A METHODOLOGY OF SPACE ALLOCATION
FOR IMPLEMENTATION AT
OHIO UNIVERSITY,

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Although most institutions of higher education have recently gone through a period of rising enrollments and expanding physical facilities, the trend has currently reversed. Schools must now re-adapt to a decreasing enrollment trend while their expanded facilities remain the same. There are many people of the opinion that instead of a problem, this is a suitable situation. The idea of having too much space rather than not enough is appealing to most. But despite the outward attractiveness of such a situation, it is not necessarily suitable to every institution.

At Ohio University this problem gains importance when certain factors of space allocation are considered. For example, unused facilities must still be maintained. Thus, the costs of utilities as well as regular maintenance and cleaning must be taken into account. These costs become very expensive when there are no activities conducted in that space to offset them. Next, the presence of surplus space generates controversy over who should be allowed to utilize it. Perhaps "squatters rights," whereby the individual who gets to the space first becomes the sole user of that space is to be allowed. Most likely, however, an institution will attempt to conduct and enforce some system of space allocation that would insure the equitable allocation and use of all physical facilities. And third, in addition to alumni and private donors, taxpayers whose tax dollars help pay the costs of public education, must be shown how
their money is spent. It seems that strong disapproval would be voiced for funds used to heat buildings used at less than their capacity as opposed to some alternative use. Thus, the importance of the design and use of a space allocation system is obvious. Without some logical system, numerous conflicts can be foreseen.

It seems apparent that as student enrollments are expected to decline, the amount and/or size of an institution's physical facilities should decrease proportionately. At Ohio University, however, this cannot be done in the short run for several reasons. First, it is physically impossible to tear down buildings in what would be viewed as a random fashion to the outside observer. Second, if accurate estimates of future facilities' use cannot be made, the costs of rebuilding or razing may be very high. Thus, any decision to change space physically must be made with reasonable certainty that the space change will serve the projected future needs of an institution. And finally, most faculty would be unwilling to allow their space to be eliminated without justification; thus forcing them to consolidate with another building or department.

Considering the importance of this problem of space allocation, and the difficulties that can arise in solving it, it seems that the most feasible alternative is to use what you have in the most efficient way possible. There are a variety of ways to do this. Perhaps minor renovations to alter the size and shape of various spaces could be undertaken, or a logical means of space allocation could be developed. It
is the second alternative that will be discussed in this thesis.

This project began with an extensive search of the applicable literature. This search, the results of which are discussed in chapter two, has provided a foundation upon which ideas have been built and developed. As a result, chapter three will serve to discuss several pertinent methodologies for space allocation. These methodologies include simulation, space costing, the M.I.T. system, the Pinnell and Wacholder system, the Ohio Board of Regents standards, and a comparison system. Each system will be described, analyzed subject to its advantages and disadvantages, and checked against the design criteria (soon to be discussed). Once a workable system is chosen, it will be modified and adjusted for Ohio University as well as prepared for actual implementation. In addition, a method of updating or periodically revising the system will be discussed. Then conclusions and several necessary appendices will follow.

Here it is important to highlight certain University guidelines that must be followed for this thesis. It must be realized that Ohio University is an old institution with a history and tradition to be preserved. So, a space allocation system must be such that it does not destroy any past achievements or their memory. The guidelines used in this report are as follows: ¹

1. The historical and architectural uniqueness of the Ohio University campus will be preserved by the remodeling and restoration of existing buildings.
2. Ohio University will maintain instructional and general facilities for a maximum student population of 15,000.

3. The design and capacity of the ormitory system and apartments will level at approximately 6,000 spaces.

4. Space requirements for academic departments, student services, and support units will be based on:
   (a) long range program plans
   (b) need analysis reflecting realistic national and state standards for space
   (c) instructional enrollment projections

5. The campus development plan will describe both restoration and phased processes for a net reduction over the next five biennia of ten percent to fifteen percent of the total space maintained by the University.

6. Restoration of existing facilities rather than new construction will be the major goal of the long range plan.

In following these guidelines, it becomes apparent that in order to design an appropriate space allocation system for Ohio University, a formal list of design criteria is required. These criteria will be used to evaluate the various alternative methodologies presented in terms of their effectiveness. They are as follows:

1. The system must be applicable to departmental space.
   (a) offices
      1. clerical
      2. faculty
      3. graduate student
   (b) laboratories
      1. research
      2. teaching
   (c) lounges
   (d) seminar rooms
   (e) other

2. The system must be maintainable and allow for annual updating, preferably before the Fall quarter.
3. Inputs to the system must be readily attainable and easily accessible.

4. The system must allow for decentralized space management whereby department managers oversee and adjust the use of their own space according to some workable standards or guidelines.

5. The system must also allow for the formation of a centralized committee to oversee the entire space allocation system, to resolve possible conflicts, and to approve space changes.

6. The system must be flexible such that it will allow for unexpected adjustments concerning funding, personnel, or program need changes.

7. The system must allow for all positive and negative feedback from all those involved. With information generated by the system's outputs, everyone should be able to voice his or her opinion to the central committee. Criticism and disapproval as well as agreement must be encouraged.

8. Proper use of the system as described must result in an allocation of space by department.

With all of the preceding in mind, this thesis will serve to design a system of space allocation for Ohio University so as to aid in the adjustment from a trend of increasing enrollments and expansion to one of decreasing enrollments and general space reductions. The following will include a complete description of the system design with conclusions and recommendations.
2. LITERATURE SURVEY

Introduction

This literature survey was conducted for the purpose of locating and researching all applicable information written on the topic of space allocation for higher education. The information located was found primarily through such sources as the Ohio University Library's Reference Department and the United States Department of Education. The Library's Reference Department sources included the card catalog, various indices such as the Educational Information Resources Center (ERIC) files, interlibrary loans, and bibliographical listings. The Department of Education not only provided a list of suggested sources of information but also sent some information directly. It is important to note that most of the sources were found by using the Computer Information Retrieval Service provided by the Library's Reference Department. This provided detailed access to the ERIC files which, in turn, led to many useful sources.

While an abundance of sources were located, not all were equally relevant to my topic. For this reason, the following description of the literature researched will be divided into reference and bibliography sections. The references can be best described as my primary sources of information and the bibliography as secondary sources. This does not imply, however, that any of these sources were useless. All served to enlarge my perspective and knowledge of the topic and to aid in the problem solving process.
Description of the Literature

Reference Sources

Beginning this description of the literature is a discussion of the reference sources followed by a discussion of the bibliographical sources. The sources in both sections have been further subdivided according to their relative usefulness and importance, and for ease of explanation and reader understanding. Most of the references proved to be very useful. The most important ones dealt with procedural guidelines for general purposes and their pertinence to Ohio University, various computational formulas to be used to determine measurements of space by which comparisons can be made, methods of updating space allocation systems, definitions of all terminology to be used, and lists of additional bibliographical references.

First, taking into account that in order to design a space allocation system for Ohio University you must begin by realizing goals, limitations, and working guidelines, it becomes obvious that all "in-place" procedural guidelines must be considered. References numbered 3, 16, 22, 23, 24, 25, 28, 32, 33, 34, 36, and 40 are all relevant in this regard. The more general guidelines can be found in references numbered 16, 32, 33, 34, 36, and 40 with the more specific guidelines to be found in the remainder. Here it must be noted that at the present time, Ohio University does not have any specific space allocation policy or guidelines in effect. So the references presented here were both interesting and important.
At this point, a brief description of the major points of each of the above listed sources is in order. Descriptions of the general guideline references are as follows:

The basic idea presented in Morisseau (16) is to be satisfied with what you have and to use it to its fullest potential. This is very sound advice not only for Ohio University but for any established university that is incapable of physically altering its facilities in the short run to suit its ever changing needs. To best accomplish this, the author suggests a system that combines the talents of technicians (engineers, architects, etc.) with those of laymen (faculty, administrators, etc.). As an example, he cites a system used in Wisconsin whereby the technicians make a physical survey of all facilities and code them with a weighted point system to make for clarity and understanding on the part of the laymen. The components of this formula include a number representing the research demand that a particular type of researcher will generate, the number of a specific type of researcher (faculty or graduate assistants), and the demand units generated by a specific academic discipline. Then the laymen add an educational need factor to this point system which results in an adjustment to the system. This system provides the basis for determining how to use and what to do with the existing facilities. Unfortunately, the general example given here is not adequate enough to judge the system's applicability to Ohio University. It does, however, attempt to set up a system of workable
space allocation guidelines.

Probasco (32) explains the Ohio Board of Regents recommendations for the amounts of various types of space that public universities should have. Using the measurement statistics of net assignable square feet (NASF) per weekly student contact hour (WSCH) and NASF per full time equivalent (FTE) student, space planning factors are given for classrooms, laboratories, offices, library and study spaces, general use facilities and other special use facilities. An assortment of useful tables, instructions for their completion, and finished examples are also provided. In addition, definitions of the terms used are given. This report is extremely helpful as it provides a basis from which to develop institutional space comparisons for use in a space allocation system.

The Wisconsin Coordinating Committee for Higher Education (33) describes guidelines for research space. It is stated that research space needs are a function of the level of activity devoted to research by all levels of participating personnel and the varying amounts of space required to conduct different types of academic research programs. A formula, dependent on several assumptions concerning time spent on research activity and the demand for research in the various academic fields, is given. Although this formula seems useful for determining the NASF for research space needs, the assumptions, which directly affect the formula inputs, seem to have been arbitrarily derived and not necessarily applicable to Ohio University. The components of
this formula include a number representing the research demand that a particular type of researcher will generate, the number of a specific type of researcher (faculty or graduate assistants), and the demand units generated by a specific academic discipline. If these inputs could be determined accurately, the formula would be most useful for a space allocation system at this university.

Modern Schools (34) makes the important point that just as educational facilities were adjusting to a trend of annually increasing enrollments most prevalent in the 1960's and early 1970's, those enrollments stopped increasing. Now, with the children of the post World War II baby boom easing out of the educational system and into the job market, educational institutions must re-adjust to a decreasing enrollments trend. Not only does this article note the problem, but it offers some solutions useful as guidelines for space allocation. The solutions are found in the following areas: continuing activities, and recreational activities. While the solutions are not adequate for application to Ohio University's space allocation problem, they may be most useful for another institution that does not have such programs in place already.

In Szutz (36) the problem of adjustment from an enrollment increase situation to one of enrollment decrease is again addressed. The author suggests that we re-focus our attention away from deciding how much more space we need to determining how adequate the amount of space we have now is. As an example, he cites the space allocation system
used by Texas colleges and universities. In addition, the author claims that to use facilities more efficiently it is necessary to adjust class schedules, schedule over a four day week rather than one of five or six days in length, and to "mothball" selected buildings. As these were suggested guidelines for classroom space allocation, they will not be considered in this project. They may serve to be useful, however, for those who choose to examine the classroom space allocation system at Ohio University.

As in Modern Schools (34), Wisconsin Coordinating Committee for Higher Education (40) also attempts to establish guidelines for the allocation of research space. It is stated that the projection of space needs for research is a function of graduate student enrollment, the particular academic discipline, and the level of research activity. In addition, it is stated that past studies have shown that research space needs are a function of the following two factors: the level of activity devoted to research by all those participating and the varying amounts of space required to conduct different types of academic research programs. It is these two factors that this article advocates the use of. For the purposes of this project, it is certainly important to consider these factors in addition to others when establishing guidelines for the allocation of research space.

This next set of references are those that pertain most directly to Ohio University. Once again, they attempt to establish space allocation guidelines for use in designing
Carlson and Roaden (3) provides guidelines, rules, and recommendations for the University Facilities Planner, the University Space Advisory Committee, and the Executive Officers and Dean of each College. In addition, it suggests a priority system for office assignments of all faculty, staff, and University organizations. While these guidelines provide interesting background information, they do not aid in deciding how much space to allocate to the various functions and personnel at a university.

Ohio University (22) provides the six general guidelines for space planning at Ohio University that were adopted by the Board of Trustees on June 24, 1978. These guidelines are concerned with the physical appearance of the University's existing buildings, future enrollment, dormitory capacity, student services and support units, space reductions, and the traditional atmosphere of the campus. They did not, however, establish a university policy for departmental space allocation. Very obviously, there cannot be an adequate space allocation program at Ohio University that does not consider space allocation guidelines at a high priority level.

Ohio University (23) describes a preliminary Ohio University Space Utilization Study conducted in 1978. The following eight factors were considered in this study: goals, the existing facilities' conditions, utilization factors, comparisons of Ohio University to other higher education institutions in Ohio, the explanation of the weekly student
contact hours measurement to be used for comparison purposes, recommendations for physical adjustments to the existing facilities, building solutions, and the University plan for the 1980's. In addition, some useful charts were included. This is a very important report and certainly warrants consideration in this thesis. While it is only a preliminary study, it lays the groundwork for an efficient space allocation system at Ohio University.

Ohio University (24) discusses a process for the assignment and management of Ohio University's general fund space. It describes the goals of the program and the factors to be taken into account in order to achieve these goals. One of the most important considerations must be the cost which Ohio University now pays for cleaning, lighting, heating, and maintaining its unused space. It also lists six stages of space management as inventory, general guidelines, development of a preliminary space utilization plan, the assignment of space, the utilization of excess space, and the modification of the space plan. The details of these six stages are provided. It seems important to be familiar with these guidelines and to use them as a foundation for a quantitative space allocation system.

Ohio University (25) is composed of several reports to the College of Arts and Sciences' Space Utilization Committee. The five reports are concerned with identifying the problems for space planning, a classroom space management procedure, department space standards and management, a comparison of space plans and standards, and the Committee's final report.
This is a very important reference for this project. It makes many valid suggestions that serve to provide further ideas and improvements. It warrants high consideration.

Ohio University (28) focuses on the prime-time classroom hours at Ohio University for the 1980-1981 academic year. Prime-time hours are shown in contrast to non-prime-time hours. In addition, these prime-time hours are broken down by major field of study and displayed as a percentage of total university hours. A similar chart for the Fall quarter 1981 is also attached. Although this information would be most useful for a classroom space allocation system based on scheduling adjustments, it is not suitable for this project because the scheduling technique and consideration of prime-time hours lends itself to determining the demand for space rather than its allocation.

The next set of important references are concerned with computational formulas and other means of comparison for higher education institutions. References number 7 and 15 deal predominantly with formulas and their results for comparative purposes. And, references number 12, 17, 20, 21, 26, 27, 29, 37, and 41 deal with other measurements and types of comparisons in addition to some formulas. Also, many of these references include definitions of the terminology used, whereas, in a later section, references will be described which only provide definitions.

Dunworth (7) discusses undergraduate laboratory utilization and requirements from a British perspective. It focuses
on a method of estimating the theoretical areas of undergraduate laboratories and the associated ancillary accommodation required by departments in relation to specific levels of student enrollment and course teaching structures. Two interesting formulas are provided. The first is for laboratory area per undergraduate student and the second is for an overall utilization rate. In order to compute these formulas, inputs such as a frequency factor, an occupancy factor, and a standard area per working place factor are necessary. Although the formulas might prove useful, the author does not provide a means for arriving at the necessary inputs; nor does he define them. Thus, the applicability of these formulas to this thesis is uncertain.

In Matsler (15) are described the California Public Higher Education space and utilization standards. Formulas are given to calculate assignable square feet per student station and student station use. These standards seem to be most applicable to laboratories and offices. Policies for one person, two or more person offices are given. In addition, standard office sizes for administrators, faculty, and clerical workers are suggested. And, definitions of many types of educational space are provided. Since techniques of comparison are essential to this project, it seems that this article is a very valuable source of information.

Froomkin et al. (12) describes the Norris Standards which were derived by the Higher Education Construction Programs Study Group led by Chalmers G. Norris. It was stated that these standards could perhaps be used to estimate the
incremental needs for space in the future. A formula for square feet per full-time equivalent (FTE) student was given as well as a table showing the net assignable square feet (NASF) for all types of public institutions in terms of classroom space, laboratory space, office space, etc. Although the standards provided are good, they are for whole institutions rather than specific departments. As a matter of fact, this generality may hinder their usefulness in this thesis because of hesitance to compare unlike standards. They are, however, worthy of note.

Although New York State Higher Education Facilities Comprehensive Planning Program (17) does not offer any standards in numerical form for comparative purposes, it does present an interesting space management system. It advocates the use of space indices, space ranges, and institutional profiles. Space indices were defined as the distribution of certain categories of gross and net assignable campus space as a function of student enrollments. Space ranges show extremes of space expressed in square feet per head count and FTE students. And, the institutional profile shows space in square feet per head count and FTE students enrolled. Upon close inspection of these three categories, it is seen that these are very useful measurements for comparative purposes. Unfortunately, this article did not display their precise means of calculation. Thus, aside from the terminology definitions provided, the information discussed here has only limited use in terms of providing background information.
Ohio Board of Regents (20) provides Ohio public university data as well as definitions. It is an excellent source of information in that it includes tables showing the NASF per daytime FTE student for classrooms, teaching laboratories, research laboratories, etc. of all Ohio higher education institutions. It also offers some data for teaching labs in terms of NASF and WSCH for all Ohio institutions. In addition, it provides sample forms for the recording of inventory which, however, are not needed at Ohio University since it already has a working inventory system in place. Although this is a most useful information source, the information is given for whole universities rather than separate departments which restricts its applicability to this thesis.

Ohio University (21) shows the cost per gross square foot of residential campuses for fiscal 1977. The campuses shown are Bowling Green, Kent State, Miami University, and Ohio University. And the areas of cost include the administration, custodial service, maintenance of buildings, maintenance of grounds, utilities, and other. Although interesting to see, this table is too outdated to be used in this thesis. Plus, an explanation of the derivation of the cost figures used would prove helpful.

Ohio University (26) shows a residential campus comparison of enrollment, space and plant operation, and maintenance expenditures for fiscal year 1977. The same institutions as in the previous reference are cited. Also, a variety of measurements such as the annual FTE students, gross square feet, and cost per gross square foot are shown. Once again,
this table is too outdated to be useful for this project because of the rapid change nature of all costs involved.

Total maintenance expenditures for residential campuses by area in relation to Fall FTE students for fiscal year 1977 are shown in Ohio University (27). Here again we see the same Ohio institutions as listed in the two previously mentioned tables. Under the areas of administration, custodial, maintenance of buildings, maintenance of grounds, utilities, and other, dollars per FTE student are computed. Again the 1977 date of this table prohibits its use in this project because current data is most applicable.

Oregon State System of Higher Education (29) provides background information on the measurements of space utilization used by the Oregon State System of Higher Education. A specific methodology for space utilization measurement of instructional classrooms and labs is categorized as: 1) the hours per week that instructional spaces are regularly scheduled, and 2) the percent of student stations that are occupied when the classroom or lab is scheduled for use, sometimes called the "fullness ratio". In addition, many useful definitions are provided. While this article claims that scheduled facilities invite the use of quantitative measures and statistical summaries, only one small chart was offered. Thus, aside from the definitions offered, the usefulness of this information as it pertains to this thesis, is limited.

Taylor (37) describes a survey of selected institutions
of the National Association of State Universities and Land-Grant Colleges. Basically, a questionnaire was sent out to see how schools allocate their space. Seventy-six percent of those polled, responded. From these responses it was discovered that most institutions have some organizational method of space allocation. And the responses ranged from a discussion of that system to the actual standards in use. Recommended office sizes in square feet were given for administrators, faculty, and clerical workers. Thus, this article is extremely useful for the comparison process.

Wisconsin Coordinating Committee for Higher Education (41) discusses space guidelines for instructional offices. These guidelines were established by the Wisconsin Coordinating Committee for Higher Education at its September 1964 meeting. They established a norm of 120 square feet per office station per FTE clerical staff and faculty position. In addition, this article discusses how both Purdue University and the University of Illinois found this norm unacceptable and have changed their respective guidelines from 120 to 136 and 135 square feet, respectively. Considering the date that this 120 square foot standard was established and the fact that there was no allowance made for departmental or office use variation, the information presented here with the exception of the above mentioned standards is not particularly applicable to this thesis.

One reference that deserves special note at this point is Simha (35). This reference describes a method for up-
dating or revising a space allocation system as the need arises. The example given was that of the system currently in use at the Massachusetts Institute of Technology. Basically, there is a central committee which makes all the space allocation decisions. Departments are required to request and give up space as necessary. In order to double-check everything, an annual inventory is conducted to see who has what (INSITE-Institutional Space Inventory Techniques system). The foundation of this system rests on the idea that all facilities are shared; no one owns or has first choice of any space. In addition, the space allocation hierarchy is described as a decentralized system whereby departments and organizations make their space requests to the technical staff of the central committee. It is this technical staff that actually makes the allocative decisions. These decisions are made, however, under the policies and guidelines established by the Committee for Research and Space Planning. Thus, while this system seems to be very useful in theory, its practical applicability to Ohio University is questionable. This will be discussed in greater detail in the next section.

The next section of references deals with definitions of space allocation terminology. The references included here are numbers 5, 11, 19, and 31. While each of these reference's primary use is to aid in defining the terms pertinent to this thesis, they also deserve individual mention because they include some other interesting information.
The Council of Ontario Universities attempted to design a space allocation system for the health sciences that would reflect present space needs, predict future space needs, and provide an equitable distribution of capital funds. Basically, Council of Ontario Universities (5) described such a system as an inventory procedure. Samples of the forms used to collect the data were given. Since Ohio University has an inventory system in place, this information, except for the very detailed definitions given, was useless.

The information supplied in Cyros (11) came from the proceedings of a Massachusetts Institute of Technology seminar on Facilities Management Systems and Inventory Techniques. Once again, since this thesis deals with methods of space utilization and allocation, the Ohio University inventory system need not be reviewed. In addition to the definitions provided, this reference also discussed Space Cost Analysis (SCAN). As this will be discussed in a later section of the thesis, it is not necessary to go into it now. So, although the information presented here was most interesting, it was not useful for this thesis.

Here again is a description of an inventory system. Office of Educational Facilities Research (19) detailed the necessary set up procedures and actually served as a manual for completing the required data collection forms. This system, used by the Texas colleges and universities produces output describing various types of information on buildings and facilities as well as the utilization of all space.
Again, the definitions given were the most useful information taken from this report.

The interesting aspect of Pinnell and Wacholder (31) is that it described utilization measurement systems for both teaching and non-teaching facilities. Similar to the Ohio Board of Regents techniques, it discussed a space factor for teaching facilities. Also, a proration system and a utilization evaluation for non-teaching facilities were presented. Finally, estimation of space requirements were made. While the details of this system will be discussed in the next chapter, it is obvious that such a system might prove to be a very useful aid in designing a space allocation system for Ohio University. It is the above mentioned information plus the definitions given in this reference that serve to make it a source of highly useful information.

The last of what are considered the most important references are those that provided additional bibliographical lists from which information relevant to this topic could be obtained. These references are numbers 6, 8, 9, 10, 14, 18, and 30. Rather than mention each one individually, it will suffice to say that Orxy Press (30) provided some excellent sources that deal directly with space allocation in contrast to those of Educational Facilities Laboratory (8) which were not as useful. In addition, MacMillan Information (14) was a thesaurus of ERIC descriptors, and thus should be more accurately classified as a source of reference information rather than a bibliographical listing.
The next set of references provided information on various alternative methodologies of space allocation. Since the next chapter will analyze these alternatives in terms of their advantages and disadvantages to application at Ohio University, it is not necessary to describe them in detail here. Already mentioned was the system of teaching and non-teaching utilization measurements in Pinnell and Wacholder (31) and the space allocation system of shared facilities used at the Massachusetts Institute of Technology and described in Simha (35). Other systems of space allocation include space costing as described by Zacher (43) and (44), simulation as described by Ansfield (1) and Center for Community Needs Assessment (4), the Wisconsin State University computerized space allocation system which is discussed in Witner (42), and a generalized summation of the administrative duties in space allocation in Taylor (38). Since the subject matter of references numbered 38 and 42 will not be included in the analysis of alternative methodologies, a brief mention of the information presented in those sources seems in order.

Taylor (38) discusses a survey taken of the member institutions of the National Association of State Universities and Land-Grant Colleges to determine various aspects of their space allocation procedures. A questionnaire was sent out to these member institutions to secure information on the size of student enrollment for the Fall 1971 semester or first quarter; the level of degrees offered; the name or
title of the office in charge of space allocation; the office for whom the space allocation is responsible; and the procedures for assigning classrooms, lecture halls/auditoriums, seminar rooms and lounges, teaching labs, research labs, and faculty office space such as according to space available and need or using a priority assignment. The eighty-four percent response rate produced a variety of results. These results, however, were not all applicable to this thesis.

Witmer (42) describes a three step computerized space management system. The three steps involved were listed as follows: 1) create a physical facilities inventory, 2) produce a summary report of the current utilization of existing facilities, and 3) project future space needs. While Ohio University presently has an adequate equivalent of steps one and two, step three seemed interesting. Most unfortunately, the discussion of step three was vague and confusing, and the variables used in a formula to derive estimates of necessary space increases or decreases were ill-defined. These variables included student contact hours (SCH) for various years and the number of years in the time period under consideration. Thus, while the idea was good, the explanation was poor and resulted in the inability to utilize this information to its fullest extent.

The final set of references in this report describes interesting information that for a particular reason, could not be used directly in this report. Included in this last
group of references are those numbered 2, 13, and 39. It seems necessary at this point to briefly mention each of these reference's subject matter and to state the factor that renders them functionally useless.

Bareither (2) describes a method to determine the demand for facilities. The data collection tools required were a student activity diary which was to be kept for eight days, and a student information questionnaire. The subjective nature of this methodology is clear. For this reason and the fact that the determination of a demand variable is most useful for the space costing alternative which is not the type of system suggested in this thesis, the information in this article is very interesting but not very useful.

Similar to the preceding article, Caudill, Rowlett and Scott (13) describes the specifics of the Educational Facilities Laboratory project at Duke University for gauging the level of space demanding activities, and shows the reader how to measure these activity levels at other educational institutions. There are several reasons why the information presented here is not very useful in regard to the topic of this thesis. First, the subjective data collection techniques of a student activity diary and a student questionnaire were used here as in the previous reference. In addition, it was stated that many of the data collection forms were not returned and of the ones that were, some were filled out improperly. Also, the data collected and presented here was from two-year schools which does not make for a suitable comparison to Ohio
University. Thus, here again it seems that although this information is interesting, it cannot be used appropriately.

Hunt, Tyler, and Sears (39) presents formulas for utilization coefficients. These utilization coefficients include a room utilization coefficient, a student station utilization coefficient, and a utility factor. At first glance, these coefficients seem highly useful. Upon examination of their underlying assumptions, however, it becomes apparent that they are difficult to apply to a space allocation system for Ohio University. First, they were designed primarily for a community college system rather than a public, four-year institution. Second, they can only be used for scheduled facilities. While teaching labs can be considered scheduled facilities, the absence of individuals in a lab does not necessarily indicate a lack of use of its facilities. The use of these coefficients in a space allocation system for classrooms is recommended, but since the topic of this thesis does not include classroom utilization, they cannot be used appropriately here.

Bibliographical Sources

The following bibliographical sources are considered interesting, but have little, if any, practical applicability to the topic of this thesis. The first references listed provide information on inventory systems. The second set discusses types of systems that are only indirectly related to this topic. And the third set reveals information on the Department of
Education and written correspondence with other universities.

First, as previously stated, Ohio University currently has a workable system of recording all of its inventory. So, rather than attempt to redesign Ohio University's inventory system, only its output will be used as an aid in designing an appropriate space allocation system.

Bibliographical sources numbered 11, 13, 14, 15, 16, and 17 are all concerned with inventory methodologies. Murphy (11), Office of Education (13), and Office of Higher Education Planning (17) describe individual systems while M.I.T. (14), (15), and (16) describe the INSITE system used by the Massachusetts Institute of Technology. Basically, bibliographical source number 11 discusses a computerized facilities inventory system used by the University of Maryland. Then source number 13 presents copies of the Department of Education's inventory of physical facilities forms to be filled out by various universities. Third, source number 17 describes the New York State higher education school system's inventory procedures. And finally, bibliographical sources 14, 15, and 16 detail the working of the INSITE II and INSITE III inventory systems. Also discussed in source number 16 is the INSITE Consortium.

The next set of bibliographical sources covers a small variety of subject matter that indirectly relates to the topic of this thesis. For example, sources numbered 4 and 21 deal with classroom utilization methodologies. Temmer (4) is concerned with achieving a classroom allocation system by adjusting course scheduling, while Ohio University (21)
focuses on reducing the number of classrooms at Ohio University so as to allow departments to manage their classroom space under the Ohio Board of Regents standards. Second, Richard Fleischman Architects (20) is a space utilization and management study for Ohio University prepared by the author. This study centered on four building options: remodel, remodel/expand, retain/maintain, and discontinue. Although this study certainly merits consideration for the long run, it does not directly touch on the topic of who should have how much space and why. Third, Peterson (19) is a market study of the residence services at Ohio University by Dr. John M. Peterson. Since this thesis does not consider the residence facilities at Ohio University, this report was not of much use. Fourth, Loomis and Skeen (10) described a system whereby interviews were conducted in order to obtain a qualitative evaluation of departmental space. Also described was a detailed engineering study on building structure at the University of Tennessee. Fifth, a system of shared facilities in a cooperative manner among universities is discussed in Kliment and Lord (9). This seemed to be basically a description of the formation of a state run university center in which many colleges share their facilities with each other. Sixth, Bareither and Schillinger (1) describes a system of translating an educational program into physical facility requirements called the Numeric Method. The purpose of this study was to devise a set of physical facility standards. Although the Numeric Method, as defined, seems to present many applicable ideas such as the establishment and adoption
of workable physical facility standards that will treat all space allocations in an objective manner, this article was vague and incomplete in its description of this system. So the information presented was limited in use. Seventh, Goins (7) describes a building efficiency study conducted in terms of the use of utilities. The data was gathered by the use of group discussions and interviews of resource personnel. The use of utilities is a questionable method for judging efficiency only because some programs require that certain utilities be used all day and night while others do not. Thus, this information had limited use in terms of the design of a space allocation system. Finally, M.I.T. (3) contains the proceedings from a seminar on space management which was held at the Massachusetts Institute of Technology in June 1976. This source described the managerial techniques for use with all personnel involved in the implementation of a new space management system so as to insure its acceptance and correct use. Unfortunately, due to the insufficient amount of information provided in this article, it has only minimum applicability to this thesis.

The third and final set of bibliographical sources is concerned with the status of the Department of Education and with correspondence from other universities. Epstein and Rich (2), Forbis (5) and (6), U.S. Department of Education (23), and Wellborn (24) all represent the attempt to ascertain the present governmental status of the United States Department of Education. Then, sources numbered 8, 12, 18, and 22 represent correspondence with Syracuse University, Harvard University,
the United States Department of Education, and the University of Southern California at Los Angeles, respectively. These sources provided information on the space allocation procedures in use at the above listed universities if available, and suggestions as to other individuals to contact for further information.

Conclusions

The extent of this literature survey has provided some interesting information. It is broad and comprehensive but also contains specific sources of information which are most pertinent to the design of a space allocation system for Ohio University. As the lists of references and bibliographical sources show, there is a vast amount of information available on space allocation systems for higher education institutions. Unfortunately, as can be seen from the preceding, many of these sources tended to be vague. While descriptive information was provided, discussion of the proper use of this information to allocate space was often neglected. Thus, seemingly relevant information was rendered useless. It was attempted in this description of the literature to organize and condense the material in such a way as to make for ease of explanation and reader understanding.
3. DISCUSSION OF ALTERNATIVE METHODOLOGIES

Introduction

It may be possible that more than one system of space allocation will work in a given situation, but it is safe to assume that there is a "best" system for that situation. The term "best" can be defined by ease of system implementation, least cost system to implement and periodically update, a system that satisfies the most people, etc.

With this in mind, the following is a discussion of several different types of space allocation systems, their advantages and disadvantages, and subject to the design criteria, an evaluation of their ability to function at Ohio University. The systems to be discussed include simulation, space costing, the M.I.T. space management system, the Pinnell and Wacholder system, the Ohio Board of Regents standards, and the comparison methodology.

Simulation

Simulation, as discussed here, is the term used to describe a computer process by which inputs are varied and then acted upon by a particular computer program, which is subject to certain constraints, so as to produce a series of outputs. In the case of space allocation, inputs such as room types, the number of available student stations, the university timetable of classes, and faculty teaching loads and course assignments can be used. The design of the program will manipulate the input as the programmer sees fit.
and subject to any required constraints such as budgetary. Then ideally, upon consideration of all generated outputs, the one best alternative could be chosen and implemented. The goal of a system such as this is to produce a space allocation system that operates with selected inputs to satisfy the objectives of an institution's space policy.

Advocates of the use of simulation for space allocation are quick to note its advantages. General terms such as greater effectiveness and improved efficiency are readily voiced as well as optimal allocation and ease of decision making. Specifically, the particular advantages to the simulation depend on the type of simulation run. For example, a simulation procedure designed to allocate educational space by Florida University was said to have the following useful advantages: 1) it attempted to look at the entire problem systematically with emphasis on explicitness, quantification, and the recognition of uncertainty, 2) by combining educational planning objectives with pertinent information regarding population projections, historical program trends, and allocative program costs and utilities, a more effective allocation of resources was possible, 3) it allowed the decision maker to change specific program allocations, system parameters, and other controllable variables in order to determine the effects of these changes upon the total educational system, and 4) it assisted the administrator in reaching a more optimal allocation based upon the principle of maximization of utility and minimization of cost. 2
Admittedly, a system such as this seems highly useful at first. Upon closer examination, however, there can be seen to be a number of disadvantages in the use of such a system at Ohio University. First, upon examination of the types of inputs used for simulation, it seems obvious that this system lends itself more easily to be used for scheduled space such as classrooms rather than unscheduled space such as offices and research laboratories. Since this thesis will attempt to allocate most departmental space exclusive of classrooms, the previously discussed type of simulation will be unacceptable. Second, there may very definitely be a problem with obtaining some of the required inputs from faculty members. You see, most faculty will be unwilling to divulge any information that they think may lead to their loss of space. In addition, while they may provide the required information, they may pad or adjust it in such a way as to alter the truth so as to insure no loss of space from their departments. And, there are most likely few administrators who would want to confront, let alone oversee faculty members as they accumulate data for input. Next, ignoring the first two disadvantages to simulation, this methodology still does not directly address the issue of the specific amount of space that a particular individual involved in a higher education system should have. Even with various alternative outputed plans to choose from, who should make the choice? An anthropology professor might choose a system different from an english professor. And neither may be satisfied with the other's choice. Perhaps the choice could
be made by a seemingly neutral administrator such as the University Facilities Planner. He could consider all the simulated outputs and choose the most appropriate plan. This procedure, however, may serve to alienate the Facilities Planner from various departments which may hinder his functional ability on other matters. So once again, a disadvantage is noted for the use of simulation for space allocation. Finally, the last point to be made concerning simulation is in relation to the previous disadvantage stated. If there are no policy guidelines or criteria for judging which system is "best," this is a terribly difficult, and perhaps impossible decision to make. Thus, the importance of a university space policy is stressed.

So, in conclusion, the use of the simulation technique for the task of allocating space at Ohio University is not recommended. Although a seemingly organized and efficient methodology with very tempting advantages, the disadvantages to its use must be considered too. In this case it seems as if the disadvantages would far outweigh the advantages; thus prohibiting such a system's implementation and general use.

Space Costing

Space costing is a method of cost accounting space and physical plant operating and maintenance expenses to an individual unit or program of an institution. It allows for a decentralization of the space resource allocation process. You see, rather than allowing a committee or specific administrator to assign space, this system gives academic managers,
such as college deans or department heads, the responsibility for determining the amount of space to assign, its scheduled and unscheduled use, and the maintenance it requires. Under this model, space changes would be based on the actual operating and maintenance costs of facilities. In other words, the academic unit becomes a client of the physical plant department and must contract it for services such as heat, air-conditioning, electricity, water, and sewage, as well as custodial services and maintenance. This system does not allow for the use of space as a seemingly free commodity. Instead, it attempts to put a price on each square foot of space and thus force academic managers to assess the worth of all their space as various transactions take place. Basically, each academic unit is given a budget. Then, each academic manager, working within the constraints of his budget, can determine how best to spend his allotment and make decisions about the size of the department's territory and staff, its hours of operation, and the frequency of maintenance.

At this point, several advantages and disadvantages to the use of a system such as this become apparent. Some important advantages are as follows. First, space costing provides an incentive to use space more efficiently. Specifically, a space user will most likely focus his attention on the space use patterns that absorb his resources such as utilities. Using only the resources deemed necessary should result in a more efficient use of space. Second, if academic managers are made responsible for paying for their space, they will need to make broader evaluations of their departmental programs.
For example, in a certain year a college dean may be willing to give up his unused space to another college so as to use that income for another purpose such as the instigation of a new program. A third related advantage to the use of space costing is that space shrinkage by one department will accommodate expansion by another. Next, it should be noted that many times the physical plant will receive instructions to decrease its use of resources. This can be difficult because they are removed from the actual users of these resources. Space costing, however, allows resource conservation to become a dual responsibility. Since academic units will have a budgetary incentive to use only the resources necessary to support their programs, they will have to work with the physical plant to accomplish this. Thus, both departments will be concerned with the efficient use of resources. And finally, it seems obvious that space costing serves to benefit the physical plant department by strengthening its political base within the institution.

Although the attractiveness of this system cannot be denied, there are several disadvantages to its use. First and most important is the extreme difficulty in trying to assign cost to intangible assets such as a room with a view, one close to parking facilities, or one that is old and charming. This is very important because the assignment of space costs provides the basis for the whole space costing system. Also, since assigning costs to intangible assets is subjective, agreement on appropriate charges by a university community or even a small space advisory committee will be difficult to obtain. There are, however, some alternatives to a sub-
jective assignment of costs. They are as follows: first, assign each room a desirability factor and construct a corresponding cost schedule. Second, compare an institution's space to equivalent space in the commercial market. Third, put space into a free-market type pool where prices are set at levels which allow for everything to be sold and buyers purchase only if the price is a fair measure of their desire for it. Although helpful, these alternatives would certainly subject their results to much question and criticism. The next disadvantage to this space costing system is seen in the high administrative costs required to set up this system. This is especially true if an institution must begin space costing from scratch with the initiation of an inventory system. There may even be additional charges incurred to those academic managers who choose to hire operation or plant managers to oversee the system and deal with the physical plant department. Next, a space costing system may promote uneven maintenance of the physical plant. For example, wealthy units, particularly those with large research contracts, will be able to afford better maintenance than relatively poor departments or colleges. Another disadvantage to the use of a space costing system is that unless there is a strictly adhered to schedule for maintenance, it is easy to postpone necessary maintenance. Academic managers are more likely to put their resources into people and programs instead of the physical plant, thereby creating a potential problem with deferred maintenance. An additional note is that many times the longer preventive maintenance is postponed,
the greater its cost. The final disadvantage to the use of
the space costing system is that academicians may resist
this type of resource allocation because they consider it
demeaning or too time consuming. With this in mind, it is
obvious that in order to make a system like this work,
full cooperation of all those involved is absolutely neces­
sary. So, it becomes a managerial problem to generate and
disperse a wide amount of information concerning every aspect
of the space costing system. Without keeping all those to be
involved in the system's use thoroughly informed, mistrust
of the system and the administrators involved will result,
and may certainly stifle the system's effective use.

Finally, in comparing this system to the design criteria,
it seems that while space costing can be used for departmental
space, it is maintainable and can be updated, it allows for
a decentralized method of allocating space and the formation
of a centralized committee, and those involved can be kept
informed; there are a number of serious setbacks to be con­
sidered. In addition to the disadvantages previously dis­
cussed, system inputs are difficult to obtain, there is a
lack of flexibility in not allowing for unexpected changes,
and it seems that once the space costs are determined, feed­
back is no longer needed. So, although space costing cer­
tainly does allocate space, many aspects of the system are
questionable in terms of the system's applicability to Ohio
University.
The M.I.T. Space Management System

The M.I.T. Space Management System is basically a centralized system of space allocation. The structure of the system begins with a central committee which is the central source of policy with respect to space allocation and the financing of change. This committee is properly called the Committee for Research and Space Planning (CRSP) and it is chaired by the senior academic officer of the Institute, the Provost, and consists of representatives from research, administration, planning, operations, finance, and personnel. The CRSP is assisted by a staff which provides technical support. It meets weekly throughout the year and is available to any member of the M.I.T. community. The staff insures that each space request is logged in and by virtue of its frequent meetings, the CRSP is encouraged to reach decisions promptly.

Although the responsibility for assigning and financing space for academic and administrative units belongs to the CRSP, the M.I.T. Space Management System is described as having a number of shared responsibilities. The deans of the schools and their department heads are allowed much flexibility in the use of their assigned space. Also, an annual audit of all space is conducted to provide the deans, department heads, and the CRSP with an accurate account of the volume and type of space that has been assigned and to whom. Furthermore, if an academic unit can make a case for additional space needs, it is the task of the central administration to find
it, finance it, and prepare it for academic use. Conversely, if space is no longer needed by a particular Institute organization, it may be retrieved to be held in reserve, or it may be reassigned to another needy academic activity. Specifically, the system works as follows: At the beginning of each fiscal year, all of the Institute's departments and organizations are notified that space related matters should be submitted to the CRSP before January 1. These proposed changes are then analyzed and evaluated with respect to need, cost, and planning implications. The requests are then evaluated by priority against the resources available for the support of space changes in that particular year. Priorities are established, reviewed with the deans of the various schools, and with their agreement, these priorities will form the basis of the space change program for the coming fiscal year.

This space allocation system has three self-proclaimed advantages over other space allocation systems. First, although there are inevitable complaints about scheduling, this system is stated as being far preferable to having individual departments control small blocks of classroom space, since except in extraordinary cases, this generally leads to gross inefficiency in the use of classroom space. Next, the initiative for space requests is decentralized, and once submitted, the requests are reviewed for fiscal and other planning considerations and then acted upon promptly. And third, by maintaining a simple visible, dependable space management process that encourages use, M.I.T. has reinforced the part-
nerships of users and managers that has provided for the effective use of space over the years.

In addition to the above advantages of the M.I.T. system, there are several disadvantages. For instance, aside from the annual audit previously mentioned, it seems difficult to oversee or check this procedure. A large amount of trust seems to be placed in the judgements of the deans of schools and their department heads. Obviously, if they do not request and relinquish space as need be, the system will not function properly. Next, in relation to the above mentioned disadvantage, there does not seem to be any assurance to deans and department heads that if they do give up space, they will later be able to obtain additional space to satisfy their needs. Thus, it may be difficult to obtain truthful system inputs and cooperation from the faculty. Finally, although it was stated that the Committee for Research and Space Planning was the policy maker for space allocation, the applicable guidelines used were not discussed. Since these guidelines serve to form the foundation of this space allocation technique, their importance cannot be ignored.

In conjunction with the previously listed disadvantages, an evaluation of this system against the design criteria is in order. First, this system satisfies several of the design criteria. For example, although this system seems to extend its usefulness predominantly to classrooms, it seems as if it could be used for any type of space, scheduled or non-scheduled. And, by promoting space changes on an annual
basis, the M.I.T. system certainly seems to lend itself to annual updating and maintainability. And lastly, very obviously the Committee for Research and Space Planning serves as the required centralized committee.

Here it is also important to include the various aspects of the M.I.T. Space Management System that do not conform to the design criteria. First, since this system functions with inputs supplied by faculty members, it seems doubtful that they are readily attainable. Rather, they are probably supplied quickly when space is needed and neglected when space should be relinquished. Also, rather than checking to see if all space requests are justified, it seems that the CRSP accepts the requests as given and judges them only according to feasibility. Second, the decentralized aspects of this system are questionable. Aside from the actual formation of space requests, it seems as if the CRSP does everything. Noticeably, there are no faculty members on the CRSP. Third, it does not seem that the M.I.T. system exhibits a vast amount of flexibility to allow for any unexpected system adjustments concerning funding, personnel, or program need changes. Changes are made once a year with no indication of review until the next year. Next, although space requests are handled on a weekly basis and the committee's services are available to the entire M.I.T. community, there does not seem to be any allowance for faculty feedback. Such feedback is essential to the efficient workings of a space allocation system and should be encouraged. And finally, it
appears that the output from the annual audit is the only source of system information available. There does not seem to be any method for informing members of the M.I.T. community of policy, guideline, or other changes that may occur irregularly. In conclusion, the M.I.T. Space Management System certainly serves to allocate space. Some aspects of the system, however, may not be acceptable if this system were to be used at Ohio University. For example, the validity of inputs derived from the faculty is questionable. Also, a centralized system may not be acceptable at Ohio University where all those who may lose space will want a strong voice in the space allocation procedures. And, a flexible system is essential at Ohio University because of the funding, personnel, and program need changes that occur quarterly. Also, missing from the M.I.T. system and essential to the traditional viewpoints and procedures at Ohio University are regular postings of information and a constant allowance for faculty feedback. While this system did not actually indicate a specific method of determining who should have which space and how much, it did describe an allocative system that, with some adjustments, warrants consideration for Ohio University.

The Pinnell and Wacholder System

The Pinnell and Wacholder system is a multi-faceted space allocation system. There are seven basic areas of consideration in this study. These areas include an inventory of existing facilities, the utilization of teaching facilities, the
utilization of non-teaching facilities, an estimation of space needs, an automated assignment of teaching facilities, a quality study of existing space, and a residential housing study. While all of these areas combined serve to establish a complete space allocation system, it is not the purpose of this report to review them all. Instead, a description of three areas, the utilization of teaching facilities, the utilization of non-teaching facilities, and an estimation of space needs will be described.

First, James Blakesley and Associates, at Purdue University, have developed the concept of a space factor (SF) that can be utilized for evaluating space utilization and predicting space requirements for teaching facilities. This space factor concept also appears in the Ohio Board of Regents standards that will be discussed in the next section of this report. The space factor for a given room is determined as follows:

$$SF = \frac{A_s \times N_s}{H_w \times U_p \times N_s} = \frac{A_s}{H_w \times U_p}$$

where:

- $SF$ = space factor = square feet/student contact hour
- $A_s$ = area per station (square feet)
- $N_s$ = number of stations
- $U_p$ = percent station utilization when room is in use
- $H_w$ = hours scheduled per week

Considering that space utilization as defined in this article is the ratio of the space assigned to the space required, this model indicates that improved utilization of teaching
facilities can be obtained by any or a combination of the following methods:

1. Reduction in the area per student stations. 
   (Increase the number of stations per room.)

2. Increase in the number of stations used when the room is in use. 
   (Provide a better match of room size to class size.)

3. Increase the number of hours scheduled per week.

In addition to reflecting utilization, the space factor provides an excellent parameter for predicting space requirements in teaching facilities. The number of student contact hours generated by a certain department, college, or university can be determined by considering the enrollment and the curriculum to be offered. Once the number of student contact hours is established, it can be multiplied by an appropriate space factor to obtain the required number of square feet for teaching facilities.

Third, the utilization evaluation is a technique recommended for evaluating the utilization of non-teaching space. It relates the space needs of an organizational unit to the program it is conducting and compares this required space \( S_r \) to the space assigned \( S_a \). By taking the ratio of assigned space to required space, a utilization ratio \( U_r \) as previously noted, can be determined as follows:

\[
U_r = \frac{S_a}{S_r}
\]

According to the authors, if \( U_r \) is less than or equal to one, then the space assigned is equal to or less than what is
required and good utilization is being obtained, i.e., no space is being wasted. If \( U_r \) is greater than one, then the space assigned is greater than that required by the program being conducted and evidence of poor utilization is indicated.

At this point, some advantages and disadvantages to this system's use should be discussed. To begin, there are three major advantages to this system's use. They include the following: First, this system is described as applicable to all university space; scheduled or unscheduled, teaching or non-teaching, academic or residential. Second, this system is organized in a clear and concise manner so that all university personnel can use it to justify their space needs. And third, this system actually computes how much space should be allocated to a particular university function.

Next, three disadvantages to the use of this system are as follows: First, some of the inputs to this system were unclear or vaguely described and others may not be readily available. Very specific and accurate inputs are needed for this system to function properly and if they are not available, it may be time consuming and expensive to obtain them. Second, despite the fact that this is a broad and all-encompassing system, Pinnell and Wacholder neglected to discuss a method of implementation. And in conjunction, it may not be possible to assume that this system will apply across the board to all higher education institutions.

Thus, with these basic advantages and disadvantages in mind, it becomes appropriate to evaluate this system against
the design criteria. First, as previously stated, this system can be used for all types of university space including the departmental space focused on in this report. Second, simply by definition, it can be seen that this system is maintainable and will allow for periodic updating. And this, in turn, provides for great flexibility in adjusting to unexpected funding, personnel, and program need changes. Also, again as previously stated, the system could be run by a committee or a single individual which would certainly allow for the formation of a space utilization committee to oversee the system and resolve any possible problems. Next it is important to note the various aspects of the Pinnell and Wacholder system that do not coincide with the design criteria. For example, it must be noted that the inputs to this system are not necessarily readily attainable or easily accessible; in which case the system would be non-functional. As previously stated, this system lacks the essential aspect of decentralization. This, in turn, minimizes the amount of feedback provided from those involved. And it may prohibit the functioning of an adequate information system so as to keep everyone informed of new developments.

To conclude, the greatest attribute of this system is that it generates information to serve as an appropriate basis for the justification of space needs. There are, however, some aspects of this system that must be further adjusted in order to use this system to allocate space at Ohio University.
The Ohio Board of Regents Standards

The Ohio Board of Regents has compiled various space planning guidelines for Ohio public universities. Although not a system of space allocation in itself, these guidelines are intended to be used for planning purposes in order to determine total building construction and remodeling requirements for an institution. In addition, space planning factors are provided as guidelines for the analysis of space utilization and for the determination of future facility needs. The Board of Regents makes an important comment that these guidelines are not unbreakable rules which institutions are expected to follow precisely. They are, however, offered as an aid to the complete process of facility planning and space allocation.5

The guidelines presented are given in the form of equations and tables to be computed. Some pertinent tables listed are net assignable square feet available by room type, projected classroom and laboratory demand, projected net assignable square feet required for instructional laboratory facilities, projected net assignable square feet required for research laboratory facilities, number of individuals requiring office space, calculation of space requirements by room type, and others. Instructions for their completion plus examples of completed tables are given.

Some advantages and disadvantages to using the Ohio Board of Regents standards as an aid to space planning are as follows: The first of two advantages stated by the author is
that these guidelines recognize the differences in educational programs at different institutions and attempt to translate the programs at each institution into the facilities required. Second, the outcome of all the required calculations can provide a basic foundation for a space utilization evaluation. Also, such data may be used for comparative purposes provided the same data is available from other similar institutions. Some disadvantages to the use of these guidelines are first, that the tables to be calculated are heavily dependent on enrollment projections. Thus, if the projections are incorrect, the final calculations will be wrong and the data will then only serve as a faculty aid for space evaluation. And, although the Board of Regents is very explicit in its instructions for making the necessary calculations, there is no information given as to what to do once these tables are complete. In other words, the Board of Regents does not offer any suggestions or recommendations for use of the computed data.

The best evaluation of these guidelines seems to be against the design criteria. It must be remembered, however, that these guidelines are merely a tool to be used in a space allocation system, rather than the whole system itself. To begin, the Board of Regents standards seem to satisfy the following four design criteria. First, these standards are useful for all types of institutional space including the departmental space focused on in this report. Second, through the use of the tables given, specific aspects of the system
can be updated regularly and not necessarily by affecting other aspects of the system. Third, it seems highly impractical that all individuals involved in space allocation at a university would be allowed to compute each of these tables individually. Rather, it seems that a space utilization committee would have to be formed to carry out this function. And fourth, the necessary calculations to complete the tables can certainly be made when required so as to allow for any unexpected adjustments concerning funding, personnel, or program need changes.

With the above in mind, several disagreements between the Board of Regents Standards and the design criteria must be noted. First, since so many accurate inputs are required to compute these standards, it seems that there would be a fair amount of difficulty in obtaining and validating them. Next, assuming that the calculations of these standards could be best done by a space utilization committee seems to imply that this would lead to a centralized system of space allocation. Once again, the importance of a decentralized system must be stated. It is a decentralized system that would most likely provide the greatest degree of feedback from the faculty to the centralized committee. And it would also serve to disseminate information so as to keep all those involved informed.

In conclusion, while the Ohio Board of Regents Standards are not a method of space allocation in themselves, they can serve as a tool in the total process. Assuming that
the standards calculated would be best used for comparative purposes, it is important to note that the same type of standards or output must be available from institutions similar to Ohio University. Without that data, accurate comparisons could not be made.

The Comparison Methodology

The Comparison Methodology, like the Ohio Board of Regents Standards, attempts to provide a basis for space use evaluations rather than an entire method for space allocation. The basic idea is to compare the same data for similar institutions so as to determine if a particular institution is allocating too much or too little space in any specific category. These comparisons can be made on a state or national basis, they can compare such measurements as net assignable square feet (NASF), full-time equivalent (FTE) student, or the number of student stations. In addition, absolute measurements of space, averages and ranges of space, modes, or set standards can also be used for comparisons. The choice of what to compare and the type of comparisons to be made depends entirely on the goals of the study. Once the comparisons are made, they can be used to justify the space changes deemed required according to university policy. For example, if the NASF for a particular department's faculty offices was compared to a national average and found to be greater than that national average, it would indicate that a reduction in the faculty office space of that specified department was needed. And
if the NASF for that department's faculty offices was less than the national average, an increase in that space would be recommended.

Two major advantages to the use of the comparison methodology to justify space changes are first that a wide variety of material can be used. It seems best to use data from institutions similar in terms of residential community, academic programs, degrees offered, etc. And naturally, national comparisons would supply a greater choice of institutional data than state comparisons. Second, comparisons such as these may allow college officers to use the data to devise guidelines for their own institutions.

Also of note are several disadvantages to this system. First, this comparison methodology seems to ignore the possibility that efficiency in the use of college buildings may change with a change in student enrollments. Thus, the same space allocations may vary by space quality which would be neglected by the comparisons. Second, it seems extremely difficult, if not impossible, to validate the accuracy of other institution's data. Thus, most data will have to be accepted as presented. And third, there is always a chance that comparisons between very dissimilar institutions will take place. If that happens, the comparison is rendered virtually invalid.

Next, an evaluation against the design criteria is in order. It seems that a comparison methodology as generally described satisfies most of the design criteria. For example,
comparisons of all types of space, including the departmental space of interest in this thesis, can be made. And certainly, a space utilization committee could be formed to oversee all procedures while, at the same time, decentralization could be allowed as college deans or department heads use the comparison data to formulate and justify their space requests. In addition, the space utilization committee would be subject to feedback from the university community and would have to provide updated information concerning space allocations so as to allow college deans and department heads to have access to current information from which to make their requests.

Although the comparison methodology seemingly fits most of the design criteria, there are two criteria it does not satisfy. First, the gathering of specific data from particular institutions may be difficult or even unavailable. And second, while your institution's data can be updated as irregular changes occur, you may not be able to have access to other institution's changes and their effects on the comparisons other than annually. So, the system seems relatively inflexible.

To conclude, although this is not a total space allocation system in itself, it certainly lays a basic foundation from which to make allocations. And it is a foundation such as this that seems useful, in part, for implementation at Ohio University.
Conclusions

The preceding has been a discussion of several different types of space allocation systems, their advantages and disadvantages, and their individual evaluations according to the design criteria. Although there are useful aspects to each of these systems, the Pinnell and Wacholder System, the Ohio Board of Regents Standards, and the comparison methodology were found to be most applicable to the design of a space allocation system for Ohio University.

In terms of the design criteria, the Pinnell and Wacholder System is applicable to the departmental space considered in this thesis, it is maintainable and allows for periodic updating, the system is decentralized but provides for the formation of a centralized committee, the system is flexible in that it allows for unexpected adjustments, it also allows for feedback from all individuals involved, and it allocates space by department. The accessibility of inputs, however, is best determined upon attempting to implement this system. Next, the Ohio Board of Regents Standards seem to satisfy all of the design criteria with the exception of requiring easily accessible inputs and allowing for a decentralized system. Many of the inputs required must be estimated and the space standards are such that a centralized committee could conduct all allocative procedures with little help from the various departments involved. Finally, the comparison methodology, like the other two systems, requires inputs that are not neces-
sarily easily accessible; in fact, they may not even be available. Also, since access to other institution's updates and changes may be limited, the flexibility of adjusting for these unexpected changes is reduced.

By combining and interacting the positive factors of each of these systems, the space allocation methodology of the next chapter has been designed. As will be described, every attempt has been made to overcome the problems of obtaining inputs easily, providing system flexibility, and allowing for feedback.
4. THE SPACE ALLOCATION METHODOLOGY FOR IMPLEMENTATION AT OHIO UNIVERSITY

This chapter will serve to describe the culmination of effort to design a method of space allocation for Ohio University. A description of the system and how it works, the underlying assumptions, the necessary inputs, a schematic outline for the space allocation procedure to be followed, and some important attributes of the system such as the formation of a centralized committee, updating, and forecasting will be discussed. In addition, it will be shown that this system satisfies all of the design criteria. Specifically, it is applicable to departmental space including teaching and research laboratories; faculty, clerical, and graduate assistant offices; lounges; seminar rooms; and other space (excluding classrooms). Also, the system is maintainable and can be updated, its inputs are all currently available at Ohio University, it allows for decentralized space management but also provides for a centralized committee, it is flexible, feedback is allowed, and the end result is a basis from which departmental space may be allocated. Finally, the difficulties encountered in attempting this system design and some brief conclusions will be discussed.

First, a description of the system and how it works is necessary. Very generally, the net assignable square feet (NASF) of space assigned ($S_a$) is compared to the NASF of space required ($S_r$) to see if an increase or a decrease in
the assigned space is necessary for a particular department. The technique for making this comparison varies with the type of departmental space under consideration. Specifically, this variation occurs in the method used to derive the space required \( (S_r) \) variable.

**Teaching Laboratory Space**

First, in order to calculate \( S_r \) for teaching laboratory space, the following inputs are needed: NASF per student station, percent occupancy, hours of lab use per week, and weekly student contact hours. The NASF per student station standards were suggested by the Ohio Board of Regents in the Probasco (32) reference (see page A12 in the appendix).

The percent occupancy and the hours of lab use per week were given as 80% and 22.5, respectively. Also, the WSCH, which is defined as a unit of measure representing one hour of instruction for one student in one week, was determined by first noting which of a department's scheduled meetings were teaching laboratories through the use of the Term File, and then recording their corresponding WSCH as listed in the Phase 005 report. Both of these publications can be obtained from the Office of Analytical Services and representative samples can be found in the appendix on pages A16 to A18.

In order to use these printouts, the code key on page A16 must first be used with the Term file, a sample of which is on page A17. The appropriate code for teaching laboratory space, 4, must be matched to the same code in the "INST"
column of the Term File as per the circled items on those pages. Then that course is checked against its listing in the Phase 005 report to determine the WSCH which are listed in the "CNT X ST" column and circled in the sample on page A18. The basic formula used to compute the space required for a department's teaching labs is as follows:

\[
S_r = \frac{\text{NASF per station}}{\% \text{ occupancy} \times \text{hours of use per week}} \times \text{WSCH}
\]

Here it is important to note that consideration must be given to teaching laboratories equipped in such a way as to render them single-purpose rather than multi-purpose labs. In order to account for these labs, each department is allocated one single-purpose teaching lab with its NASF per station equal to 1.5 times the NASF per station standard for that department and an additional 100 WSCH. The increased NASF per station size serves to allow for specialized equipment in the lab and the additional 100 WSCH is a reasonable estimate of the number of WSCH that would be generated by a single-purpose teaching laboratory. It was derived by observing the WSCH of teaching labs listed in the Term File and choosing a representative value. The increased amount of teaching lab space required that results from these adjustments for single-purpose labs takes into account the fact that single-purpose laboratories can only be used for one purpose because of the type of fixed equipment needed. Whereas, multi-purpose laboratories can be used for many purposes by simply varying the tools and supplies for each lab. An example of calculating the re-
quired teaching lab space can be illustrated using the civil engineering department. In viewing the data sheets, which are itemized lists of the inputs needed from each department for this system on pages A6 to A8 in the appendix, it can be seen that the civil engineering department has 233 WSCH.

The NASF per station standards on page A1 show that each civil engineering teaching lab station should be 100 NASF. So, the single-purpose teaching lab would have its NASF per station equal to 1.5 times 100 which equals 150 NASF, and its WSCH equal to 100. The following calculations indicate the procedure for computing the total amount of space required for teaching labs in the civil engineering department:

\[ S_r = \frac{\text{NASF per station}}{.80 \text{ occupancy} \times 22.5 \text{ hours of use per week}} \times \text{WSCH} \]
\[ + \frac{1.5 \times \text{NASF per station}}{.80 \text{ occupancy} \times 22.5 \text{ hours of use per week}} \times 100 \]

\[ S_r = \frac{100}{.80 \times 22.5 \times 233} + \frac{1.5 \times 100}{.80 \times 22.5} \times 100 \]

\[ S_r = 1294.44 + 833.33 \]

\[ S_r = 2127.77 \text{ NASF} \]

This \( S_r \) constant is then compared to the space assigned (\( S_a \)) which is presently being compiled by the Facilities Planner in the Summary of Roomtypes report; a representative sample of which can be seen on page A14. The data sheet for civil engineering shows that \( S_a \) for teaching labs is 3124 NASF. So the next step is to compute the utilization ratio (\( U_r \)) as follows:
\[ U_r = \frac{S_a}{S_r} \]

If \( U_r \) is less than one, the indication is that more of the particular type of space in a certain department is needed. And if \( U_r \) is greater than one, the indication is that the NASF of space assigned should be reduced. Realizing that values for \( U_r \) are infinite, it is important to establish tentative upper and lower limiting values to indicate which space assignments are seriously in error and require immediate attention, and which space assignments are reasonably good for the present time. With this in mind, the following limits are tentatively suggested for teaching lab space:

\[ 0.75 \leq U_r \leq 1.25 \]

Thus, values of \( U_r \) less than \( 0.75 \) or greater than \( 1.25 \) warrant immediate attention for teaching labs, whereas values of \( U_r \) of \( 0.75 \) to \( 1.25 \) are assumed to be reasonably accurate for the short run. In the civil engineering example:

\[ U_r = \frac{3124}{2127.77} \]

\[ U_r = 1.47 \]

Thus, upon closer examination it is seen that a space change of \( 2127.77 - 3124 = -996.23 \) NASF is needed in teaching lab space for civil engineering. The space change is computed by subtracting \( S_a \) from \( S_r \):

\[ \text{space change} = S_r - S_a \]

If the result is negative as in the above example, the space assigned should be reduced by the difference. But if the
result is positive, the amount of space assigned should be increased by the difference of that calculation. A summary of the preceding calculations can be seen in the civil engineering example on page A4 in the appendix. Thus, the final conclusion for civil engineering's teaching lab space is that a reduction of approximately 996.23 NASF of the teaching lab space assigned is recommended.

Research Laboratory Space

The second type of departmental space to consider is research laboratory space. In order to calculate $S_r$ for research lab space, it is necessary to know the NASF per lab standard as seen on page A2 in the appendix, and the number of currently sponsored research projects and the amount of funding they receive per year. The NASF per research lab standards were derived by observing the literature sources that described space standards for research labs and then choosing a representative or modal value. An example of this procedure will be illustrated later in this chapter for graduate assistant office space standards. It should be noted, however, that if a department is not listed in the research laboratory space standards on page A2, that it is assumed that this department does not require research lab space. The number of currently sponsored research projects and their funding per year can be found in the Sponsored Programs at Ohio University report which is available from the Office of Research and Sponsored Programs. A representative sample can be seen in the appendix on page A11.
Basically, the following formula shows that each department is required to have at least one research lab of the standard size listed on page A2 of the appendix. And additional labs of that same standard size are determined by multiplying the number of sponsored research projects funded at $30,000 or more per year by the research lab standard. Added to this is fractional research lab space resulting from projects funded at less than $30,000 per year. This fraction of lab space is determined by the proportion of $30,000 that is indicated, and is then multiplied by the research lab space standard. The specific formula is as follows:

\[ S_r = (1 + \text{number of sponsored research projects}) \times \frac{\text{research lab space}}{\text{standard}} + \frac{\text{sum of funds of sponsored research}}{\text{funded at } \$30,000 \text{ or more}} \times \frac{\text{research lab space}}{\text{standard}} \]

In order to further illustrate this formula, the chemical engineering department will serve as an appropriate example. First, from the chemical engineering data sheet on page A6 of the appendix, it is seen that chemical engineering has six sponsored research projects with five having annual funding greater than $30,000 and one funded at $23,000. Then, from the research lab standards on page A2 of the appendix, the research lab space standard for chemical engineering is seen as 300 NASF per lab in the department. Thus, \( S_r \) is computed as follows:
\[ S_r = (1 + 5) \times 300 + \left( \frac{23,000}{30,000} \right) \times 300 \]

\[ S_r = 1800 + 230 \]

\[ S_r = 2030 \text{ NASF} \]

The next step is to compute \( U_r \) for chemical engineering's research lab space. But first, tentative upper and lower limits must be established for \( U_r \) as follows:

\[ .75 \leq U_r \leq 1.25 \]

Next, the chemical engineering data sheet on page A6 lists \( S_a \) for research labs space as 1963 NASF. So, the utilization ratio is as follows:

\[ U_r = \frac{S_a}{S_r} \]

\[ U_r = 1963/2030 \]

\[ U_r = .97 \]

Since .97 is greater than .75 and less than 1.25, it can be assumed that chemical engineering's assigned research lab space is presently adequate. Checking this by calculating the space change shows:

\[ \text{space change} = S_r - S_a \]

\[ \text{space change} = 1963 - 2030 \]

\[ \text{space change} = -67 \text{ NASF} \]

Thus, it can be concluded that chemical engineering's assigned research lab space is indeed adequate for the present time. A reduction of 67 NASF from the 2030 NASF assigned is currently not of major concern.
Faculty Office Space

The third type of departmental space to be considered is faculty office space. Since the Summary of Roomtypes report (see page A14) from the Facilities Planner's Office includes graduate assistant offices as part of faculty offices, each graduate assistant will be counted as one-third FTE student in the following calculations. In addition, each professor and associate professor is required to have an individual or one-person office, and each assistant professor, instructor, and lecturer is required to have a double or two-person office. The necessary inputs for calculating the faculty office space required for a particular department are the number of professors, associate professors, assistant professors, instructors, and lecturers which can be found in either the Ohio University Faculty Salary Study (see page A15) or the Compendium of Historical Planning Information for Credit Generating Departments (see page A10), and the number of graduate assistants which can be found by multiplying the number of budgeted FTE graduate assistants, provided in the Compendium of Historical Planning Information for Credit Generating Departments, by three people per FTE graduate assistant:

\[
\text{number of GAs requiring offices} = 3 \text{ people per FTE GA} \times \text{number of budgeted FTE GAs}
\]

This is because three GAs will be assigned to one office.
Also needed are the appropriate office space standards for faculty and graduate assistants which can be found on page
A3. Here again, these space standards were derived by observing all the applicable literature sources for faculty and graduate assistant office space and then choosing a representative or modal value. For example, space standards suggested in the literature for graduate teaching and research assistant offices were as follows:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Suggested Space Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyros (11)</td>
<td>61 NASF/graduate asst.</td>
</tr>
<tr>
<td>Cyros (11)</td>
<td>63 NASF/graduate asst.</td>
</tr>
<tr>
<td>Cyros (11)</td>
<td>64 NASF/graduate asst.</td>
</tr>
<tr>
<td>Matsler (15)</td>
<td>60 NASF/graduate asst.</td>
</tr>
<tr>
<td>Taylor (37)</td>
<td>60 NASF/graduate asst.</td>
</tr>
<tr>
<td>Taylor (37)</td>
<td>50 NASF/graduate asst.</td>
</tr>
<tr>
<td>Taylor (37)</td>
<td>60 NASF/graduate asst.</td>
</tr>
</tbody>
</table>

Thus, 60 NASF/graduate assistant was chosen as a representative or modal value for graduate assistant offices. The formula for computing the space required for faculty offices in a particular department is:

\[ S_r = \left( \frac{\text{number of professors} + \text{number of associate professors}}{\text{one-person faculty office space standard}} \right) + \left( \frac{\text{number of assistant professors} + \text{number of instructors} + \text{number of lecturers}}{\text{two-person faculty office standard}} \right) \times 5 + \left( \frac{\text{number of budgeted GAs}}{\text{graduate assistant office space standard}} \right) \times 3 \]

It can be seen from the office space standards on page A3 that this formula simplifies to:

\[ S_r = (\frac{\text{number of professors} + \text{number of associate professors}}{\text{one-person faculty}}) \times 140 + \]

\[ (\frac{\text{number of assistant professors} + \text{number of instructors} + \text{number of lecturers}}{\text{two-person faculty}}) \times \left( \frac{\text{number of budgeted GAs}}{\text{graduate assistant office}} \right) \times 3 \]
As an example, mechanical engineering's data sheet on page A8 shows that there are six faculty in that department; four professors, one associate professor, and one assistant professor. Also, in 1979, they were budgeted for one FTE graduate assistant. Thus, the faculty office space required for the mechanical engineering department would be as follows:

\[
S_r = (4 + 1) \times 140 + (1 + 0 + 0) \times 200 \times .5 + 1 \times 3 \times 60
\]

\[
S_r = 700 + 100 + 180
\]

\[
S_r = 980 \text{ NASF}
\]

Next, from the mechanical engineering data sheet on page A8, it is seen that the faculty office space assigned is 985 NASF. Thus, in computing the utilization ratio with limits of:

\[
.75 \leq U_r \leq 1.25,
\]

\[
U_r = \frac{S_a}{S_r}
\]

\[
U_r = \frac{985}{980}
\]

\[
U_r = 1.01
\]

Since \( .75 \leq 1.01 \leq 1.25 \), it is assumed that the current amount of faculty office space assigned to the mechanical engineering department is adequate. In order to check this, the space change must be calculated as follows:

\[
\text{space change} = S_r - S_a
\]
space change = 980 - 985
space change = -5

Since the space change here is a negative number, the indication is that there is too much faculty office space assigned to the mechanical engineering department, which should reduce its faculty office space by 5 NASF.

In conclusion, however, since the $U_r$ of 1.01 was within the specified limits of $0.75 \leq U_r \leq 1.25$, the faculty office space assigned to the mechanical engineering department seems adequate for the short run.

**Clerical Office Space**

The fourth type of departmental space to consider is clerical office space. While the required clerical office space for a particular department is calculated in a similar fashion as that of faculty office space, it is first important to note the applicable assumptions. These assumptions include 1) up to one budgeted civil service worker requires a one-person clerical office, 2) over one to two budgeted civil service workers require a two-person clerical office, 3) over two to three budgeted civil service workers require a three-person clerical office, and 4) over three to four budgeted civil service workers require a four-person clerical office. The inputs necessary for calculating the required clerical office space for a specific department are the NASF per office standard which is found on page A3, and the number of budgeted civil service workers in each department.
The NASF per office standard was derived by observing all the literature sources applicable to clerical office space standards and then choosing a representative or modal value. And the number of budgeted civil service workers is found in the Compendium of Historical Planning Information for Credit Generating Departments, a sample of which can be seen in the appendix on page A10. With these inputs, clerical office space for a particular department is simply the appropriate NASF per office standard. The formula is as follows:

\[ S_r = \text{NASF per 1, 2, 3, or 4-person office standard} \]

Using the industrial and systems engineering department as an example, it can be seen from the data sheet on page A7 that this department has one budgeted civil service worker. Thus, \( S_r \) is as follows:

\[ S_r = 100 \text{ NASF} \]

Computing the utilization ratio with limits of:

\[ .75 \leq U_r \leq 1.25 \]

and seeing from the industrial and systems engineering data sheet on page A7 that the clerical office space assigned is 190 NASF,

\[ U_r = \frac{S_a}{S_r} \]

\[ U_r = \frac{190}{100} \]

\[ U_r = 1.9 \]

Since 1.9 is greater than 1.25 and thus lies outside the \( U_r \) limits, a closer examination of this space allocation is
warranted. The space change is computed as follows:

\[ \text{space change} = S_r - S_a \]

\[ \text{space change} = 100 - 190 \]

\[ \text{space change} = -90 \text{ NASF} \]

Since this is a negative value, the indication is that the industrial and systems engineering department must reduce its clerical office space by 90 NASF.

**Lounge Space**

The next type of departmental space to consider is lounge space. It will be assumed that each department is allocated one lounge. The decision of whether to use it for students, faculty, clerical workers, or various combinations of such is left to the departments themselves to decide. In order to compute the required amount of lounge space for each department, the number of FTE undergraduate students in the department is needed as well as the NASF per station standard. The number of FTE undergraduate students per department can be found in the Compendium of Historical Planning Information for Credit Generating Departments, a sample of which is seem on page A9. And the NASF per station is suggested as four by the Ohio Board of Regents in the Probasco (32) reference. The lounge space required is calculated by multiplying the number of FTE undergraduate students by the NASF per station standard as follows:

\[ S_r = (\text{number of FTE undergraduate students}) \times (\text{NASF/station}) \]
For example, the mechanical engineering data sheet shows a total of 145 FTE undergraduate students. So, the lounge space required for this department would be determined as follows:

\[ S_r = \frac{145 \text{ FTE}}{\text{undergraduate students}} \times (4 \text{ NASF/station}) \]

\[ S_r = 580 \text{ NASF} \]

The utilization ratio, once again with limits of:

\[ 0.75 \leq U_r \leq 1.25 \]

and with no lounge space assigned as seen from the mechanical engineering data sheet, is computed to be:

\[ U_r = \frac{S_a}{S_r} \]

\[ U_r = 0/580 \]

\[ U_r = 0 \]

Since 0 is less than 0.75 and thus falls outside of the \( U_r \) limits, further examination is necessary. Obviously, with no lounge space assigned but 580 NASF required, the mechanical engineering department's NASF of lounge space must be increased. But, to verify this, the space change can be calculated as follows:

\[ \text{space change} = S_r - S_a \]

\[ \text{space change} = 580 - 0 \]

\[ \text{space change} = 580 \text{ NASF} \]

Since the difference is positive, 580 NASF of lounge space should be added to the mechanical engineering department.
Seminar Space

Another type of departmental space to consider is seminar space. Here it will be assumed that each department should have one seminar room. Thus, the only input required is the NASF per seminar room standard which is seen on page A3. This standard was derived by observing the literature sources that described space standards for seminar rooms and then choosing a representative or modal value. Thus, with respect to this standard, $S_r$ is as follows:

$$S_r = \text{NASF per seminar room}$$

$S_r = 350 \text{ NASF}$

Here again, the utilization ratio, which is subject to the following limits:

$$0.75 \leq U_r \leq 1.25$$

must be computed. The civil engineering department, for example, has no seminar space assigned as can be seen from the civil engineering data sheet on page A6. Thus, the utilization ratio is calculated as:

$$U_r = S_a/S_r$$

$$U_r = 0/350$$

$$U_r = 0$$

Similar to the mechanical engineering lounge space example, since there is no seminar space assigned but 350 NASF is required, the civil engineering department needs to increase their amount of seminar space. In following with the system
procedures, though, the space change should be calculated because 0 is less than .75 which is the lower \( U_r \) limit. Thus,

\[
\text{space change} = S_r - S_a \\
\text{space change} = 350 - 0 \\
\text{space change} = 350 \text{ NASF}
\]

The positive value of the difference further indicates that the civil engineering department needs to increase its seminar space to approximately 350 NASF.

**Other Space (excluding classrooms)**

The last type of departmental space to consider is other space (excluding classrooms). Some examples of other space are given by the Ohio Board of Regents in the Probasco (32) reference are animal quarters, demonstration facilities, field service facilities, general use facilities, greenhouses, and teaching clinics. The inputs needed to compute the required amount of other space are the NASF per student station and the number of students enrolled in programs which utilize these space types. The NASF per student station is also given by the Ohio Board of Regents in the Probasco (32) reference. And the number of students enrolled in programs which utilize other space types can be found in the Term File which is available from the Office of Analytical Services; a sample of the Term File can be seen in the appendix on page A17. In order to use the Term File properly, the number of students enrolled in programs which utilize other
space is found by locating the specific program using other space, and then reading across to the seats assigned, "SEAT ASSN", column which notes the number of students participating in that program. These items are noted and circled on page A17 in the appendix, which is the sample Term File listing. Thus, other space required would be computed by multiplying the NASF per student station by the number of students enrolled in the applicable program. Thus,

\[ S_r = \left( \frac{\text{NASF per student station}}{\text{number of students enrolled in program}} \right) \]

In the case of a program that utilizes living space for animals, it is left to the department to decide what is comfortable and adequate but not excessive. Here it is important to note that if departments determine that they need other space, they must inform the centralized committee in writing of the particular type of space needed, the purpose for which it will be used, the anticipated number of students involved, and the approximate NASF needed. The committee will then review this request and decide if a space allocation should be made. Unfortunately, it is not possible to provide a specific example for other space because the space assigned data for the remaining departments is not yet tabulated by the Facilities Planner in the Survey of Roomtypes report, an example of which can be seen in the appendix on page A14. It can be noted, however, that the general procedures described for the previous space types discussed apply for other space too. For example, after \( S_r \) is computed, the utilization ratio with its specified limits:
.75 \leq U_r \leq 1.25

can be calculated as follows:

\[ U_r = \frac{S_a}{S_r} \]

If \( U_r \) is less than .75 or greater than 1.25, the space change should be computed and made accordingly. If, however, \( U_r \) is found to be a value of .75 to 1.25, the space change could still be computed but it need not be made in the short run. As with the previous space types, the space change formula is:

\[ \text{space change} = S_r - S_a \]

If the space change is a positive value, an increase in the space assigned is indicated. Whereas, if the space change is a negative value, a decrease in the space assigned is suggested.

Total Space Changes

Finally, in order to compute the total departmental space required, the space required (\( S_r \)) values for each type of departmental space should be added together. Thus,

\[ S_{rT} = S_\text{TL} + S_\text{RL} + S_\text{FO} + S_\text{CO} + S_\text{L} + S_\text{S} + S_\text{FO} \]

where:

- \( S_{rT} \) = total departmental space required
- \( S_\text{TL} \) = required teaching lab space
- \( S_\text{RL} \) = required research lab space
- \( S_\text{FO} \) = required faculty office space
For example, the total space required for the chemical engineering department as seen in the example on page A4 in the appendix, is as follows:

\[ S_{rT} = 1277.77 + 2030 + 1240.2 + 100 + 380 + 350 + 0 \]
\[ S_{rT} = 5377.97 \text{ NASF} \]

If this is compared to the total amount of space assigned, the net space change for a particular department can be determined. The total amount of space assigned to a department can be computed with this formula:

\[ S_{aT} = S_{aTL} + S_{aRL} + S_{aFO} + S_{aCO} + S_{aL} + S_{aS} + S_{aO} \]

where:

\[ S_{aT} \] = total departmental space assigned
\[ S_{aTL} \] = assigned teaching lab space
\[ S_{aRL} \] = assigned research lab space
\[ S_{aFO} \] = assigned faculty office space
\[ S_{aCO} \] = assigned clerical office space
\[ S_{aL} \] = assigned lounge space
\[ S_{aS} \] = assigned seminar space
\[ S_{aO} \] = assigned other space (excluding classrooms)

Again using the chemical engineering department as an example, total space assigned is computed as follows:
\[ S_{at} = 2805 + 1963 + 1689 + 309 + 0 + 0 + 0 \]
\[ S_{at} = 6766 \text{ NASF} \]

In comparing \( S_{at} \) to \( S_{rt} \) for the chemical engineering department, it can be seen that the following total space change is needed:

\[
\text{space change} = S_{rt} - S_{at}
\]
\[
\text{space change} = 5377.97 - 6766
\]
\[
\text{space change} = -1388.03 \text{ NASF}
\]

Since the difference is negative, it is suggested that the chemical engineering department should decrease its departmental space by approximately 1388.03 NASF. To verify this, an additional calculation can be done whereby the total space change for a department is computed. The applicable formula is:

\[ SC_T = SC_{TL} + SC_{RL} + SC_{F0} + SC_{CO} + SC_{L} + SC_{S} + SC_{O} \]

where:

- \( SC_T \) = total space change for a particular department
- \( SC_{TL} \) = teaching lab space change
- \( SC_{RL} \) = research lab space change
- \( SC_{F0} \) = faculty office space change
- \( SC_{CO} \) = clerical office space change
- \( SC_{L} \) = lounge space change
- \( SC_{S} \) = seminar space change
- \( SC_{O} \) = other space change (excluding classrooms)
Again, using the chemical engineering department as an example:

\[ SC_T = -1527.23 + 67 - 448.8 - 209 + 308 + 350 + 0 \]

\[ SC_T = -1388.03 \text{ NASF} \]

Thus, the value of -1388.03 as in the calculation of \( SC_T = S_{r_T} - S_{a_T} \) suggests that the chemical engineering department has 1388.03 NASF more space than it needs and should decrease its total departmental space by approximately 1388.03 NASF.

One final total useful to compute is a total utilization ratio for the entire department. Rather than add the \( U_r \) values for each space type, i.e., teaching labs, research labs, faculty offices, etc., as was done for \( S_{r_T}, S_{a_T}, \) and \( SC_T \), the total \( U_r \) should be computed as follows:

\[ U_{r_T} = \frac{S_{a_T}}{S_{r_T}} \]

So, \( U_{r_T} \) for the chemical engineering department would be:

\[ U_{r_T} = \frac{6766}{5377.97} \]

\[ U_{r_T} = 1.26 \]

Since this 1.26 value falls outside the utilization limits of \( 0.75 \leq U_r \leq 1.25 \), the indication is that a closer examination of the amount of space assigned to the chemical engineering department is warranted. And, as seen in the calculation of the total space change for this department, it is recommended that the chemical engineering department decrease
its total departmental space by approximately 1388.03 NASF.

Summary Charts

In order to clarify and summarize all of the preceding information, the following three charts are presented. The first chart is a list of the assumptions used to determine the space allocation procedures, the second is a list of inputs for each type of departmental space and their source, and the third is a schematic outline of all the preceding space allocation procedures.

Assumptions

A. Teaching Laboratory Space

1. Each department is entitled to one single-purpose teaching lab. The size of this lab is based on the appropriate teaching lab space standard as listed in the appendix on page A1 multiplied by 1.5 to allow for equipment, and an estimated 100 weekly student contact hours (WSCH) for the use of that single-purpose lab only. Additional multi-purpose labs are based on the teaching lab standard and the total WSCH for the Fall quarter.

2. As given by the Ohio Board of Regents in the Probasco (32) reference, the percent occupancy of teaching labs will be 80% and the hours of use per week will be 22.5.

B. Research Laboratory Space

1. Each department is entitled to one research lab of the appropriate size as listed in the table of research laboratory space standards on page A2 of the appendix. Then, each sponsored research project funded at $30,000 per year or more justifies an additional research lab. Projects funded at less than $30,000 per year justify fractional laboratory space as their proportion of $30,000 indicates.
C. Faculty Office Space

1. Individual or one-person faculty offices are required for all professors and associate professors.
2. Double or two-person faculty offices are required for all assistant professors, instructors, and lecturers.
3. Triple or three-person faculty offices are required for all FTE graduate assistants.

D. Clerical Office Space

1. Individual or one-person clerical offices are required for up to one budgeted civil service worker.
2. Double or two-person clerical offices are required for over one to two budgeted civil service workers.
3. Triple or three-person clerical offices are required for over two to three budgeted civil service workers.
4. Quadruple or four-person clerical offices are required for over three to four budgeted civil service workers.

E. Lounge Space

1. Each department is entitled to one lounge whose size is based on the number of FTE undergraduate students in a department and the NASF/station standard found on page A3 of the appendix.
2. The department must decide if the lounge is to be used for students, faculty, clerical workers, or some combination of such.

F. Seminar Room Space

1. Each department is entitled to one seminar room of 350 NASF as shown in the seminar room space standard on page A3 of the appendix.

G. Other Space (excluding classrooms)

1. Other space calculations are based on the number of students enrolled in a program utilizing other space and the NASF/station standard as seen on page A3 of the appendix.
2. The size of animal living quarters is left to the discretion of the department.

H. General

1. Although space is allocated for a specific purpose, i.e., teaching labs, clerical offices, etc., the departments must decide how to sub-divide the space and use it as they see fit.

2. The space allocation procedures and their results are only as accurate as the inputs provided.

Inputs

A. Teaching Laboratory Space

1. Space assigned, ($S_a$)
   Available from Summary of Roomtypes report, Facilities Planner's Office
   Sample on page A14 in appendix
   Presently being compiled

2. NASF/student station
   Available from Teaching Laboratory Space Standards, on page A1 in appendix
   Derived by comparison of literature sources

3. Percent occupancy
   Available from Ohio Board of Regents in Probasco (32) reference
   Sample on page A12 in appendix

4. Hours of lab use per week
   Available from Ohio Board of Regents in Probasco (32) reference
   Sample on page A12 in appendix

5. Weekly student contact hours, (WSCH)
   Available from Term File and Phase 005 file, Office of Analytical Services
   Samples on pages A16-18 of appendix

B. Research Laboratory Space

1. Space assigned, ($S_a$)
   Available from Summary of Roomtypes report, Facilities Planner's Office
   Sample on page A14 in appendix
   Presently being compiled
2. NASF/lab in a department
   Available from Research Laboratory Space Standards on page A2 in appendix
   Derived by comparison of literature sources

3. Number of currently sponsored research projects and the amount of funding each receives per year
   Available from Sponsored Programs at Ohio University report, Office of Research and Sponsored Programs
   Sample on page A11 in appendix

C. Faculty Office Space

1. Space assigned, \( S_a \)
   Available from Summary of Roomtypes report, Facilities Planner's Office
   Sample on page A14 in appendix
   Presently being compiled

2. NASF/office
   Available from Office Space Standards on page A3 in appendix
   Derived by comparison of literature sources

3. Number of professors, associate professors, assistant professors, instructors, and lecturers per department
   Available from either the Ohio University Faculty Salary Study or the Compendium of Historical Planning Information for Credit Generating Departments, Office of Information Systems
   Sample of Faculty Study on page A15 in appendix
   Sample of Compendium on page A10 in appendix

4. Number of budgeted graduate assistants per department
   Available from the Compendium of Historical Planning Information for Credit Generating Departments, Office of Information Systems
   Sample on page A10 in appendix

D. Clerical Office Space

1. Space assigned, \( S_a \)
   Available from Summary of Roomtypes report, Facilities Planner's Office
   Sample on page A14 in appendix
   Presently being compiled

2. NASF/office
   Available from Office Space Standards on page A3 in appendix
   Derived by comparison of literature sources
3. Number of budgeted civil service workers per department
Available from the Compendium of Historical Planning Information for Credit Generating Departments, Office of Information Systems
Sample on page A10 in appendix

E. Lounge Space

1. Space assigned, \( S_a \)
Available from Summary of Roomtypes report, Facilities Planner's Office
Sample on page A14 in appendix
Presently being compiled

2. NASF/station
Available from Ohio Board of Regents in Probasco (32) reference
Sample on page A13 in appendix

3. Number of FTE undergraduate students per department
Available from the Compendium of Historical Planning Information for Credit Generating Departments, Office of Information Systems
Sample on page A9 in appendix

F. Seminar Space

1. Space assigned, \( S_a \)
Available from Summary of Roomtypes report, Facilities Planner's Office
Sample on page A14 in appendix
Presently being compiled

2. NASF/seminar room
Available from Seminar Space Standards on page A3 in appendix
Derived by comparison of literature sources

G. Other Space (excluding classrooms)

1. Space assigned, \( S_a \)
Available from Summary of Roomtypes report, Facilities Planner's Office
Sample on page A14 in appendix
Presently being compiled

2. NASF/student station
Available from Ohio Board of Regents in Probasco (32) reference
Sample on page A13 in appendix
3. Number of students enrolled in programs utilizing other space
   Available from Term File, Office of Analytical Services
   Sample on page A17 in appendix

Schematic Outline

The following is a schematic outline of the steps necessary to implement this space allocation system. The inputs listed are followed by codes in parentheses, which correspond to the preceding inputs table so as to further clarify the sources of information used. Also, the formulas for computing the space required ($S_r$) value are given. The outline is as follows:

A. Accumulate all needed information

1. Space assigned, (A1, B1, C1, D1, E1, F1, G1)
2. Space required
   a. Teaching lab space
      1. NASF/student station, (A2)
      2. % occupancy, (A3)
      3. Hours of use per week, (A4)
      4. Weekly student contact hours, (A5)
   b. Research lab space
      1. NASF/lab in department, (B2)
      2. Number of currently sponsored research projects and the amount of funding each receives per year, (B3)
   c. Faculty office space
      1. NASF/office, (C2)
      2. Number of each type of faculty member, (C3)
         a. Professors
         b. Associate professors
         c. Assistant professors
         d. Instructors
         e. Lecturers
      3. Number of budgeted GAs per department, (C4)
   d. Clerical office space
      1. NASF/office, (D2)
      2. Number of budgeted civil service workers, (D3)
e. Lounge space
   1. NASF/station, (E2)
   2. Number of FTE undergraduate students per department, (E3)
f. Seminar space
   1. NASF/seminar room, (F2)
g. Other space (excluding classrooms)
   1. NASF/student station, (G2)
   2. Number of students enrolled in programs utilizing other space, (G3)

B. Derive $S_r$
1. Teaching lab space

$$S_{TL} = \frac{\text{NASF per station \times .80 occupancy \times 22.5 hours of use per week \times WSCH} + \frac{1.5 \times \text{NASF per station \times .80 occupancy \times 22.5 hours of use per week \times 100 WSCH}}{\text{WSCH}}}{100 WSCH}$$

2. Research lab space

$$S_{RL} = \left(1 + \frac{\text{number of sponsored research projects funded at } \$30,000 \text{ or more}}{\text{research}}\right) \times \left(\frac{\text{sum of funds of sponsored research projects funded at } \$30,000 \text{ or more}}{\text{research projects funded at } \$30,000 \text{ or more}}\right) \times \left(\frac{\text{less than } \$30,000 \text{ per year}}{\text{research projects funded at } \$30,000 \text{ or more}}\right) \times \left(\text{lab space standard}\right)$$

3. Faculty office space

$$S_{FO} = \left(\frac{\text{number of professors + associate professors}}{\text{one-person faculty}}\right) \times \left(\text{office space standard}\right) + \left(\frac{\text{number of assistant professors}}{\text{assistant professors}}\right) \times \left(\text{two-person faculty}\right) \times \left(\text{office standard}\right) + \left(\frac{\text{number of instructors + number of lecturers}}{\text{instructors + lecturers}}\right) \times \left(\text{FTE GA per FTE GAs}\right) \times \left(\text{graduate assistant office space standard}\right) + \left(\frac{3 \text{ people per FTE GA}}{3 \text{ people per FTE GAs}}\right) \times \left(\text{number of budgeted FTE GAs}\right) \times \left(\text{graduate assistant office space standard}\right)$$
4. Clerical office space

\[ S_{r_{CO}} = \text{NASF per 1, 2, 3, or 4-person office standard} \]

5. Lounge space

\[ S_{r_{L}} = (\text{number of FTE undergraduate students}) \times (\text{NASF/station}) \]

6. Seminar space

\[ S_{r_{S}} = \text{NASF/seminar room} \]

7. Other space (excluding classrooms)

\[ S_{r_{0}} = (\text{NASF per student station}) \times (\text{number of students enrolled in program}) \]

C. Compute \( U_r \) for each space type

\[ U_r = \frac{S_a}{S_r} \]

1. Establish limits

\[ .75 \leq U_r \leq 1.25 \]

a. If \( U_r < .75 \), increase space assigned
b. If \( U_r > 1.25 \), reduce space assigned
c. If \(.75 \leq U_r \leq 1.25 \), no space change is needed in the short run

D. Compute space change in NASF for each space type

\[ \text{space change} = S_r - S_a \]

1. Space change computation is mandatory if \( U_r < .75 \) or \( U_r > 1.25 \)
   a. If space change = positive value, increase \( S_a \) by the difference
   b. If space change = negative value, reduce \( S_a \) by the difference

2. Space change computation is optional if \(.75 \leq U_r \leq 1.25 \)
E. Compute totals for each department

1. Total space assigned

\[ S_{aT} = S_{aTL} + S_{aRL} + S_{aFO} + S_{aCO} + S_{aL} + S_{aS} + S_{aO} \]

where:

- \( S_{aT} \) = total departmental space assigned
- \( S_{aTL} \) = assigned teaching lab space
- \( S_{aRL} \) = assigned research lab space
- \( S_{aFO} \) = assigned faculty office space
- \( S_{aCO} \) = assigned clerical office space
- \( S_{aL} \) = assigned lounge space
- \( S_{aS} \) = assigned seminar space
- \( S_{aO} \) = assigned other space (excluding classrooms)

2. Total space required

\[ S_{rT} = S_{rTL} + S_{rRL} + S_{rFO} + S_{rCO} + S_{rL} + S_{rS} + S_{rO} \]

where:

- \( S_{rT} \) = total departmental space required
- \( S_{rTL} \) = required teaching lab space
- \( S_{rRL} \) = required research lab space
- \( S_{rFO} \) = required faculty office space
- \( S_{rCO} \) = required clerical office space
- \( S_{rL} \) = required lounge space
- \( S_{rS} \) = required seminar space
- \( S_{rO} \) = required other space (excluding classrooms)
3. Total space change
   a. \[ SC_T = S_{r_T} - S_{a_T} \]
      where:
      \[ SC_T \] = total space change for a particular department
      \[ S_{r_T} \] = total departmental space required
      \[ S_{a_T} \] = total departmental space assigned
   
b. \[ SC_T = SC_{TL} + SC_{RL} + SC_{FO} + SC_{CO} + SC_L + SC_S + SC_0 \]
      where:
      \[ SC_T \] = total space change for a particular department
      \[ SC_{TL} \] = teaching lab space change
      \[ SC_{RL} \] = research lab space change
      \[ SC_{FO} \] = faculty office space change
      \[ SC_{CO} \] = clerical office space change
      \[ SC_L \] = lounge space change
      \[ SC_S \] = seminar space change
      \[ SC_0 \] = other space change (excluding classrooms)

4. Total utilization ratio
   \[ U_{r_T} = S_{a_T} / S_{r_T} \]
   where:
   \[ U_{r_T} \] = total departmental utilization ratio
   \[ S_{a_T} \] = total departmental space assigned
   \[ S_{r_T} \] = total departmental space required
Complete The System

In order to make this a complete space allocation system in accordance with the design criteria, it is recommended to establish a centralized committee, an updating procedure, and a forecasting procedure.

First, the establishment of a centralized committee should be in the form of a space utilization committee which meets monthly. These monthly meetings would keep all committee members up to date on all planned and unexpected space allocations, as well as any comments or criticisms voiced by the faculty or university administrators. Also, this space utilization committee should include a faculty representative from each college, the facilities planner, and possibly the provost. It is suggested that the facilities planner or the provost serve as the chairperson because the faculty representatives may change each year. Thus, the facilities planner or the provost serving as the chairperson would provide some planning continuity from year to year. In addition, the basic responsibilities of the space utilization committee would be to evaluate the system output, be receptive to all feedback, establish and adjust Ohio University space policy and guidelines, review all of the system's underlying assumptions, and possibly update the system. While the first and foremost responsibility would be to establish a space policy for the allocation of space at Ohio University, a review of the system's underlying assumptions is also important. For example, the tentative
$30,000 value suggested as a guideline in allocating research laboratory space should be reviewed. Also, the committee should consider the utilization ratio limits:

\[ 0.75 \leq U_r \leq 1.25 \]

to see if they are accurate and commensurate with the space policy established. In addition, it must be noted that although clerical workers could input the necessary data to update the system, the space utilization committee should have the option of doing that itself. An itemized list of the space utilization committee's duties and responsibilities is as follows:

1. Establish a space policy for the allocation of space at Ohio University. Include short and long range goals.

2. Evaluate and analyze system output so as to make allocative decisions.

3. Be receptive to all feedback from the individuals involved and affected by the space allocation decisions.

4. Review the other space requests to determine if a request is justified and if a space allocation should be made.

5. Review all system assumptions, especially:
   a. Teaching lab space assumptions
      1. 1.5 X NASF/station for single-purpose labs
      2. 100 WSCH for single-purpose labs
   b. Research lab space assumptions
      1. $30,000 threshold value
   c. Utilization ratio limits
      \[ 0.75 \leq U_r \leq 1.25 \]

6. Possibly update the system and use it to forecast future space allocations.
Next, updating, as conducted by the committee members or clerical workers should occur annually in order to keep the system current; updating prior to the Fall quarter each year, perhaps during the summer, would be sufficient since the academic year begins in the Fall. All that is required for updating the system is to input the updated information needed as was previously listed, and perform the necessary calculations to get the updated output. Perhaps the space standards which were derived from the literature should be reviewed and possibly updated every five years to assure their accuracy and usefulness. In addition, unexpected space changes may necessitate more frequent system revisions. All that is required in this case is to input the changed data into the system to generate the revised and updated output.

Finally, forecasting or the determination of future space projections can certainly be made by inputting estimated data into the system and then examining the output. Here it is important to note that these projections will only be as accurate as the estimated data that they are based on. Therefore, projections of five years into the future are suggested so as to maintain a reasonable level of accuracy.

Thus, the establishment of a centralized committee, an updating procedure, and a forecasting procedure all contribute to the completeness and thoroughness of this space allocation system.
Examination Against the Design Criteria

A brief examination against the design criteria will show that this system satisfies each of the criteria. First, the system is specifically applicable to the listed departmental space such as teaching laboratories, research laboratories, faculty offices including office space for graduate assistants, clerical offices, lounges, seminar rooms, and other space (excluding classrooms). And, as just described it is maintainable and allows for annual updating. Also, the inputs needed are readily attainable and easily accessible with the exception of the space assigned measurements which are currently being compiled by the Facilities Planner in the Summary of Roomtypes report. In addition, considering that all members of the university community, primarily the faculty and the administration, would have access to the system's output and would have to determine how to specifically sub-divide each type of space for their department, decentralized space management becomes apparent. Space is allocated to departments in blocks. For example, the biology department may be allocated 1000 NASF of teaching laboratory space. It is then the department's decision to divide that space up into separate laboratories as they see fit. This assumes, of course, that the departments are the best judges of their own use of space for their academic programs. Next, the suggested formation of a space utilization committee certainly serves to satisfy the criterion to establish a centralized committee. And, by definition, this
space utilization committee will allow for feedback from all faculty and university administrators. The recommended monthly meetings should serve to make the committee easily accessible to all interested individuals. Also, as previously stated, by allowing for periodic, unexpected space change adjustments, the system renders itself flexible to university funding, personnel, and program need changes. Finally, the purpose of designing this system was to establish a basis from which a justifiable space allocation could be made. And with proper use, this system will do just that.

Design Difficulties

Prior to stating the conclusions to this chapter, it is important to note two of the most important difficulties encountered in attempting to design this system. First, the necessary data was not always available. So, many times, revising and restructuring the system was warranted to incorporate other types of data. This resulted in a slight loss of accuracy because the most desirable information was unavailable and the next best alternative had to be used. It must be noted, however, that the alternative data was used in such a way as to make the system workable. The next difficulty encountered is, by far, the most serious. At the present time, Ohio University does not have any space policy or guidelines applicable to space allocation procedures. Thus, there was no foundation on which to build a space allocation system. To compensate for this, several assumptions, as listed earlier in this chapter, were made.
While the intention of making these assumption was to provide necessary aids to the design process, it is important to consider them in establishing space allocation policy for Ohio University.

Conclusions To This Chapter

In conclusion, this chapter served to describe the culmination of effort to design a method of space allocation for Ohio University. The system and how it works, the underlying assumptions, the required inputs, a schematic outline of the space allocation procedure, and some important attributes to the system such as the suggested establishment of a space utilization committee, updating procedures, and forecasting procedures were discussed. Also noted was an examination of this space allocation system against the design criteria and some important difficulties encountered in the design process.

A space allocation system such as this serves to establish the basis from which all members of the Ohio University community, especially faculty and administrators, can determine their space needs. Simplicity and ease of implementation have been stressed so that any difficulties in understanding and implementing this system are minimized. Since the required inputs are presently available at Ohio University, this system can be implemented in the short run. Considering the traditional way in which departmental space has been allocated in the past at Ohio University, i.e., territorial
and squatters rights, the use of this system would result in an improved method of space allocation from which to make logical space allocation decisions.
5. CONCLUSIONS

The final conclusions to this thesis are primarily recommendations for improving, expanding, and maximizing the efficiency of the space allocation system presented in the preceding chapter. Prior to discussing the recommendations, however, it is important to briefly summarize the major sections of this thesis.

The research for this thesis began by conducting an extensive literature survey. The literature reviewed not only provided important background information for this topic, but it helped initiate most of the ideas that this space allocation system is founded on. While some sources were more pertinent than others, all served to increase the amount of knowledge gained in preparation for this system's design. Next, the chapter on alternative methodologies highlights some of the most important reference sources. It is in this chapter that several suggested methods of space allocation are described and analyzed against the design criteria. Although none of the systems satisfied all the design criteria, some aspects of each system can be seen in the system designed for Ohio University. For example, the utilization ratio is a concept advocated in the Pinnell and Wacholder system. Also, frequent reference is made to the Ohio Board of Regents standards. And, the basic NASF standards used in this system were derived through comparing similar standards in the literature. Thus, the cumulative result of all this research plus various ideas, advice, and considerations is the space
allocation system designed for Ohio University.

Although this system is designed to be implemented now, there are some recommendations needed for its future use and improvement. The first recommendation for improvement is centered on the derivation of the space required for research laboratories. In accordance with the Ohio Board of Regents standards, the required research lab space might be determined as follows:

\[ S_r = (C_1 \times (MHC) + C_2 \times (DHC) + C_3 \times (FHC)) \times \text{module size} \]

where:

- \( MHC \) = master headcount
- \( DHC \) = doctoral headcount
- \( FHC \) = faculty headcount
- \( C_1 \) = percent of masters degree students requiring research lab space in a department at a given time.
- \( C_2 \) = percent of doctoral candidates requiring research lab space in a department at a given time.
- \( C_3 \) = percent of faculty requiring research lab space in a department at a given time.

The first of two problems with this equation is a definition of the module size. The Ohio Board of Regents fails to define this term but the implication is that it is representative of station size. Without a clear definition, however, module size could be misinterpreted and misused in the formula, thus producing an inaccurate result. The second problem with this equation is estimation of the \( C \) variables. Departmental differences are difficult but necessary to consider here, and at the present time, Ohio University does not have this data readily available. Thus, a suggestion that
Ohio University improve its data collection ability and expand on the types of data collected seems in order. Another system improvement suggested which also focuses on the derivation of space required for research laboratories is to try to account for the yearly fluctuations in project research funds for a particular department. The use of a smoothing function whereby an average value of research funds over a period of several years, such as five, might be used in the $S_{RL}$ formula given, rather than the project funds for a single year. Perhaps the formula could be revised as follows:

$$S_{RL} = \left( 1 + \frac{\text{projects funded at } \$30,000 \text{ or more}}{\text{per year from 198X to 198Y}} \right) \times \left( \frac{\text{average number of sponsored research}}{\text{research lab space standard}} \right)$$

$$+ \left( \frac{\text{average amount of yearly funds of sponsored research projects funded at less than } \$30,000}{\text{per year from 198X to 198Y}} \right) \times \left( \frac{\text{research lab space standard}}{\text{research lab}} \right)$$

A decision on whether to use a smoothing function would best be made by the space utilization committee. Next, the need for Ohio University space policy and guidelines directly applicable to space allocation procedures and goals is once again stressed. A space policy would serve to clarify all space allocation procedures and provide a foundation from which to generate future adjustments and improvements to the system. This is the primary and foremost responsibility of the space utilization committee upon its formation. Then, in accordance with the establishment of a space policy at
Ohio University, the university community, particularly faculty and administrators, should be kept informed of all space policy and system changes. The faculty and administration must be in support of the space system and the space policy, as well as to be cooperative with each other and the space utilization committee. Faculty must be assured that every effort will be made to increase their space as the need arises. If they are not assured of this, they will be most reluctant to give up any of their departmental space, and thus force a collapse of the system. Perhaps one way to inspire approval and confidence in this space allocation system is to allow all interested faculty to offer their opinion on space policy and to be a part of determining Ohio University's short and long range space allocation goals. This would generate both a willingness and a desire for establishing equitable space allocations.

In addition to recommendations for future improvements of the space allocation system, some suggestions for further research are needed. First, with the use of Corelap and Craft facilities layout programs, this system might serve to establish the basis from which the inputs to these programs are derived. Specifically, the space required values for the various types of space in each department could determine the size of the inputed space types to the programs. The programs can produce several different iterations from which the choice of one to implement could be made. These programs, however, are best used for laying out the
space of new facilities rather than old facilities because the old facilities will already have established room areas defined by walls which may not be feasible to tear down. If used in the planning stage of new facilities, though, these programs and their output may prove to be very important tools for allocating space. The second recommendation for future research is to eventually write a computer program for this system so as to further simplify its use. Perhaps the Office of Analytical Services could be responsible for collecting the necessary data to run, update, and forecast with this space allocation system. Then the various outputs could be submitted to the space utilization committee for analysis and evaluation.

The space allocation system presented here and suggested for implementation and use at Ohio University, represents a thoroughly researched and thought-out effort to achieve a more systematic allocation of departmental space than has been used in the past. In time, its use should serve to generate a more justifiable allocation of space. And as this system is further improved and updated, Ohio University will move closer toward the goals that this system is designed to achieve.
6. NOTES


References


APPENDICES
# Teaching Lab Standards

<table>
<thead>
<tr>
<th>Lab Type</th>
<th>NASF/Station</th>
</tr>
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<tbody>
<tr>
<td>Agriculture</td>
<td>80</td>
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<tr>
<td>Anthropology</td>
<td>60</td>
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<tr>
<td>Art</td>
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<tr>
<td>Biological Sciences (excluding greenhouse)</td>
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<tr>
<td>Computer Science</td>
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<td>Mechanical</td>
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<td>Radio-TV</td>
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Note: These standards were suggested by the Ohio Board of Regents in the Probasco (32) reference.
## Research Lab Standards

<table>
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<tr>
<th>Lab Type</th>
<th>NASF/Lab in Dept.</th>
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<td>Agriculture</td>
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<td>Anthropology</td>
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<tr>
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<td>Computer Science</td>
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<tr>
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<td>Electrical</td>
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<tr>
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<td>Geography</td>
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<td>Library Science</td>
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<td>Mathematics</td>
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<td>Physical Sciences</td>
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<td>Geology</td>
<td>250</td>
</tr>
<tr>
<td>Physics</td>
<td>250</td>
</tr>
<tr>
<td>Other</td>
<td>250</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>40</td>
</tr>
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</table>

Note: These standards were derived by observing the standards in the literature applicable to research laboratory space and selecting a representative or modal value.
### Office Standards

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<th>NASF</th>
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</thead>
<tbody>
<tr>
<td><strong>Faculty</strong></td>
<td></td>
</tr>
<tr>
<td>One Person</td>
<td>140</td>
</tr>
<tr>
<td>Two Person</td>
<td>200</td>
</tr>
<tr>
<td><strong>Graduate Assistants</strong></td>
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</tr>
<tr>
<td>Research</td>
<td>60</td>
</tr>
<tr>
<td>Teaching</td>
<td>60</td>
</tr>
<tr>
<td><strong>Clerical Workers</strong></td>
<td></td>
</tr>
<tr>
<td>One Person</td>
<td>100</td>
</tr>
<tr>
<td>Two Person</td>
<td>180</td>
</tr>
<tr>
<td>Three Person</td>
<td>240</td>
</tr>
<tr>
<td>Four Person</td>
<td>280</td>
</tr>
</tbody>
</table>

### Lounge Standard

**NASF/station**

| Lounge Room | 4 |

### Seminar Room Standard

**NASF**

| One Seminar Room | 350 |

### Other Space Standards

**NASF/station**

| Animal Quarters    | 3   |
| Demonstration Facilities | 3   |
| Field Service Facilities | 2   |
| General Use Facilities | 2   |
| Greenhouses        | 2   |
| Teaching Clinics   | 4   |

Note: The seminar room standards and the office standards were derived by observing the standards in the applicable literature and selecting a representative or modal value. The lounge and other space standards were suggested by the Ohio Board of Regents in the Probasco (32) reference (see sample on page A13).
### Chemical Engineering

<table>
<thead>
<tr>
<th>Space Type</th>
<th>$S_a$ (NASF)</th>
<th>$S_r$ (NASF)</th>
<th>$U_r = S_a / S_r$</th>
<th>Space Change (NASF)</th>
</tr>
</thead>
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<tr>
<td>Clerical Office</td>
<td>309</td>
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</tr>
<tr>
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<td>1689</td>
<td>1240.2</td>
<td>1.36</td>
<td>- 448.8</td>
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<tr>
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<td>0</td>
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</tr>
<tr>
<td>Research Lab</td>
<td>1963</td>
<td>2030</td>
<td>.97</td>
<td>+ 67</td>
</tr>
<tr>
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<td>0</td>
<td>350</td>
<td>0</td>
<td>+ 350</td>
</tr>
<tr>
<td>Teaching Lab</td>
<td>2805</td>
<td>1277.77</td>
<td>2.20</td>
<td>-1527.23</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>6766</strong></td>
<td><strong>5377.97</strong></td>
<td><strong>1.26</strong></td>
<td><strong>-1388.03</strong></td>
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### Civil Engineering

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<th>$S_r$ (NASF)</th>
<th>$U_r = S_a / S_r$</th>
<th>Space Change (NASF)</th>
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</thead>
<tbody>
<tr>
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<td>182</td>
<td>100</td>
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<td>942</td>
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<tr>
<td>Lounge</td>
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<td>656</td>
<td>0</td>
<td>+ 656</td>
</tr>
<tr>
<td>Research Lab</td>
<td>240</td>
<td>300</td>
<td>.80</td>
<td>+ 60</td>
</tr>
<tr>
<td>Seminar Room</td>
<td>0</td>
<td>350</td>
<td>0</td>
<td>+ 350</td>
</tr>
<tr>
<td>Teaching Lab</td>
<td>3124</td>
<td>2127.77</td>
<td>1.47</td>
<td>- 996.23</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
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<td><strong>4793.77</strong></td>
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### Industrial and Systems Engineering

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<th>$S_r$ (NASF)</th>
<th>$U_r = S_a / S_r$</th>
<th>Space Change (NASF)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>100</td>
<td>1.90</td>
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<td>1460.6</td>
<td>.99</td>
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<tr>
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<td>404</td>
<td>0</td>
<td>+ 404</td>
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<td>Research Lab</td>
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<td>1454.98</td>
<td>.18</td>
<td>+1190.98</td>
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<tr>
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<td>0</td>
<td>+ 350</td>
</tr>
<tr>
<td>Teaching Lab</td>
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<td>.22</td>
<td>+1900</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
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<td><strong>6219.58</strong></td>
<td><strong>.39</strong></td>
<td><strong>+3775.58</strong></td>
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### Mechanical Engineering

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<th>$S_r$ (NASF)</th>
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<th>Space Change (NASF)</th>
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</thead>
<tbody>
<tr>
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<td>980</td>
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<tr>
<td>Lounge</td>
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<td>580</td>
<td>0</td>
<td>+ 580</td>
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<tr>
<td>Research Lab</td>
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<td>3.14</td>
<td>- 642</td>
</tr>
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<td>Seminar Room</td>
<td>0</td>
<td>350</td>
<td>0</td>
<td>+ 350</td>
</tr>
<tr>
<td>Teaching Lab</td>
<td>2598</td>
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<td>1.58</td>
<td>- 948</td>
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<td><strong>3960</strong></td>
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Data Sheets

Chemical Engineering

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<tbody>
<tr>
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<td>309</td>
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<td>Faculty Office</td>
<td>1689</td>
</tr>
<tr>
<td>Research Lab</td>
<td>1963</td>
</tr>
<tr>
<td>Teaching Lab</td>
<td>2805</td>
</tr>
</tbody>
</table>

8 Faculty (7 professors, 1 asst. professor)
3 people per FTE GA X .89 budgeted FTE GAs = 2.67 GAs
1 Civil Service
95 FTE undergraduate students (1979)

Research Project Funding Amounts/year:

\[
\begin{align*}
\text{\$} & \quad 46,461 \\
& \quad 91,752 \\
& \quad 359,996 \\
& \quad 33,000 \\
& \quad 368,000 \\
& \quad 23,000 \\
\end{align*}
\]

\$1,798,464 for 6 projects

Teaching Labs (Fall 1981):

<table>
<thead>
<tr>
<th>WSCH</th>
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<tbody>
<tr>
<td>Ch. E. 200</td>
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<td>Ch. E. 418</td>
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</table>

80 = total

Civil Engineering

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<th>Sa (NASF)</th>
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<tbody>
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<td>Faculty Office</td>
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</tr>
<tr>
<td>Research Lab</td>
<td>240</td>
</tr>
<tr>
<td>Teaching Lab</td>
<td>3124</td>
</tr>
</tbody>
</table>
Civil Engineering cont.

5 Faculty (2 professors, 2 assoc. professor, 1 asst. professor)
3 people per FTE GA X 1 budgeted FTE GA = 3 GAs
1 Civil Service
164 FTE undergraduate students (1979)

No Research Projects

Teaching Labs (Fall 1981):

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>CE 223</td>
<td>24+12+22+14</td>
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<tr>
<td>CE 341</td>
<td>10+ 8+14</td>
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<td>CE 452</td>
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<td></td>
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Industrial and Systems Engineering

<table>
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</tr>
<tr>
<td>Research Lab</td>
<td>264</td>
</tr>
<tr>
<td>Teaching Lab</td>
<td>550</td>
</tr>
</tbody>
</table>

6 Faculty (5 professors, 1 asst. professor)
3 people per FTE GA X 3.67 budgeted GAs = 11.01 GAs
1 Civil Service
101 FTE undergraduate students (1979)

Research Project Funding Amounts/year:

$ 282,821
26,821
140,701
73,939
28,677

$ 552,959 for 5 projects

Teaching Labs (Fall 1981):

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ISE 333</td>
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# Mechanical Engineering

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<tr>
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<tr>
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<td>2598</td>
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</table>

6 Faculty (4 professors, 1 assoc. professor, 1 asst. professor)
3 people per FTE GA X 1 budgeted GA = 3 GAs
1 Civil Service
145 FTE undergraduate students (1979)

No Research Projects

**Teaching Labs (Fall 1981):**

<table>
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<tbody>
<tr>
<td>ME 430</td>
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### Students

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<tr>
<td>65 MECH. ENG.</td>
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<tr>
<td>FRESHMAN</td>
<td>18</td>
<td>38</td>
<td>50</td>
<td>52</td>
<td>53</td>
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<td>SOPHOMORE</td>
<td>26</td>
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<td>23</td>
<td>32</td>
<td>38</td>
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<td>20</td>
<td>24</td>
<td>29</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>SENIOR</td>
<td>22</td>
<td>27</td>
<td>29</td>
<td>38</td>
<td>24</td>
</tr>
<tr>
<td>UNDERGRAD</td>
<td>86</td>
<td>110</td>
<td>131</td>
<td>134</td>
<td>145</td>
</tr>
<tr>
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<td>5</td>
<td>3</td>
<td>6</td>
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<tr>
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<td>1</td>
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<td>--</td>
<td>--</td>
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<td>5</td>
<td>5</td>
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<tr>
<td>TOTAL</td>
<td>91</td>
<td>115</td>
<td>136</td>
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2. ANNUAL DEGREES AWARDED:

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<td>18</td>
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<td>1</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23</td>
<td>15</td>
<td>20</td>
<td>19</td>
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</table>

3. FALL APPLICATIONS AND MATRICULATION

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<tbody>
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<td>NEW FRESHMEN</td>
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<td>62</td>
<td>78</td>
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<td>27</td>
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*From: Compendium of Historical Planning Information for Credit Generating Departments, Office of Information Systems, Dec. 1979.*
### Staffing and Productivity

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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenured</td>
<td>--</td>
<td>--</td>
<td>40</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>Non-Tenured</td>
<td>--</td>
<td>--</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
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<td>--</td>
<td>2</td>
<td>9</td>
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<td>Associated</td>
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<td>--</td>
<td>4</td>
<td>6</td>
<td>4</td>
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<tr>
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<td></td>
<td>50</td>
<td>59</td>
<td>61</td>
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<tr>
<td><strong>Percent Tenured</strong></td>
<td></td>
<td></td>
<td>80.0%</td>
<td>69.0%</td>
<td>65.0%</td>
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</table>

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Academic Year Contracts</td>
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</tr>
<tr>
<td>Head-Count</td>
<td>--</td>
<td>--</td>
<td>42</td>
<td>41</td>
<td>40</td>
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<td>20,46</td>
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<td>20,465</td>
<td>22,880</td>
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<td>Fiscal Year Contracts</td>
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<td>Head-Count</td>
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<tr>
<td>Average Salary</td>
<td>--</td>
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<td>30,940</td>
<td>31,153</td>
<td>37,744</td>
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<td>Median Salary</td>
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<td>30,750</td>
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<tr>
<td><strong>13. Budgeted FTE Staffing:</strong></td>
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<tr>
<td>Faculty</td>
<td>44.80</td>
<td>43.18</td>
<td>43.20</td>
<td>43.28</td>
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<td>Grad. Assistants</td>
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<td>Administrators</td>
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<td>1.00</td>
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<td>Civil Service</td>
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<td>.88</td>
<td>.89</td>
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<td><strong>Total</strong></td>
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<td>49.78</td>
<td>50.54</td>
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<tbody>
<tr>
<td><strong>14. Staffing Ratios:</strong></td>
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<tr>
<td>FTE Students</td>
<td>565.5</td>
<td>585.5</td>
<td>606.2</td>
<td>654.2</td>
<td>697.9</td>
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<tr>
<td>FTE Std/FTE Faculty</td>
<td>12.6</td>
<td>13.6</td>
<td>14.0</td>
<td>15.1</td>
<td>16.1</td>
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<tr>
<td>FTE Std/FTE F Acc.Ga</td>
<td>11.0</td>
<td>12.2</td>
<td>12.4</td>
<td>12.6</td>
<td>12.9</td>
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<tr>
<td>FTE Std/FTE Tot Staff</td>
<td>11.4</td>
<td>11.8</td>
<td>12.0</td>
<td>12.1</td>
<td>12.3</td>
</tr>
</tbody>
</table>

*From: Compendium of Historical Planning Information for Credit Generating Departments, Office of Information Systems, Dec. 1979.*
COLLEGE OF EDUCATION

School of Curriculum and Instruction

Projects Funded in Fiscal Year 1981

STEVENS, EDWARD J. "Literacy, Law and Social Order," National Institute of Education, $44,807

COLLEGE OF ENGINEERING AND TECHNOLOGY

Department of Chemical Engineering

Projects Funded in Fiscal Year 1981

BAASEL, WILLIAM D. "Acid Rain Study," Environmental Protection Agency, $46,461.


"Coal/Oil Mixture Combustion," Ohio Department of Energy, $70,000. Project initiated December, 1979; prior funding $298,000.

Previously Funded Active Projects

SAVAGE, ROBERT L. "A Study of the Potential Use of Solvent Refined Coal in Ohio," Ohio Air Quality Development Authority. Project initiated July, 1979; total funding $23,000.

32

*From: Sponsored Programs at Ohio University, Office of Research and Sponsored Programs, Fiscal year 1980-81.
For Example: XYZ University projects that by 1981 there must be sufficient classroom space for 19,000 Day FTE students producing 228,000 Day Weekly Student Contact Hours. Also, 4,000 WSCH are generated through continuing education courses during the day period.

Of this 232,000 total WSCH figure, 187,000 WSCH will require classrooms, 30,000 for lecture hall space and 15,000 for seminar rooms. By applying the factors:

- (Classrooms) \(0.711 \times 187,000 = 132,957\)
- (Lecture Halls) \(0.663 \times 30,000 = 19,890\)
- (Seminar Rooms) \(0.878 \times 15,000 = 13,170\)

Total Classroom and Classroom Service Space required by 1981 = 166,017

B. Laboratories (Room Types 210, 220 and 230 including service areas)

In determining the laboratory space for teaching laboratories and unscheduled or individual study laboratories, the Net Assignable Square Feet per Weekly Student Contact Hour (NASF/WSCH) will be used as the basic factor. By applying this factor (NASF/WSCH) to the projected Weekly Student Contact Hours (either day or evening use) for each instructional program, the required Net Assignable Square Feet of laboratory space can be determined.

The factors in Table A (Columns f thru i) have been calculated for both day or evening use for instructional programs by the formalization of three components: student station area, optimum number of hours of laboratory room use per week, and student station occupancy when the room is in use.

The components are as follows:

<table>
<thead>
<tr>
<th>Teaching Laboratory (Room Type 210)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day Use</strong></td>
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<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td><strong>Student Station Area</strong></td>
</tr>
<tr>
<td><strong>Hours of Room Use per week</strong></td>
</tr>
<tr>
<td><strong>Station Occupancy of Rooms in use</strong></td>
</tr>
</tbody>
</table>
H. Other Special Use Facilities

These facilities include teaching clinics, demonstration facilities, field service facilities, animal quarters and greenhouses. The planning factors for these facilities will vary by programs offered by a university. The following factors are suggested as guidelines:

1. Teaching Clinics and Demonstration Facilities (Room Types 540 and 550)
   Up to three net assignable square feet per total FTE student may be used for planning purposes.

   Universities should document need for teaching clinic space based on projected enrollments in such programs as psychology, speech and hearing and remedial reading and writing.

   Projected enrollments in areas such as teaching and home management is a factor in determining demonstration facilities.

2. Field Service Facilities, Animal Quarters and Greenhouses (Room Types 560, 570 and 580)
   Up to two net assignable square feet per total FTE student may be used for planning purposes. Universities should document need for these facilities based on projected enrollments in such programs as psychology, zoology, botany, etc.

   Facility requirements for medical science (excluding nursing and pharmacy) at universities with medical schools should not be included in this calculation. Also, agriculture at the Ohio State University is also excluded.

   These factors may be combined and shown as "other special use" facilities in the tables used for the calculation of space requirements.

I. General Use Facilities

This category includes assembly facilities, exhibit and museum rooms, lounges and locker rooms which are used for instruction and library functions or are a service to that function.

The factor of four net assignable square feet per total FTE student will be used for planning purposes.
### SUMMARY OF ROOM TYPES BY PCS

**CIVIL ENGN** 2070430

<table>
<thead>
<tr>
<th>ROOM TYPE</th>
<th>BUILDING DESCRIPTION</th>
<th>NUMBER OF ROOMS</th>
<th>NET SF ASSIGN</th>
<th>NUMB OF STATION</th>
<th>SQ FT PER STATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>GENERAL CLASSROOM</td>
<td>4</td>
<td>2569</td>
<td>160</td>
<td>16.05</td>
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<tr>
<td>13</td>
<td>TEACHING LABORATORY</td>
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<td>3124</td>
<td>62</td>
<td>50.38</td>
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<tr>
<td>15</td>
<td>TEACHING LABORATORY SERVICE</td>
<td>2</td>
<td>422</td>
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<td></td>
</tr>
<tr>
<td>20</td>
<td>UNSCHEDULED TEACHING LABORATORY</td>
<td>2</td>
<td>660</td>
<td>17</td>
<td>39.82</td>
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<tr>
<td>25</td>
<td>UNSCHEDULED TEACHING LABORATORY SERVICE</td>
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<tr>
<td>35</td>
<td>RESEARCH LABORATORY</td>
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<td>240</td>
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<td>60.00</td>
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<tr>
<td>10</td>
<td>FACULTY OFFICE</td>
<td>6</td>
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<td></td>
</tr>
<tr>
<td>13</td>
<td>GENERAL OFFICE</td>
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<td>182</td>
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</tbody>
</table>

### SUMMARY TOTALS FOR CIVIL ENGN

**ALL ROOMS ASSIGNABLE TO PCS NUMBER: 2070430**

<table>
<thead>
<tr>
<th>TOTAL NUMBER OF ASSIGNABLE ROOMS</th>
<th>TOTAL NET SF ASSIGNABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>8301.00</td>
</tr>
</tbody>
</table>
**Table 12 - AUP Local Summary - Average Academic Salaries Using Current Base**

<table>
<thead>
<tr>
<th>A1981-82 Ohio University Faculty Salary Study</th>
<th>1981-82 Academic Year Summary</th>
<th>1981-82 Academic Year Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table 12 - AUP Local Summary - Average Academic Salaries Using Current Base</strong></td>
<td><strong>Table 12 - AUP Local Summary - Average Academic Salaries Using Current Base</strong></td>
<td><strong>Table 12 - AUP Local Summary - Average Academic Salaries Using Current Base</strong></td>
</tr>
<tr>
<td><strong>INTENSIVE ENGLISH</strong></td>
<td><strong>NO PROF</strong></td>
<td><strong>NO ASSOC</strong></td>
</tr>
<tr>
<td>1</td>
<td>41553</td>
<td>0</td>
</tr>
<tr>
<td><strong>INSTITUTE OF MEDICINE</strong></td>
<td><strong>NO PROF</strong></td>
<td><strong>NO ASSOC</strong></td>
</tr>
<tr>
<td>1</td>
<td>41553</td>
<td>0</td>
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<tr>
<td><strong>MISCELLANEOUS PROGRAMS</strong></td>
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<table>
<thead>
<tr>
<th>Card Column/Code Position</th>
<th>Field Name</th>
<th>Code</th>
<th>Instruction</th>
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</thead>
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<tr>
<td>44</td>
<td>TYP</td>
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<td><em>Type of Instruction: Enter appropriate code which describes the type of class in which the course section meets:</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Classroom: Lecture-Recitation</td>
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<tr>
<td></td>
<td></td>
<td>2</td>
<td>Seminar: Discussion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Lecture Seminar: Lecture and Discussion</td>
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<td>4</td>
<td>Laboratory: Practice and Experimentation</td>
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<td></td>
<td>5</td>
<td>Lecture-Laboratory: Lecture and Demonstration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Individual Study: Arranged Assignments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Outdoor Laboratory: Outdoor Assignments. This code position may also be used when building and room numbers are entered (code positions 5 thru 14) which indicate the alternate or bad weather indoor assignment.</td>
</tr>
</tbody>
</table>

45-54 Instructional Data For Course-Section

<table>
<thead>
<tr>
<th>Code Position</th>
<th>Field Name</th>
<th>Code</th>
<th>Instruction</th>
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</thead>
<tbody>
<tr>
<td>45-50</td>
<td>Subject Field Unit (Numeric)</td>
<td>XXXXXX</td>
<td>Enter the appropriate code which identifies the instructional department which issues or teaches this course-section. Use unique and consistent codes; definitions are provided in Code List N, &quot;Standard Classification of Subject Fields&quot;.</td>
</tr>
</tbody>
</table>

51 Course Level of Instruction (Numeric)

<table>
<thead>
<tr>
<th>Code</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Enter the appropriate code which describes the course level of instruction of the course-section.</td>
</tr>
</tbody>
</table>

1. General Studies
2. Technical
3. Baccalaureate
4. Master's
5. Doctoral
6. Professional
7. Individual Study

*From: Term File, Office of Analytical Services, 1981.*
<table>
<thead>
<tr>
<th>CRN</th>
<th>Title</th>
<th>Credits</th>
<th>Fee</th>
<th>Time</th>
<th>Space</th>
<th>Instructor</th>
<th>Sec No</th>
<th>Sec Type</th>
<th>Room</th>
<th>Instructor</th>
<th>Lab No</th>
<th>Instructor</th>
<th>Lab No</th>
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</thead>
<tbody>
<tr>
<td>1469</td>
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<td>218</td>
<td>ENGR 310</td>
<td>0901</td>
<td>ENGR 310</td>
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<td>ENGR 310</td>
</tr>
</tbody>
</table>

Use "INST" column, code 4, to identify teaching lab space. 

**Use "SEAT ASSN" column to determine the number of students participating in programs which utilize other space.**
<table>
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<th>NAME</th>
<th>ROOM</th>
<th>CAPC</th>
<th>NR</th>
<th>DEPT</th>
<th>COURSE</th>
<th>DAYS &amp; TIME</th>
<th>CNT HR</th>
<th>STU</th>
<th>CNT X ST</th>
<th>CNT</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Use "CNT X ST" column to determine the WSCH for teaching lab space.
Glossary

Administrative Office: A room with office-type equipment used by an administrative official for the purpose of carrying out administrative duties as related to the educational and/or physical facilities of an institution of higher education.

Classroom: An instructional room used or intended and equipped to be used for class meetings, regardless of the size of the room.

Clerical Office: A room with office-type equipment used by staff personnel for the purpose of carrying out their assigned clerical duties.

Faculty Office: A room equipped with office-type equipment which is assigned to and is occupied by one or more faculty members for the purpose of carrying out administrative, clerical, and faculty duties other than the meeting of classes.

Full-Time Equivalent (FTE) Student: One FTE student is defined as either one undergraduate student carrying 20 credit hour for the Fall term or one graduate student carrying 18 credit hours for the Fall term.

General Use Facilities: Rooms and their service areas relating to and available for use by all students, faculty, and staff. Examples are assembly facilities, museums, art galleries, food service and merchandising facilities, lounges, and recreational facilities.

Graduate Non-Teaching Assistant Office: A room with office type equipment used by a graduate student for the purpose of carrying out duties in support of an instructional, research, or public service function, but not including a principal responsibility for one or more class sections.

Graduate Teaching Assistant Office: A room with office type equipment used by a graduate student who has primary responsibility for one or more class sections.
Gross Square Feet: The sum of the total areas in square feet at each floor level, included within the outside faces of the exterior walls, for all buildings utilized by institutions of higher education for the purposes of carrying out their educational programs.

Lounge: A room used by students, staff, administrative personnel, and/or faculty for recreational purposes such as work breaks.

Net Assignable Square Feet (NASF): The sum of all floor areas of a building as measured from the inside walls at or near the floor level for those rooms and spaces assigned to or available for assignment to departments or individual occupants.

Net Usable Square Feet: The square foot area in the interior of a building excluding such structural elements as walls, columns, shafts, partitions, etc., based upon measurements taken at or near floor level.

Non-Assignable Square Feet: Areas such as stairs, halls, elevators, toilet rooms, janitor rooms, mechanical rooms, etc.

Non-Usable Square Feet: Space including all exterior wall areas, interior partitions, pipe spaces and chases, vertical plenums, dead spaces, etc.

Research Laboratories: Any special-purpose research facility, including those used by graduate students and advanced undergraduate students for individual research, lab applications, training in research methodology which requires special-purpose equipment for staff and/or student experimentation or observation.

Seminar Room: A room with a table or tables and chairs which are arranged for informal discussion type instruction.

Space Assigned: That space which has been assigned to a particular department for a specified use.

Space Factor: A guideline to be used for evaluating space utilization and predicting space requirements. Also used to establish space planning criteria which could be used in determining the facility requirements at public universities.

Space Required: A unit of space to be determined from the space planning criteria that sets a standard for
the amount of space needed for a specific space type at an institution of higher education.

Student Station: The particular number of chairs, seats, laboratory desks, or some other facility necessary to accommodate students during an instructional period.

Teaching Laboratory: A room used by regularly scheduled classes which require special-purpose equipment for student participation, experimentation, observation, or practice in a field of study.

Utilization Ratio: The ratio of space assigned to space required so as to relate the space needs of an organizational unit to the program it is conducting.

Weekly Student Contact Hours (WSCH): A unit of measure which represents one hour of instruction for one student in one week.
GLOSSARY NOTES


2 Goins, p. 88.


8 Ohio Board of Regents, p. 284.

9 Ohio Board of Regents, p. 284.


11 Ohio Board of Regents, p. 284.