planning function
- plan includes a general development plan for the site with and without existing structures -- opportunities provided through acquisition policy--also look at adjacent sites as a means of looking at development zones.

--Acquisition is the key to future planning and development-targets of opportunity play a role in deciding which facilities will be built and funded

-plans for future bldgs especially in main academic zone are well understood

--Program development responsibility also rests with Planning Office.

B. Priority Setting-- Resource Allocation--

-- For each project MIT reviews all financial alternatives first - borrowing, fundraising, income form operations and program revenues,endowment loans -pay interest only, various methods to finance a project.

--Capital budget put together by director of finance under the direction of the SVP.

-Dir of Physical Plant and Director of Planning are also involved

-- Project financial commitments must be secured and approved prior to picking an architect.

-often decisions are required with regard to the percentage of fundraising actually obtained versus the total expected fundraising for a project that is necessary prior to allowing the project to proceed.

--Development of capital budget is an annual process.

C. Implementation Phases

--Executive responsibility rests with the Sr. VP.

--Provost is the chief academic officer and review academic needs.

-Biology example - acquired a site for new building which changed plan to build a new physics bldg.- approximately 1/3 of site was to be used for the Biology facility with the remainder to be developed in the future as the land became available and science

program needs and funding warranted. Acquisition will take a long period of time therefore a plan was needed for this area of the campus.

--Architect selection -SVP appoint a committee that includes the Dean of the program area, Dean of Architecture, Director of Planning, Director of Physical Plant.

-The committee starts with long list

-Long list narrowed to 5-10 for interviews - no constraints - look for experience used to look for MIT grads -this is no longer a requirement plenty of opportunities along east coast

-The role of the committee is to recommend 2 firms to SVP who then takes the 2 names to Executive Group- consisting of President, Provost and SVP. for final decision. The Sr. VP will make a single recommendation.

-- The architect selection process has changed over the years as a result of the interest and involvement of the President.

-MIT grads at onetime were always selected --just happened

--After selection a client team is established consisting of representatives of the Planning Office, Physical Plant and User.

-Physical Plant leads the client team -- final programming, design development, contract award and supervision full or half time to represent Institute's interest

-This approach has been used for 25 years

--Planning Office leads programming effort

-in past the process became too mechanical

-SVP-keep program general in early stages with Planning Office control

-The detailed program is completed with assistance of architect - balance can be a problem in terms of needs and vision for project --compromise

--Design stage led by architect -- interaction with client team through design review

-sometimes a construction contractor is brought into the project early for cost estimating purposes and to add construction experience to the design and programming phases. Also helps build a team atmosphere.

-Attempt to build a strong and early relationship between architect and contractor-flexible arrangement-success depends on style of architect -have even tried forming one firm-did this for two housing projects -cuts out arguing between architect and contractor over cost vs design matters.

--SVP prefers bidding for selection of contractor after drawings are completed and therefore to choose from a large competitive set of contractors

- a fast track approach has caused real problems

-the alternative is to include the contractor early during design phase

--MIT's process is essentially old - twenty five years.

-- Institute Building Committee -- reviews conceptual design (schematic) and toward the end of working drawings -- issue driven or when there is a problem - The Committee includes Pres, Provost, SVP as chair, Dean of Arch, P.O, Phys.Plant, Treasurer and client.

-important committee which meets as needed on major project s only.

--Also have a Space Committee which includes the Provost as the chair, SVP-vice chair, 3 Deans sci-eng-arch, VP Research, Planning, Director of Finance, Design -- Facility Mgt. staff.

-This Committee handles renovation and space issues-meet twice a month do much internal design and space allocation

D. Review and Evaluation --

--Executive Committee of Corporation is involved final project approval only-meets monthly

-review and approval at the completion of working drawings prior to project going out to bid.

Appendix D

Massachusetts Institute of Technology
Director of Planning
September 22, 1987

Interviewee Background:
O. Robert Simha-Director of Planning
--Architect/Planning graduate of MIT -long tenure reports to SVP
-Sr. VP Dickson started as construction mgr.-get things done helps in implementation of planning-perspective is broad understanding of all segments or process
--Director of Planning-role is to provide long term planning perspective -evolutionary view - system view
-- Tenure

A. Master Planning -- Facility Planning --
--Plan vitality is a function of leadership and professionalism of mgt.
-successful planning -interaction of systems - team approach - balance the planning and design perspectives -- staff continuity a major reason for the success of planning at MIT
-dynamics between planning, design and construction staff make or break effort-
--Planning Office initially responsible for developing long range plan and capital budget -also space - once established these function moved back into operating units - physical plant for space and the finance office for capital budgeting
-The Planning Office is now viewed as a resource-close relationships among departments and personnel--key sense of mission
--MIT has a tradition of implementing plans beginning with:
-MIT -- 1912-1938 plan implemented -legacy of flexible buildings - expansion and contraction of activities and changes in functions - this was a key principle of MIT facility planning.
-1.interconnectivity of buildings -few obstructions to space use
-2.structural bay system -on interior bearing wall systems in order to meet basic functions of programs.
-flexibility in space use has been part of tradition -the plan was to build or extend this concept
-system allows change of space to meet new demands -this has been successfully achieved
-general building useful for many potential users - a project is viewed as providing the needs of the first user
--Post-war changes were to architecture not to basic principles of plan
-key principle- response to the dynamic nature of institute.
-style and building detail -- architect takes program what they can develop-objective of useful life -various uses. The focus has been on building and program function.
--Space is owned centrally -- Committee on Resources and Space Planning - space is not the concern of a department head.--allocates space and money for renovation
-committee staffed by phys. plant
--Principle for master planning-continuity in staffing - equity in plan on the part of university - planning has been based principles which are well understood at MIT--simple with central control and allocation
-real flexibility --allows for change and a wide variety of uses --
-part of structural system -- space and infrastructure

--Design profession builds program from smallest to largest unit of space -design is based on this hierarchical form --leads to a system that ignores potential change in use.
- This principle must be identified early in the program development stage and therefore allows for program changes during process
-The key is the structural system of the building in terms of potential uses.
--At MIT this is more important than architecture-community is internal in terms of how space is used and organized-design tend to be object oriented rather than function.
-MIT focus has been on function.
--Planning Office is responsible for facility planning and long range institutional planning --
-5yr planning cycle - academic plans feeds capital planning process -- early warning system for campus facility planning - use of visiting committees -- feeds annual capital budget plan --
-Planning Office is also responsible for institutional research
-For 5-yr academic plans the Planning Office works with the Provost's Office to identify long term needs of the academic units
-This planning support function feeds capital development program and serves as an early warning system-use of visiting committee reports--identify new needs also look at secondary impacts of these plans like parking, circulation, utilities, etc. These plans are updated yearly
--Capital development plan is annual process that is used by development staff for fundraising purposes.
--MIT campus planning utilizes sector plans -use outside consultant - architect may do some buildings but this is not a requirement.

B. Priority Setting-- Resource Allocation--
--Financial analysis is the prime responsibility of Director of Finance -- Planning Office plays a role in this for financial and programmatic analysis
-Dir of Finance -- monitors institutional financial position-reports to VP F. Operations with regard to the operating and capital budget
-Planning Office feeds this process to the Director of Finance
--Treasurer is an officer of corp. -chief investment officer -- also VP development
-- All of these VP's report to the Sr. VP Operations
--The annual capital development planning process is a key to resource decisions and tying to institutional master plan.
-Committee on Resources of Institution - academic budgeting process

C. Implementation
--Planning Office is key in the program development stage -set principles, determine priorities, program requirements -- functional relationships
--Preliminary program is based on institutional standards -- part of preliminary analysis phase with principles clear -- prior to hiring an architect
-how the project fits into the site plan -- analysis
-analysis of site, bldg, and service requirements, project budget developed with Phys. Plant-use outside consultant to double check cost estimates.
-The Planning Office during the early stages acts much like a commercial real estate developer -a preliminary budget w/o complete program is established.
-The Planning Office also works with financial staff to develop a financial plan for each project
--Placement within the organization and relationships are key to PO--must have good relationship with operating staff
-varying organizational styles can work -- function of organizational culture

--Architect selection - desires for greatness on the part of architects make it difficult to get across MIT's interest in function

-1. single initial architect -- Bosworth full load between 1911-1938 continuity -eliminates the competitiveness into the design process-acceptance of vision

-2. 60-70's -sector planning over a broader area -- modest success -- problem with commitment to principles -not as great as the original buildings.

- modern era have asked firms to deal with individual (smaller sections) areas or sectors of the campus

modest success -- some difficulties with acceptance of the principles

-3. single architect for each building

- MIT prefers one but that is unlikely given the longer planning and implementation periods today.-- insures commitment to principles.

--PO and Dir of Phys Plant make up a list for review by Sr. VP

-sector plan is completed with consultant help. -- 15yr vision --based on principles Biology project part of east campus plan

- program developed by PO and Phys. Plant

- SVP establishes a committee -- look for experience/familiarity, size, distance, competence -- MIT grad not required.

- the department does not select the architect--institution does

-SVP makes a recommendation to the President and Provost.

--Design stage -criteria specified in program - look for major principles and structural system

-The design process is structured -- based on a tight schedule - project manager is provided by the Physical Plant staff-generally set up by PO, PP, SVP.

-A/E/Const runs project form this point.

-The A/E staff were in PO at one time along with space and facility management group were transferred to Physical Plant once the system was established

--Client team plays a role through schematic plan development --MIT people working with project architect -through program development -- meet less frequently after this point since focus becomes building systems rather than spaces-problems go back to Director of Planning if they are program related and to Director of Physical Plant if they are design related

-Institute Building Committee resolves issues and makes decisions where required

D. Review and Evaluation --

--Corporation's Executive Committee review and approves project at the stage when the project is ready to proceed to construction

Appendix D

University of Rochester
Vice President for Administration
October 26, 1987

Interviewee Background:
Don Hess-VP for Administration - 14 yrs. with U of R previously VP for Campus Affairs and responsible for research federal relations, admissions, etc. residence halls.
--2 yrs responsible for facilities, administrative auxiliaries, personnel etc. - space allocation and facilities -- no longer admissions and registrar
- functions previously reported to the Treasurer -- not much planning

A. Master Planning -- Facility Planning --
-- VP recognized need for more planning since past process has been too ad hoc - now putting into place a new process
-- Main reason for planning focus is opportunity with lots of land available for future development -South Campus
-land acquisition achieved unificaton and spurred plan development
- where should next building be? River Campus, Medical or South campus, Main campus is built up
- issue: can academic facility move away from River Campus? - tie to Library and Faculty Club, sports facilities -- what does this mean for integration and interactions
-3 new buildings required -- business --opto-electronics, and nursing
- issue: what density for campus -- green space-attractiveness -- market competition
-costs are an important consideration in moving to South Campus -- requires a transportation link -rapid transit system to provide the link in order to move academic facilities to the South -- restricted use to assure time for transportation
--Support facilities are required in the new area -- utilities-telecommunications -residential near grad living center, dining etc.
--The concept of the plan and issues have been developed and promoted by the VP for Administration
- need for research building and parking near existing Laser Energetics Bldg-land acquisition strategy for right of way to River Campus
--VP developing a plan for South Campus--presented to Board
- close Wilson blvd. -- Sassaki acted as advisors, historical role
-internally developed --AED did drawing
-will be planning for land acquisition strategy
-also looking to develop a "U" district for zoning purposes -- control of nearby area. - look to build a cocoon and develop standards for this area of the city and the campus
--30's many buildings built at one time -- set the stage for future development although not a specific plan.
--issues where to site future facilities?
-density --advocates of open green spaces
-use of rapid transit to link South and River Campuses-support needs -utilities-residential
- good land holdings -- purchased right of way
--VP views this as a campus development program
-use Sassaki Associates as advisors -- they put together a plan in the 60's for the campus
-act as a sounding board

-close the road and join the campus
-master planning done in-house with defined limits
-standards for design or land uses don't exist

--VP plans to meet with deans and other campus administrators to discuss and revise the plan - kicked off by VP
- planning process -- 1yr. to complete
-Council of Deans, the Senate, Exec. Staff, BOT committee
-need to further address the program assumptions -- top down approach
-some old plans -- top down
-review and revise plans as a result of this review process

--Medical campus - facility design group now part of VP's group but construction group is still decentralized but in the process of being consolidated -- maintenance still up in the air.
--next building project is crucial to future campus development.

B. Priority Setting-- Resource Allocation--

--project starts in college with a request -through Budget Office which report to Provost and Exec. VP
--Exec Staff, all VP's, and top three make decisions
-approval by Facility Committee of Trustees -- VP Administration provides staff support -with approval then to BOT for final action
--Project request - outlines need, use space utilization for program and long term space use
-generic -- univ. space standards
-address siting issues -- ad hoc approach in past
-Dean establishes a committee of faculty/visiting committee members, which includes the arch. design group from central administration.
-develop a detailed program --schedule, financing,-program definition group scheduling, timing, funding, design issues
-fundraising key to future facilities --campaign
--renovations have also been ad hoc -- all renovations that exceed $10,000 will be included in future budgets-in order to have some control over these projects.
--some central inclusion of projects into budget in order to develop a long time frame, certain academic and support facility needs
--space owned by departments

C. Project Implementation

D. Review and Evaluation

--Board of Trustees Committee - new role for the Facility Committee - unclear -
-VP presented plan to this committee - still learning their role -- invited to comment on plans
--also Academic Affairs Committee -- review program plans
--Finance Committee to review financial priorities

Appendix D

University of Rochester
Director of Budget and Financial Planning
October 26, 1987

Interviewee Background:

Ron Paprocki-Responsible for budget office -- financial planning and institutional analysis and planning

-director of budget operation and separate dir of instit. res.
-in July the facilities planning function was transferred to Hess

--Reports to Provost and the Exec. VP/Treasurer includes -- Office of Pres.
--Internal executive budget committee -- 3 person group above two and Director
-include Pres for major policy items.
--new to the position in July

A. Master Planning -- Facility Planning --

B. Priority Setting-- Resource Allocation--

--Rochester has not had a discrete capital budget process in the past but are planning one for 88-89 - will begin implementing this in February
--Budget requests will be asked for in July and August - smaller capital needs.
-ultimately develop a prioritized list.
--Looking for a more formal process rather than a rolling one decrease the number of ad hoc requests.
--Plan to develop a major list of projects for funding purposes -VP Administration assembled-fundraising and debt service -importance of fundraising
--Also reviewing the approval process in order to tighten the process and not let individual requests rule the plan rather the plan should rule the process
-who should sign off, what are the substantive approvals, do we have the money
-impact on operating budget etc.-- mechanics and logistics -focusing on this
--Director of Budget is developing a link between the financial and programmatic issues.
-also attempting to define the impact on the operating budget
--Approvals by President and Exec. Group
-look to budget office to develop funding options and revenue sources.
-will have had some degree of work completed -- design phase before final approval to Board
--Fall update Executive Group
--Jan present formal budget
--Feb. take budget to Board this is consistent with past schedule for operating budget.
-new committee - Financial Planning Committee -- long run endowment policy and strategy

D. Review and Evaluation

--Finance and Facility Committee's of Board

Appendix D

University of Rochester
Director of University Facilities
October 26, 1987

Interviewee Background:
Interview-- Bill Daigneau
--Engineering and MBA background - new to the University July 1, 1987
--Responsible for University Facilities includes design and engineering, construction management, facility maintenance, building and grounds, utilities, and the business services for these functions.
-facility planning as a support mechanism for the VP for Administration

A. Master Planning -- Facility Planning --
--Involved functions of facility planning for individual projects
- included space planning to arbitrate disputes or handle requests for new space
-no standards exist.
--decentralized authority structure -- Deans control program planning and development phase
-central admin -- allocation and coordination functions

B. Priority Setting-- Resource Allocation--

C. Project Implementation
--In the past problems where process is unclear or unstated -especially in the program development and planning of space
--should go through schematic design phase before first cost estimate is developed unless the project is a lower priority -- spend the design fee 1.5% to get the better information
-too much potential for change in program during schematic phase. -- better cost estimates this way
--Deans run their own processes here
-program planning phase is decentralized with Dean establishing a committee with some assistance from design group -- administration worried about costs AED is asked to comment on estimates without being involved in program development
-budget cycle follows this same pattern with AED not being involved
--Approved financing and project goes to design phase
--Programming phase needs work and better definition through schematic development
-get program people to understand preliminary design and space issues.
-AED leads on renovations and technical projects -- larger projects the colleges take the lead and AED plays an advisory mode.-don't manage this step in the process leadership depends on project and activity of organization involved
--AED develops architect lists and sends out RFP or letter of interest - long list no prequalifications -- work with Dean's committee
-RFP sent to a dozen firms
-AED with program committee reduces to a short list
-consensus process within committee -- no criteria
-short list 3-5 interviews look for individuals on the team, credentials, etc.
-consensus process for selection.
-nature of arch selection is very much a function of the scale of the project with larger projects bringing higher level review -- Dean or Provost, VP
-approval comes before design on larger projects after schematics on smaller renovations

--Schematic phase - AED assigns project mgr. - role of directing architect - has authority to influence design -- fairly powerful - staff are trained as architects and engineers.
-must take into account user's interest -- emphasis has been on the university's interest over the user.--energy, maintainability -during this phase
-but program functions must be handled by the user -- tradeoffs go to systems vs. space or program
-responsibility to take conflicts up for decision making at the exec. level.
-review stages - committee review
-standards being developed, site work etc. infrastructure systems, etc.
--Design development - larger projects submitted to Executive staff for review and Facility Comm. of BOT -- major image impact on the campus.
-proj mgr coordinates the design development phase and authorizes the entering into working drawing phase
--Working drawing phase - project manager makes sure review takes place and has enough authority to influence the design architect
-these have been taking place at 90% level but need to take place earlier
-alternatives too be viewed at a high level when tradeoffs are in quiestion.
-AED in control at this stage of the process with some review by the maintenance group of Physical Plant -- not the occupants
--Cost estimates developed by project arch. after working drawings are complete
-foundation for the bidding process or redesign
--looking to improve this process by using outside cost estimators- hurts the schedule
--In the past AED out of the project at this point and Construction Management group takes over.
--contractor selection - competitive bidding with an informal pre-qualification process
-low bidder matter of practice rather than policy -- looking at this also
-primarily use general contractors not construction management
--Facility Committee notified of the award as an informational item - no real review
--Construction management staff are engineers and inspectors who manage the projects from this point-provide a quality control function

D. Review and Evaluation
--Facility Committee at final project approval stage-role in campus planning is unclear

Appendix D

University of Pennsylvania
Master Planner
Chairman -Architecture Deptartment
February 5, 1987

Interviewee Background:

--Al Levy-professional architect-faculty member and private practitioner, recently promoted to Chairman position.

--has been working with the university over the last eight years on campus-wide facility planning issues-within last three years has been given responsibility for developing the overall campus plan.

A. Master Planning -- Facility Planning --

--Architecture department has been working with facility planning for past five years on a contractual basis - dealing with specific campus problems --functional systems such as utilities, annual projects, athletics, field house location, retail area, engineering facilities expansion, historical bldgs. -- eight studies over the last five years.

-Contracted with facility planning office since 81 -- research center in GSFA.

-5 yr effort but not involved in nitty gritty of capital projects look at patterns of use, space, design and make recommendations

--This has evolved into a role of campus master planner over the last 1.5 yrs.

-look at uses and design of spaces.

-Started out as a role of Assisting the facility planning office and has evolved into a more significant role of campus master planning.

--Attempting to develop a process for overview and discussion of larger issues that lead to specifics.

- objective experts help with institutional decision while recognizing politics of the organization

- planners should provide alternatives for decision makers - Levy will have his own biases but plan should be objective

--Levy now has authority for development of the campus master plan but requires the assistance of Zemsky and Whittington to understand institutional chain of command and decision making process. They provide connection to capital planning and approval process

-a line of authority and monetary support for master planning

-Master Planning effort is focusing on what was, what are the key questions for the future, a review of options and alternatives for debate and discussion.

-General plan outline -- use of Walnut St to connect campus to Central City from 43 St. to River. Desire to control the environment as much as possible.

-land is available for purchase and or future development

--Levy reports to Sr Planning Group and the Sr. VP through Zemsky and Whittington

-they determine proper channels - this provides an indirect channel to Pres and Provost via the Sr. Planning Group

-Currently educating the Trustees and Academic Community with regard to the overall plan

-detailed review by Zemsky, Whittington and eventually the Sr. Planning Group.

--Example of an issue -dilemma - campus character or Chemistry growth.

--Plan is a consensus document that is intended to have both a long range view but yet be operational

- sensitive to institutional pressures. A measure of current values and policies, requires a formalized review process and will have a limited life as the organization changes.

--Real estate acquisition is a major piece of future plan
-acquiring properties between 43rd St. and River. - attempt to buy anything with in main boundaries

--Plan should provide information and a process for the institution.

B. Priority Setting-- Resource Allocation--

--Individual projects go to Provost and the Capital Council for review and approval.
-individual projects are not now evaluated for impact on master plan -- should develop a routine mechanism for such a review -- master plan impact statement

--Responsibility for how request fits with master plan is a function of the capital planning and budget process - See Whittington interview.
-Implementation is with facilities planning - impact statement should be a tool for facility planning

--5 yr planning process provides basis for facility needs

C. Implementation Phases--

--Architect Selection panel consists of Dean of GSFA, Facility Planning and Client Group.
-RFP sent to a selected group - closed process heavily influenced by the client or donor. -- short list and interviews -- panel makes a recommendation to Pres.

--The Director of Facility Planning develops the contract and works with the selected firm.

--Levy feels a new project architect needs to be educated about the campus plan prior to starting the design phase.
- there should be a specific charge to the architect prior to hiring on plan and program requirements or specifications against which DRB can evaluate architects work.

--The design process is supervised by facility planning group and the Design Review Board.
-Reviews occur at schematic and design development stage -- basically operates to identify problems -- Pres. arbitrates or decides if there are issues that DRB can't resolve.

--Construction managed both internally or externally depending on type of job.

D. Review and Evaluation --

--Design Review Board membership includes-Dean of GSFA, Chr. of Architecture (also Master Planner), Arch. Faculty, Ch. Landscape Dept., Provost or Admin., VP Facilities Mgt., BOT member,Dir. Facility Planning -- staff role, Client, Students and Faculty
-Meets with architect to talk and inform them about the campus "language" prior to beginning of design phase -recommendatory powers only
-President arbitrates--complicated process-which looks at extremes, design vs. costs

--BOT Facility Committee reviews designs at appropriate steps.

Appendix D

University of Pennsylvania
Chief Planning Officer
February 5, 1987

Interviewee Background:

--Robert Zemsky-Chief Planning Officer focus on institution-wide issues especially academic related ones.
-Also is Director of the Research Institute on Higher Education
-joint funding from other central administration offices-fee for service concept
--Reports to President and works on independent research contract basis.

A. Master Planning -- Facility Planning --

--Current process is decentralized at Penn -- Med School, Wharton, etc.
- Penn is attempting to put into place a more formal and rigorous process for review and decision making.
-Engineering School got Davis -Brody to do a study/plan where client was Engineering not the University
-not controlled by Facility Planning -done independently-problems developed with cost estimates and program scope,arguments over costs-fundraising targets were established difficulty with costs.
--process is somewhat project by project at this point although it is improving- getting better through Cap. Council -- money drives this.
--Programming is a function of which department needs the facility (Meds do their own)
-centrally funded there is greater influence (Wharton has power)
-3401 Walnut is an example but poor implementation -- problems in that overall criteria were not followed.
--Master planning and budget process improvements mandated by Trustees in last 5 yrs.
--SR.VP ultimately responsible for campus plan
- delegated to VP Finance and Chief PO(consistent with U direction)
-Master Planner acts as an internal consultant for master plan.
--Sr. Planning Group consists of Pres, Provost, SR. VP, Ex. VP Med, Vp Finance, Vp Develop.,Budget Dir. and Chief P.O.
-final review of master plan -- Sr. Planning Group has both an operational and visionary perspective
-Sr. Planning -- consensus group -- developing a 5yr planning cycle
--Cap. Council is decision making body with regard to the capital budget and provides approval for individual projects.
--Res. Institute on Higher Education - role to support "U" decision-making and planning
-1/3 funding -- acts as internal consulting firm
-define issues for central administration in order to serve the Sr. Planning Group - identifying needs for capital campaign
-provide a technical basis for good planning
- role in master planning - data sources -key role in the project -- ask tough questions -- integration
-role in facility planning are on an individual project basis -as needed on assignment (co-generation plant or business school needs).
--Agenda setting for University's future takes place through Sr. Planning Group rather than Capital Council

-key role for process improvements
--prior to current Master Planning effort there was a landscape plan
- driven by Myerson --past Pres.
- not much building in 1960's and 1970's, early 1980's pressure grew for more bldgs and recently Penn is building a lot of facilities.

B. Priority Setting-- Resource Allocation--
--Capital Council membership includes Pres, Prov, Sr. VP, VP Develop, VP Finance, Sec. of Corporation
-Staff -- Deputy Provost, VP Finance, Chief Planning Officer, Budget Dir., Dir of Facility Planning.
-Individual Projects approved by Capital Council go to Trustee's for approval
--Capital Budgets -units make request and must show priorities and financing plan
-SR. VP chairs Capital Council with VP Finance and Dir of Facility Planning as key staff

C. Implementation Phases
--Architect selection is dependent upon previous experience, especially with Penn,and the reputation of the firm
--after a project is approved Facility Planning takes the project into program and design stages -
-VP Finance deals with funding
-bids approved VP Finance certifies
-Design process managed by Dir of Facility Planning -- DRB reviews designs
--lots of variation in the process which is a function of wealth of unit HUP, Med, Wharton
-negotiation between central administration and unit, also influence of donors
- master plan role - getting better -driven by capital campaign,developing a good list of priorities,closer relationship between master planning and capital council -- greater potential
--Penn Organization.
-Pres -Provost--Deputy Provost & Deans, Sr. VP, Dir of Budget, Chief P.O. Sec of Corp.
-SR. VP area includes - VP Fin, VP Fac--Dir of Fac. Planning, VP Personnel

D. Review and Evaluation --
--Design Review Board -- how can it be more influential? major issue
- when there are problems how can DRB become influential and make their recommendations stick -
- 3401 retail facility and Wharton building are examples fo this problem.
--BOT Facility Committee reviews plans
-history of concern for land use management -- positive influence on process trustees role -- development, investments, financial health, land -key force
--Univ. Council is a faculty governance group with responsibility for review of facility plans.

Appendix D

University of Pennsylvania
Vice President for Finance
February 5, 1987

Interviewee Background:
--M. Whittington-Responsible for financial operations, capital budgeting and university financing.

A. Master Planning -- Facility Planning --
--The need for a campus plan grew out of the demand for new buildings during the last few years and also from interest on the part of trustees in facility development.

B. Priority Setting-- Resource Allocation--
--Bond financing in 1985 provided opportunity or requirement to develop a capital budgeting process. This has been started within last three years.
-- Need to develop a link between the budgeting process and the 5-yr academic planning process .
- -current goal is to to be pare down wish lists to a realistic level
- -want polished proposals - well developed project proposals
- -capital budget should link the various funding mechanisms,identify sources and prioritize projects
- -key is coordination of process for budgetary decision making and priority setting

--Current focus is on larger projects which redo existing space rather than create new space
- -research space renovations and seek gifts which deal with a mainstream problem or need.
- -needs driven -- tougher decision making-looking for budgetary relief.
- -projects must contribute to institutional priorities since it is getting harder to raise money for buildings -- Penn is getting better in this regard.

--Facility planning and Capital Planning process has evolved into a joint development with all the key people are involved.
- -Dean's interaction at the programming and preliminary funding step.
- -establish an account -- VP Finance check on priority and funding availability, feasibility is reviewed by the Director of Facility Planning
- -Capital Council approves A/E fees -- passed to Trustees as an information only

C. Implementation Phases
--Facility Management now talks to VP Finance -- close coordination
- -getting better closer relationship to construction and financing staff

--This is an evolving process with Capital Council approving individual projects as well as the overall budget
- -processes are becoming interrelated
- -Trustees also approve both overall budget and individual projects

--Detailed design - prices and cost estimates developed before final approval
- -when money is in hand.

--Plan on strengthening the review role of the Design Review Committee

D. Review and Evaluation --

--Facility Committee - assigns a Trustee to each project to watch over progress, for major new building projects

--Budget And Finance Committee approve financing

--Each Trustee resolution includes a statement whether or not the project was part of units budget plan.

Appendix E

Selected Definitions

Board of Trustee's are those individuals whose primary responsibility is the selection of the president. In addition they provide oversight and approval on various policy matters. through the committee structure they offer input normally on financial affairs, investment strategies and the direction of the physical development of the university.

Campus Master Planning the process of creating and designing land use schemes for the future development of campus facilities in a manner consistent with the institution's overall goals and philosophy. Such plans generally include visual representations of potential building locations, circulation patterns, architectural considerations, landscaping, and time frame for implementation. Master plans vary in terms of the land area covered from sections or areas to the total campus.

Capital budget for an individual project involves the identification of funding sources and a time frame over which the project expenditures and revenues will be realized. The institution-wide capital budget provides expenditure and revenue information and schedules for all facility project, usually with some prioritization.

Central design staff are involved in the architectural and engineering aspects of building projects or campus facility plans. These staff report to a vice presidential officer. architects - engineers

Central planning staff are responsible for coordination, creating or overseeing facility planning activities including campus master plans. These staff report to a vice presidential officer.

Client or program representative refers to the personnel within an organizational unit for which the proposed facility is being planned and in which the particular program will be housed. For academic departments, colleges, and schools the client group consists of an academic administrator in charge of the program area as well as faculty and support staff. For an administrative unit, the client group includes the chief administrator in addition to appropriate administrative and support staff. For a facility projects that addresses a community-wide need or a cross-section of programs the client group will consist of administrators, faculty, staff, or students representing those programs and be under the direction of the central university planning or design staff person.

Construction staff are responsible for and involved in the supervision, management or coordination of the construction phase of a building project.

Cost estimates involve projections of project expenditures based upon a given building program and developed and checked at various stages during a project's life.

Design phase involves three levels of progressively more detailed architectural and engineering drawings for the facility which serve as the basis for the construction phase.

Schematic design consists of drawings and other documents illustrating the scale and relationship of the components of the building program.

Definitive design (design development) consists of drawings and other documents to fix and describe the size and character of the entire projects as to architectural, structural, mechanical and electrical systems, materials, and such other elements as may be appropriate.

Working drawings (construction documents) consist of drawings and specifications setting forth in detail the requirements for the construction of the project.

Executive group includes the institutional officers charged with policy setting and decision-making. This group includes the president, the vice president for academic affairs or provost, the vice president for business and finance or operations, and other vice presidents where such membership is appropriate to the organization.

Facility development process involves procedures related to the programming, design and construction of individual building projects which include new facilities, major renovations of existing facilities, and the landscaping of of open and green spaces.

Facility program (building program) provides the detailed description of the types of activities to be housed in the facility. The program also outlines the nature, size and use of spaces in the facility.

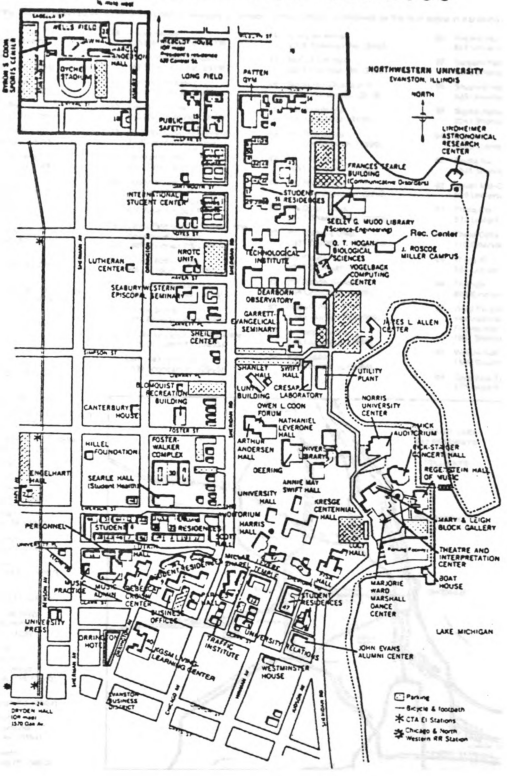
Project architect/outside architect is a firm hired by the institution that is charged with translating the building program into a specific design. The firm is primarily responsible for developing the materials for the schematic, definitive design and working drawings phase of the project.

Space refers to the actual places such as offices, laboratories, classrooms, etc., in which activities take place.

APPENDIX F

CAMPUS MAPS

Campus Information 491-2300



Student Residences

To complete the mailing address for a student residence, include Evanston, Illinois 60201—followed by the four digits in parentheses.

1 Acacia
616 Lincoln St. (2497)

2 Allison Hall
1830 Chicago Av. (3858)

3 Alpha Chi Omega
637 University Pl. (3897)

4 Alpha Delta Phi
2325 Sheridan Rd. (2969)

5 Alpha Epsilon Phi
720 Emerson St. (3821)

6 Alpha Gamma Delta
1856 Orrington Av. (3887)

7 Alpha Phi
701 University Pl. (3899)

8 Alpha Tau Omega
630 Lincoln St. (2499)

9 Beta Theta Pi
2349 Sheridan Rd. (2963)

10 Bobb Hall
2305 Sheridan Rd. (2961)

11 Chapin Hall
Humanities Residential College
726 University Pl. (3870)

12 Chi Omega
1870 Orrington Av. (3888)

13 Chi Omega Rho
1824 Hinman Av. (3872)

14 Chi Psi
550 Lincoln St. (2483)

15 Chi Psi
619 Colfax St. (2807)

16 College of Commerce and Industry
1838 Chicago Av. (3806)

17 College of Community Studies
2303 Sheridan Rd. (2964)

18 Courtyard Hall
2532 Asbury Av. (2369)

19 Delta Delta Delta
625 University Pl. (3866)

20 Delta Gamma
618 Emerson St. (3892)

21 Delta Tau Delta
2317 Sheridan Rd. (2961)

22 Delta Upsilon
2307 Sheridan Rd. (2997)

23 Delta Zeta
717 University Pl. (3894)

24 Dryden Hall (off map)
Graduate Students
1570 Oak Av. (4299)

25 East Fairchild
Communications
Residential College
1855 Sheridan Rd. (3842)

26 Elder Hall
2400 Sheridan Rd. (2964)

27 Engelhart Hall
Graduate Students
1915 Maple Av. (3194)

28 Evans Scholars
721 University Pl. (3893)

29 Foster House
2253 Sheridan Rd. (2979)

30 Foster-Walker Complex
1927 Orrington Av. (2978)

31 Gamma Phi Beta
640 Emerson St. (3889)

32 Goodrich House
2321 Sheridan Rd. (2960)

33 Hampton Court Apartments
2730-66 Hampton Pkwy.

34 Hinman House
2313 Sheridan Rd. (2966)

35 Hobart House
Women's Studies
Residential College
630 Emerson St. (3880)

36 Jones Fine and Performing Arts
Residential College
1820 Sheridan Rd. (5063)

37 Kappa Alpha Theta
619 University Pl. (3887)

38 Kappa Kappa Gamma
1871 Orrington Av. (3899)

39 Kappa Sigma
2251 Sheridan Rd. (2963)

40 KGSM Living-Learning Center
1725 Orrington Av. (3853)

41 Lambda Chi Alpha
2339 Sheridan Rd. (2966)

42 Lindgren House
2309 Sheridan Rd. (2965)

43 McCulloch Hall
2313 Sheridan Rd. (2960)

44 North Mid-Quads Hall
660 Emerson St. (3810)

45 NU Residence
600 Lincoln St. (2496)

46 NU Residence
711 University Pl. (3895)

47 NU Residence
1835 Hinman Av. (3811)

48 NU Residence
1900 Orrington Av. (2910)

49 Phi Delta Theta
2347 Sheridan Rd. (2962)

50 Phi Gamma Delta
2331 Sheridan Rd. (2966)

51 Phi Kappa Psi
2247 Sheridan Rd. (2999)

52 Phi Kappa Sigma
584 Lincoln St. (2488)

53 Pi Beta Phi
636 Emerson St. (3868)

54 Pi Kappa Alpha
588 Lincoln St. (2486)

55 Psi Upsilon
620 Lincoln St. (2496)

56 Rogers House
647 University Pl. (3873)

57 Sargent Hall
2245 Sheridan Rd. (2998)

58 Shepard Hall
626 University Pl. (3871)

59 Sigma Alpha Epsilon
2241 Sheridan Rd. (2985)

60 Sigma Chi
2249 Sheridan Rd. (2992)

61 Sigma Nu
2335 Sheridan Rd. (2967)

62 South Mid-Quads Hall
655 University Pl. (3844)

63 Theta Chi
572 Lincoln St. (2487)

64 Theta Delta Chi
710 Emerson St. (3821)

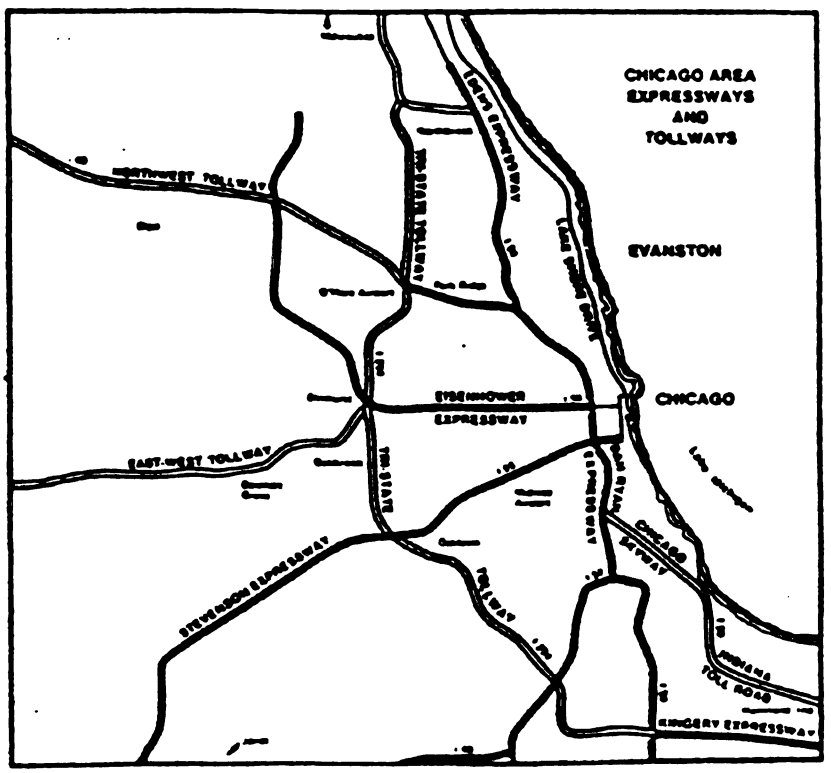
65 Theta Xi
562 Lincoln St. (2485)

66 Triangle
626 Emerson St. (3891)

67 West Fairchild
International Studies
Residential College
1861 Sheridan Rd. (3843)

68 Willard Hall
1865 Sherman Av. (3774)

69 Zeta Beta Tau
576 Lincoln St. (2489)



4-84. ARA 2839

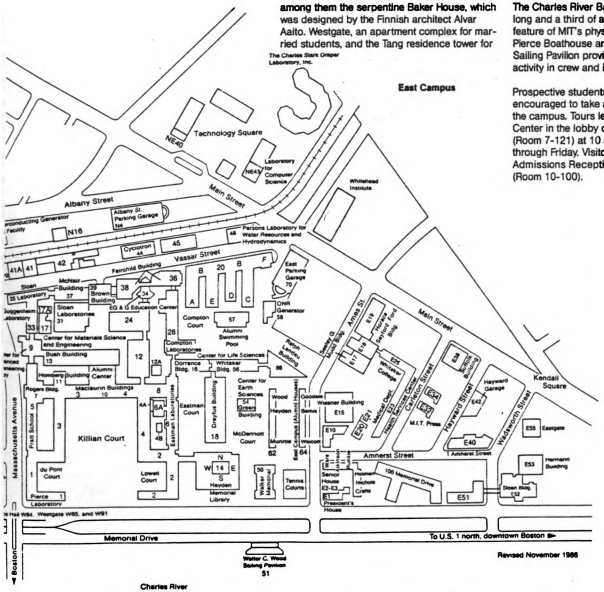
Across Massachusetts Avenue, on West Campus, is the Student Center (the Julius Adams Stratton building), which contains social rooms, cafeterias, offices for student activities, music rooms, a spacious reading room, and recreational and commercial facilities. The Student Center Plaza is bounded on the west by Kresge Auditorium and on the east by the Chapel. Both buildings were designed by Eero Saarinen. The auditorium contains a large concert hall seating 1,200, a little theatre, offices, and rehearsal rooms. The Chapel is used regularly for religious services by all faiths and is open throughout the day for meditation. The Chapel's unusual design includes an exterior moat that reflects light in changing patterns on the interior walls. Adjacent to the Chapel is the Center for Advanced Visual Studies.

Located throughout the campus is an outstanding collection of contemporary environmental sculpture including works by Henry Moore, Louise Nevelson, Alexander Calder, Pablo Picasso, and Tony Smith. This collection highlights the history, art, and architecture of the Institute.

Along Memorial Drive and facing out on the Charles River are additional student residences, among them the serpentine Baker House, which was designed by the Finnish architect Alvar Aalto. Westgate, an apartment complex for married students, and the Tang residence tower for graduate students are located at the westernmost end of the campus. Also on West Campus are the du Pont Athletic Center and playing fields for soccer, lacrosse, baseball, softball, touch football, rugby, cricket, track, and tennis. The Athletics Center includes an ice rink and field house, and Rockwell Cage accommodates varsity and intramural basketball, volleyball, and badminton. MIT's Steinbrenner Stadium includes a six-lane, 400-meter, all-weather running track, the first of its kind in North America. The Stadium also includes facilities for the steeplechase and field events, with a game field inside the track oval for intercollegiate football, soccer, lacrosse, and field hockey games.

The Charles River Basin, which is two miles long and a third of a mile wide, is a major feature of MIT's physical environment, and the Pierce Boathouse and the Walter C. Wood Sailing Pavilion provide means for extensive activity in crew and in sailing.

Prospective students and their families are encouraged to take a student-guided tour of the campus. Tours leave from the Information Center in the lobby of the Rogers Building (Room 7-121) at 10 am and 2 pm Monday through Friday. Visitors are welcome at the Admissions Reception Center after the tour (Room 10-100).



The Campus

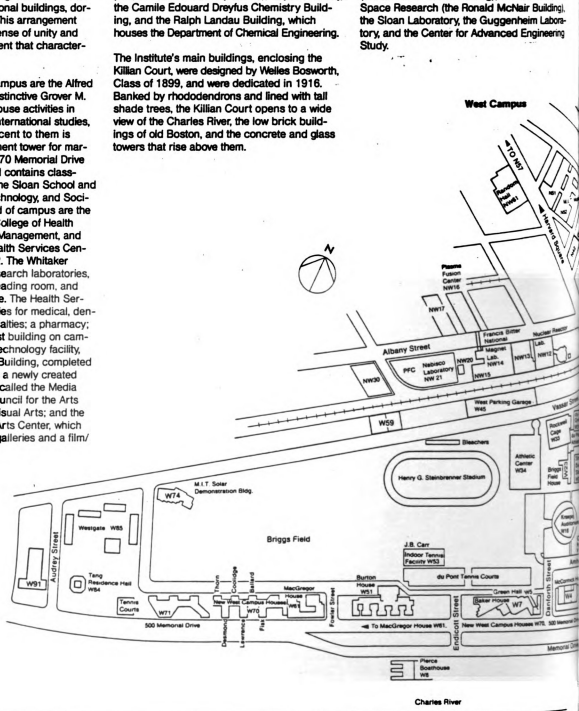
MIT's 146-acre campus extends for more than a mile along the Cambridge side of the broad Charles River Basin facing historic Beacon Hill and the central sections of Boston. Most academic activities are brought together in a group of interconnected buildings designed to permit maximum flexibility and easy communication among the departments and Schools. The extensive athletic plant and playing fields are on the campus, as are the recreational buildings, dormitories, and dining halls. This arrangement contributes greatly to the sense of unity and interdepartmental involvement that characterize the Institute.

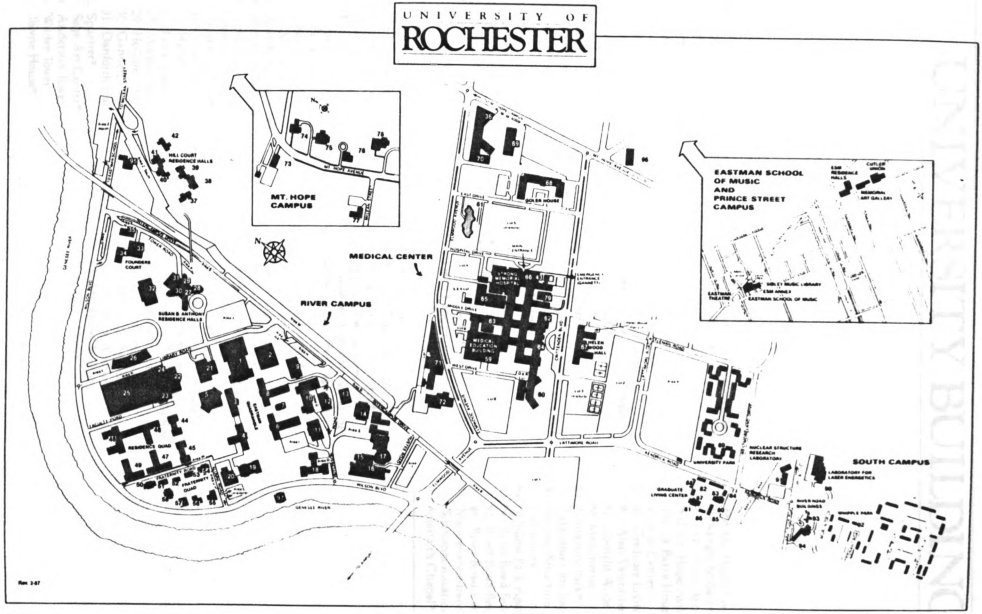
At the eastern end of the campus are the Alfred P. Sloan Building and the distinctive Grover M. Hermann Building, which house activities in management, economics, international studies, and political science. Adjacent to them is Eastgate, a 29-story apartment tower for married students. A building at 70 Memorial Drive was recently renovated, and contains classroom and office space for the Sloan School and the Program in Science, Technology, and Society. Also located on this end of campus are the buildings for the Whitaker College of Health Sciences, Technology, and Management, and the Medical Department Health Services Center, completed in early 1982. The Whitaker College Building houses research laboratories, classrooms, a library and reading room, and headquarters for the College. The Health Services Center provides facilities for medical, dental, surgical, and other specialties; a pharmacy; and an infirmary. The newest building on campus is the Arts and Media Technology facility, also known as the Wiesner Building, completed in 1985. This facility houses a newly created interdisciplinary laboratory called the Media Lab; office space for the Council for the Arts and the Committee on the Visual Arts; and the Albert and Vera List Visual Arts Center, which comprises three exhibition galleries and a film/video theatre.

A commanding feature of East Campus is McDermott Court, in which a great sculpture by Alexander Calder rises in bold contrast to the facade of the 20-story Center for Earth Sciences, the Cecil and Ida Green Building. Surrounding McDermott Court are student residences, Walker Memorial (which houses a dining hall and snack bar, the graduate student pub, and student activity offices), Hayden Library, the Camile Edouard Dreyfus Chemistry Building, and the Ralph Landau Building, which houses the Department of Chemical Engineering.

The Institute's main buildings, enclosing the Killian Court, were designed by Welles Bosworth, Class of 1899, and were dedicated in 1916. Banked by rhododendrons and lined with tall shade trees, the Killian Court opens to a wide view of the Charles River, the low brick buildings of old Boston, and the concrete and glass towers that rise above them.

Interconnected with these central buildings are the Center for Life Sciences (the Dorrance and the Whitaker buildings), the Karl Taylor Compton Laboratories (electronics and nuclear science), the EG&G Education Center (with lecture and laboratory facilities for the Department of Electrical Engineering and Computer Science), the Center for Materials Science and Engineering (the Vannevar Bush Building), the Center for Space Research (the Ronald McNair Building), the Sloan Laboratory, the Guggenheim Laboratory, and the Center for Advanced Engineering Study.



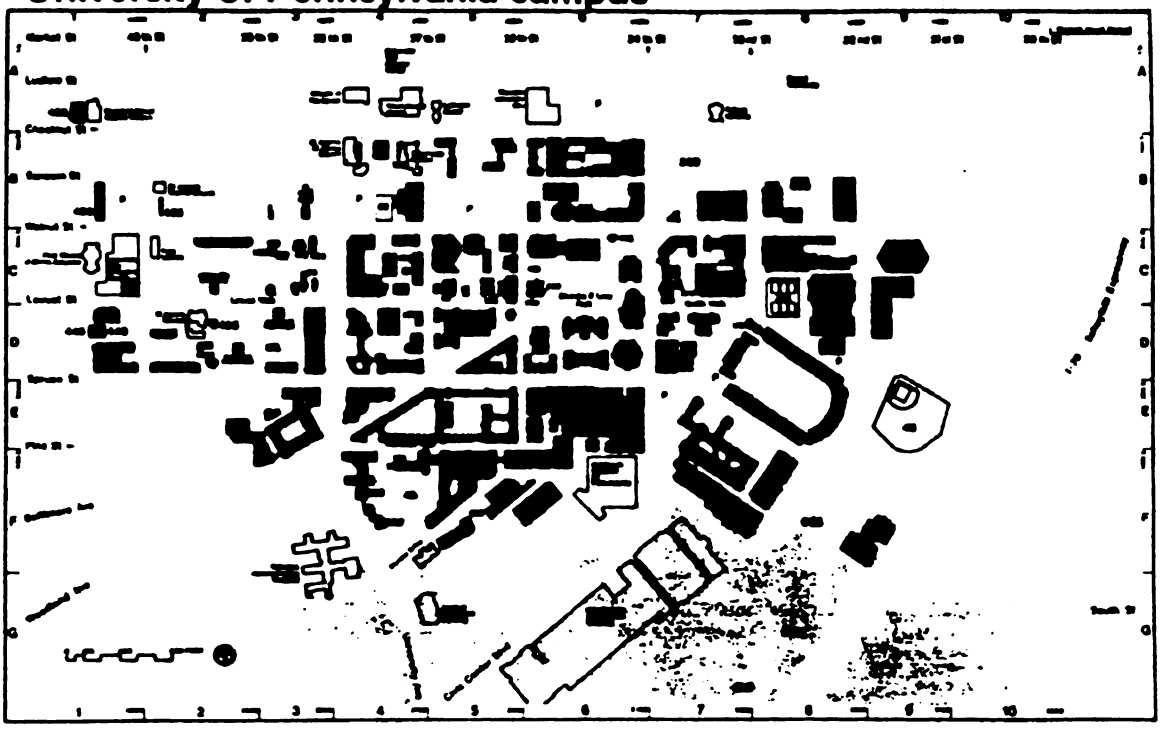

UNIVERSITY OF
ROCHESTER
MT. HOPE CAMPUS
MEDICAL CENTER
RIVER CAMPUS
EASTMAN SCHOOL OF MUSIC AND PRINCE STREET CAMPUS
SOUTH CAMPUS
HILL COURT RESIDENCE HALLS
FOUNDERS COURT
SUSAN B. ANTHONY RESIDENCE HALLS
RESIDENCE QUAD
GENESEE RIVER
GRADUATE LIVING CENTER
UNIVERSITY PARK
NUCLEAR STRUCTURE RESEARCH LABORATORY
LABORATORY FOR LASER ENERGETICS
EASTMAN THEATRE
EASTMAN SCHOOL OF MUSIC
MEMORIAL ART GALLERY

UNIVERSITY BUILDINGS

Key

1. Rush Rhees Library
2. Meliora Hall*
3. Morey Hall*
   Eastman Kodak Colonnade
4. Lattimore Hall*
5. Wilson Commons*
6. Dewey Hall*
7. Hoyt Hall*
8. Bausch & Lomb Hall*
9. Harkness Hall*
10. Gavett Hall*
11. Hopeman Engineering Bldg.*
12. Taylor Hall*
13. N.Y. State Center for Advanced Technology*
14. Wilmot Bldg.*
15. Hylan Bldg.*
16. Hutchison Hall*
    Hubbell Auditorium*
    Lander Auditorium
17. Computer Studies and Science Library Bldg.
18. Administration Bldg.*
19. Strong Auditorium*
20. Todd Union*
21. Frederick Douglass Bldg.*
    Fairbank Alumni Center
    Bookstore
    Faculty Club
    Dining Center
22. Alumni Gymnasium*
23. Alexander Palestra*
24. Field House*
25. Zornow Sports Center*
26. Fauver Stadium*
27-31. Susan B. Anthony Residence Halls*
    27. Gates Hall
    28. Morgan Hall
    29. Hollister Hall
    30. Gannett Hall
    31. Danforth Hall
32. Spurrier*
33. Sage Art Center*
34. Anderson Tower
35. Wilder Tower
36. Towne House*
37-42. Hill Court Residence Halls
    37. Slater House
    38. Munro House
    39. Kendrick House
    40. Gale House
    41. Fairchild House
    42. Chambers House
43. Gannett Emergency Center
44. Crosby Hall
45. Burton Hall
46. Hoeing Hall
47. Lovejoy Hall
48. Gilbert Hall
49. Tiernan Hall
50. Theta Delta Chi
51. Sigma Alpha Mu
52. Sigma Chi
53. Medieval House*
54. Drama Center*
55. Delta Kappa Epsilon
56. Alpha Delta Phi
57. Theta Chi
58. Psi Upsilon
59. Medical Education Bldg.*
60. Department of Psychiatry*
61. Eastman Dental Center*
    (independent affiliated agency)
62. Rehabilitation & Diagnostic Center*
63. Department of Radiation Biology and Biophysics*
64. University Health Service*
65. Supplies & Accounts Bldg.
66. Strong Memorial Hospital*
67. Helen Wood Hall*
68. Goler House*
69. Mt. Hope Professional Bldg.
70. Computing Services
71. Department of Radiation Biology and Biophysics Annex*
72. Central Utilities Plant
73. 575 Mt. Hope Avenue
74. 590 Mt. Hope Avenue
75. 630 Mt. Hope Avenue
    Peter Barry House
76. 668 Mt. Hope Avenue
    Ellwanger & Barry Bldg.
77. 685 Mt. Hope Avenue
78. 692 Mt. Hope Avenue
    Patrick Barry House
79. Cancer Center
80-88. Graduate Living Center*
    80. Alan Valentine Tower
    81. Cornelis W. de Kiewiet Tower
82-88 Maisonettes
89. University Park*
90. Laboratory for Laser Energetics
91. Nuclear Structure Research Laboratory
92. Whipple Park Apartments*
93-94. River Road Buildings
    93. River Road Residence*
    94. River Road Laboratory*
95. Maintenance-Transportation Bldg.
96. Telecommunications Bldg.
97. Interfaith Chapel*

University of Pennsylvania campus



Admissions, Undergraduate (College Hall 1)
Alumni Relations (Houston Alumni Center 3)
Anatomy Chemistry Building of the School of Medicine
Annenberg Center for Communications Arts and Sciences
Annenberg School of Communications
Arts and Sciences, College of (Logan Hall 3)
Arts and Sciences, School of (College Hall 1)
Athletic Facilities
Basketball Courts, Gimbel
Bower Field
Class of 1923 Ice Rink
Fencing House
Franklin Field
Gimbel Gymnasium
Gimbel Basketball Courts
Hockey Field
Houston Center
Huntsman Gymnasium
Levy Tennis Pavilions
Lott Tennis Courts, Hunter
Murphy Field
Powelton
Range Squash Courts
Sports Medicine, Weightman Hall
Stewart Field
Swimming Pool
Weightman Hall
Weightman Training House
Auditorium, Center, Logan Hall
Bennett Hall
Biology
Biology Laboratories
Dreisbach
Kaplan Wing
Leidy Laboratories of Biology
Mulford Biology Research Laboratory, Society 6
Blockley Hall
Blue Square Inc.
Bower Field
Bursar, Franklin Building
Career Planning and Placement Center, Hilleman
Carnegie, Franklin Building
Caster Building
Chemistry Laboratories
Chemistry Laboratories—Cret Wing
Chemistry Laboratories—1958 Wing
Chemistry Laboratories—1972 Wing
Christian Association
Class of 1920 Commons
Class of 1923 Ice Rink
Class of 1925 House
Clinical Research Building
College Hall
College of Arts and Sciences (Logan Hall 3)
College of General Studies (Logan Hall 3)
Computer Connection
Computing Service, 3711 Locust Walk
Cyclotron
Dental Medicine, School of
Evans Building
Dental Care Center
Levy Center for Oral Health Research
4015 Irving Street
4025 Irving Street
Dietrich Graduate Library
Dubois House
Dunning Wing of Furness Building
Edison Building
Education Building, Graduate School of
Engineering and Applied Science, School of
Towne Building
Graduate Research Wing of the Moore School
Moore School Building
Pender Laboratory of the Moore School
Towne Building
English House
Evans Building
Faculty Club (Penn Hall 3)
Fels Center of Government
Fine Arts, Graduate School of (Meyerson Hall 3)
Fischer Hall
Franklin Building
Franklin Building Annex
Franklin Field
Furness Building
Gimbel Gymnasium
Goddard Laboratories
Graduate Office of the Faculties (College Hall 1)
Graduate Research Wing of the Moore School
Graduate Tower B
Greenhouse, International Center
Harnwell House
Harrison House
Hayden Hall
High Rise North
Hill House
Hollenback Center
Hospital of the University of Pennsylvania
Algeo Building
Dunner Center for Radiology
Dulles
Gates Pavilion
Gibson
Hunter
Magnetic Resonance Imaging
Maloney
Penrose Research Center
Rhoads Institute
Silverstein Pavilion
Sports Medicine, Weightman Hall
White
Hotel, 36th & Civic Center Boulevard
Houston Hall
Human Resources, Office of, Franklin Building
Huntsman Gymnasium
Handicapped Programs Office, Harnwell Hall
Information Center, University, Williams
Institute of Contemporary Art, Meyerson Hall
Intercultural Center, Greenfield
International Programs Office, Harnwell Hall
Irvine Auditorium
Johnson Pavilion
Kahn Gallery of Lost McKeown Sculpture, Gimbel Gym
Kahn Library, Architectural Drawings, Fine Arts, Furness Building
Kaplan Wing
Kings Court
Kornberg Medical Foundation
Laboratory for Research on the Structure of Matter
Lauder Hall, Richardson
Law School
Law School Addition
Lewis Hall
Pepper Hall
Roberts Hall
Leidy Laboratories of Biology
Levy Center for Oral Health Research
Levy Tennis Pavilions
Lewis Hall
Libraries
Annenberg School of Communications
Biddle Law Library, Lewis Hall
Biomedical Library, Johnson Pavilion
Chemistry Library, Chemistry Labs—1973 Wing
Dental School Library, Evans Building
Dietrich Graduate Library
Fine Arts Library, Furness Building
Lippincott Library, Van Pelt Library
Math-Physics-Astronomy Library, DRL
Museum Library, University Museum
SEAS Library, Towne Building
SEAS Library—Electrical, Moore School Building
Social Work Library, Caster Building
Van Pelt Library
Veterinary Library, Hospital
Wood Library of Museum Sciences, 33rd, Richardson
Logan Hall
Lott Tennis Courts, Hunter
Mayer Residence Hall
Medical Building
Medicine, School of
Anatomy Chemistry Building of the School of Medicine
Johnson Pavilion
Medical Education Building
Medical Laboratories Building
Richards Medical Research Laboratories
Meyerson Hall
Middle East Research Institute, 3808 Walnut Street
Moore School Building
Moore School Graduate Research Wing of the
Morgan Building
Mulford Biology Research Laboratory, Society 6
Music Building
Music Building Annex
Newman Center
Nichols House
Nursing Education Building, Nursing, School of
Off Campus Living, 3809 Walnut Street
Offices, Research and Services, Buildings
3537 Locust Walk
3600 Locust Walk
3611 Locust Walk
3914 Locust Walk, Public Safety
3924 & Spruce Streets, Parking Garage
3925 Spruce Street
3701 Walnut Street, Parking Garage
3400 Walnut Street
3401 Walnut Street
3808 - 10 Walnut Street
3900 Walnut Street
4015 Walnut Street, Study Pennsylvanian
4025 Chestnut Street
4015 Irving Street
4025 Irving Street
On Campus Recruiting, Hilleman
Palestra
Pender Laboratory of the Moore School
Penn Children's Center
Penn Plaza, Franklin Building
Pepper Hall
President's House, 3812 Walnut Street
Psychology Laboratories Building
Psychology Faculty Office Building
Psychology Faculty Office Building Annex
Public Safety, Department of, 3914 Locust Walk
Quadrangle, The
Registrar, Office of the, Franklin Building
Residence Offices, High Rise North, Upper Lobby
Richards Medical Research Laboratories
Range Squash Courts
Rittenhouse Laboratory, Dorrel
River Fields
Murphy Field
Stewart Field
Roberts Hall
ROTC, Army and Navy, Hollenback Center
Rosenwald Building, Veterinary Medicine, School of
Ross Gallery, Furness Building
School of Arts and Sciences, College Hall
School of Social Work, Caster Building
Shoemaker Hall
Smith Hall
Sports Medicine, Weightman Hall
Steinberg Hall/Dietrich Hall
Stiles Building, Commons, Law School
Stouffer Hall
Stouffer Triangle
Student Activities Building, 3533 Spruce
Student Financial Aid, Logan Hall
Student Health Service, Allaway Clinic, HUP
Summer Sessions, Logan Hall
Swimming Pool, Center
Tandem Accelerator Laboratory
Tennis Courts
Levy Tennis Pavilions
Lott Tennis Courts, Hunter
Towne Building
Transportation and Parking, Franklin Building Annex
University Museum
University Museum Academic Wing
University Museum Garage
University Press, Blockley Hall
University Residences, Logan Hall
Van Pelt Library
Van Pelt Wing
Veterinary Hospital of the University of Pennsylvania
Veterinary Medicine, School of
Old Quadrangle
Rosenwald Building
VHUP
Weightman Hall
Wharton School, Steinberg Hall/Dietrich Hall
Wharton Executive Education Center
Wharton Graduate Career Development and Placement, Hilleman
Wharton Graduate Division, Hall
White Training House
Williams Hall
Wistar Institute
P Public Parking A6 B1 B4 B5 B7 B8 E7 F7 F8

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