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AUTHOR	Dahnke, Harold L.; Jamrich, John X.
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ABSTRACT

The data collection system used in this evaluation was developed in cooperation with the U. S. Office of Education. The inventory data included data in the categories of building information, room information, classroom-laboratory utilization, office assignments, and enrollment. A summary of the data is charted and described for each of the institutions. (HH)

A SPACE UTILIZATION STUDY

FOR

FIVE STATE-SUPPORTED

SOUTH CAROLINA

COLLEGES AND UNIVERSITIES

Director of the Study:
Harold L. Dahnke, Director
Office of Space Utilization
Michigan State University

Consultant to the Study:
John X. Jamrich, Associate Dean
College of Education
Michigan State University

MICHIGAN STATE UNIVERSITY EAST LANSING

OFFICE OF THE DIRECTOR OF SPACE UTILIZATION

November 1, 1967

Mr. John K. Cauthen
Chairman, South Carolina Advisory Committee
on Higher Education
401 SCN Building
900 Assembly Street
Columbia, South Carolina 29201

Dear Mr. Cauthen:

In accordance with your request a study has been made of the utilization of the physical facilities of five state-supported institutions of higher education in South Carolina.

This is a report of the results of that study. Basically, it attempts to report quantitatively and qualitatively the facilities which existed at the time of the study and to evaluate the use of space related to academic purposes.

Hopefully, the publication of this report marks not an end but a beginning. Unless the institutions continue--with whatever modifications may be desirable--the space inventory process initiated by this study, and unless they collectively debate and finally agree upon acceptable space factors to be used in evaluating space needs, this study shall soon be of limited utility and shall have failed to meet its fundamental purpose.

The data which form the basis of this report were submitted by the institutions and supplemented by personal visitations to each campus. The excellent cooperation received from the institutions was sincerely appreciated.

Respectfully,

Harold L. Dahnke
Director

TABLE OF CONTENTS

TABLES

TABLES (Continued)

CHAPTER I

INTRODUCTION

Within recent years an increasing amount of interest has been focused on space utilization in the nation's colleges and universities. Institutional requests for capital dollars to build more facilities have almost invariably been met with questions concerning the utilization of the buildings they already have. The advent of Federal funds for construction of higher education facilities also has caused colleges and universities to evaluate their present and long-range use of existing facilities.

Studies of space utilization have not always hit the mark. Among the more critical limitations of many studies are:

1. Frequently, utilization analyses have been restricted to a study of classrooms and teaching laboratories. The generalizations which can be drawn from such a study are limited, at best. A meaningful evaluation of the utilization of facilities requires a comprehensive analysis of all existing facilities, because the effective utilization of one type of space is dependent on the availability of other types of space. For example, insufficient library space (or faculty office space, or residential space, etc.) may preclude an increase in the number of students admitted, which is a necessary prerequisite to improved classroom utilization.
2. Frequently, studies have led to inappropriate conclusions. Low levels of utilization for classroom facilities have been generalized as characteristic of the total physical plant. It is argued that if classroom use is poor, probably other facilities are being inadequately utilized.

3. Frequently, studies have invited unfortunate institutional comparisons. The amount of space required by various educational programs differs greatly. If it is reasonable to assume that to place one student in a Chemistry laboratory requires more space than to seat one student in a classroom for purposes of instruction in English, then it is reasonable to assume that the amount of space required for the program of one institution will differ from the amount for an institution with a different program, even though enrollment levels in the two institutions are comparable.

4. Frequently, studies have used inappropriate units of measurement. While such an index as square feet per full-time-equated student may be useful as an average for a group of institutions, it cannot be applied individually to institutions. Space requirements vary with the type of space being studied. Classrooms must be evaluated against one criterion, offices against another, library space against still another, and so on.

Implicit in the limitations cited above are the essential requirements of a space utilization study. It must be comprehensive enough to include all facilities; it must be designed to permit an evaluation of the use of all facilities; it must recognize program differences within an institution and between institutions; and it must use evaluative measures appropriate to the kind of space being studied.

Limitations

The present study has attempted to satisfy these essential requirements. That it has not completely met them is more a function of time and distance than of deliberate choice. The complexities of a space utilization study are great enough within the confines of his own institution for one who daily deals with these problems. To complete such a study as this within a year and primarily at long-distance is to invite less than a complete understanding of the total programs of the institutions involved.

1. The original design of the study was based upon all of the facilities available to the five South Carolina colleges and universities. Under the pressure of time, certain modifications were made to the initial request for data. Since residence halls and related facilities were of lesser concern to the major purposes of the study, it was agreed that these facilities could be inventoried on a building basis rather than room by room. Because of institutional variations in applying this modification, the possibilities of certain inter-institutional and intra-institutional analyses were attenuated.

2. Although the original design of the study proposed a total inventory of the facilities, it did not anticipate an evaluation of all of the space in each of the institutions. Primary attention was devoted to the establishment of a common inventory process among the institutions. Within the time limits set for the study the utilization evaluation was necessarily limited.

3. The structure of the study provided sufficient levels of data classification to identify program differences within and among the five institutions. However, two types of limitations were introduced by the data submitted for analysis. First, some institutions were unable to provide data classified by the organizational unit to which the space

was assigned. This created difficulty not only in the inventory process but also in certain portions of the utilization analysis. Second, institutions varied considerably in their interpretation of the various classification systems used in the study. An attempt was made through a series of correspondence and telephone conversations to remove these discrepancies. Although it is believed that the data as presented are now based on a common understanding of the several classification systems employed in the study, it is possible that certain minor differences still remain.

4. For the most part the evaluative measures used in the utilization analysis are considered appropriate. Because certain data were not available, as indicated above, less refined measures had to be used in certain cases.

5. Data were submitted by the institutions on punched cards. The apparent omission of keypunch verification in certain instances provided a possible source of error. Various checks were employed to enhance the reliability of the data and hopefully no major errors of fact remain in the data as presented.

Purposes

A "space utilization study" typically has three interrelated purposes. First, it provides an inventory of existing facilities. Second, it evaluates the use of present space. Third, on the basis of related program data, it projects additional facility needs. The inventory process must anticipate the evaluation and projection purposes; the evaluation process must be consistent with the projection techniques. It is possible to limit a "space utilization study" to the inventory process alone, although no meaningful "utilization" data result. However, evaluation of the use of existing space requires the inventory process, as well as related educational program data. Likewise, the projection of space needs requires both the inventory process and the evaluation of present utilization levels.

The inventory process alone may serve several useful purposes. It may provide summary information concerning facilities both quantitatively and qualitatively. Quantitative summaries may be classified by type of space, by organizational unit, and by function. Qualitative summaries serve to identify rehabilitation needs as well as facilities which need to be replaced. Granted a common classification system, a space inventory also permits inter-institutional comparisons.

The evaluation process primarily serves ad-hoc day-to-day decision making processes. It provides basic data for determining the reassignment of space from one type to another, from one organizational unit to another, and/or from one function to another.

The projection process involves the development of long-range building needs, the space parameters for specific building projects, the capital funds required by these projects, and data which justify the need for them.

The present study has not attempted to satisfy all of these purposes. A common inventory process for the five colleges and universities was established and data were collected and summarized on this basis. The utilization of some, but not all, of the space in these institutions has been evaluated. No attempt has been made to project additional facility requirements, although certain specific needs are implicit in the utilization analyses.

The limitation of this study to the inventory process and a partial utilization evaluation was necessary and deliberate. It was necessary because the span of one year permits little more than an inventory and a cursory evaluation. It was deliberate because a definitive evaluation and a meaningful projection of needs must be made by the institutions themselves. Long-range planning for facility needs requires information and decisions concerning enrollment projections, numbers of students by level, student-staff ratios, financial resources, and, most important, the educational programs to be offered. While an "outsider" may reasonably propose an inventory process and evaluative space standards, he cannot in good conscience chart the future course of any institution under the guise of a space utilization study.

Further, it is desirable that such a study as this only serve as the beginning of an on-going process. In too many studies of this kind, the knowledge and expertise remains with the consultants. It has been a fundamental assumption of this study that the consultants would initiate an inventory and evaluation process which the institutions themselves would continue. Modifications, additions, and improvements to it will result when these institutions continue further analyses with their own resources as part of their long-range planning process.

CHAPTER II

SCOPE

The physical facilities of a college may be described in many ways. Descriptive data may be developed for buildings or space within buildings; i.e., rooms.

Data concerning buildings might include such quantifiable elements as square feet, cubic feet, number of floors, construction cost, number of rooms, number of stations, and so on. Buildings might be characterized by such items of information as year of completion, type of construction, name of the building, ownership, source of funds, and similar attributes. Buildings might be judged qualitatively with respect to their condition, their suitability for the programs they house, and so on.

Data concerning rooms might include such quantifiable elements as dimensions, square feet, cubic feet, lineal feet of chalkboard, number of electrical outlets, light level, and so on. Rooms might be characterized by such items as the type of room (classroom, laboratory, etc.), the departmental unit to which it is assigned, and the function (instruction, research, etc.) which it serves. Rooms might be judged qualitatively with respect to their condition or their suitability to the academic program served.

The temptation is great to enumerate all possible data concerning buildings, and the rooms within them, and to proceed to collect the data. But experience soon proves that the initial task is monumental. If it is not abandoned before it is completed the first time, it is soon set aside when the enormity of the task of keeping such data up-to-date is realized.

Design

Concurrent with the initiation of this space study for five South Carolina colleges and universities, an inventory data collection system was being developed in cooperation with the U.S. Office of Education. The early drafts of materials prepared for the Office of Education formed the basis for the classification system used in this study. Between these original drafts and the most recent draft, which has been published and released by the U.S. Office of Education, only minor modifications occurred. Thus, the data collection system employed in this study should allow these institutions to collect data not only on a basis comparable with each other, but also in consort with many other institutions in the United States.

Institutions

This study included five public colleges and universities in South Carolina:

The Citadel

Clemson University

South Carolina State College

University of South Carolina

Winthrop College

The eight regional campuses of the University of South Carolina also were included in the study.

An early decision was made to exclude the Medical College of South Carolina from this study.

Data requested from each institution included the following:

Building Information	(FORM A)
Room Information	(FORM B)
Classroom-Laboratory Utilization	(FORM C)
Office Assignments	(FORM D)
Enrollment Data	(FORM E)

Building Information

The five institutions participating in this study were requested to provide certain information on all buildings which they owned:

1. Building Name
2. Building Code
3. Date of Original Construction
4. Date of Latest Major Addition
5. Date of Latest Major Renovation
6. Condition of Building
7. Suitability of Building for Present Purposes
8. Gross Square Feet in the Building

Room Information

For each room in each building the following information was requested:

1. Building Name
2. Building Number
3. Room Number
4. Square Feet in the Room
5. Departmental Assignment of the Room

6. Type of Room

7. Function Served by the Room

8. Institutional Code

9. Date of the Inventory

Classroom-Laboratory Utilization

For all courses offered during the Fall Term, 1966 these data were required:

1. Building Name

2. Building Number

3. Room Number

4. Beginning and Ending Hour of Class

5. Departmental Assignment of the Room

6. Department Offering the Course

7. Course Number

8. Type of Room

9. Number of Stations in the Room

10. Enrollment in Each Section of the Course

11. Rated Capacity of the Room

12. Institutional Code

Office Assignments

For each room identified as an office, the following information was requested:

1. Building Name

2. Building Number

3. Room Number

4. Square Feet in the Room

5. Number of Occupants Classified by:

   a. Administrative-Professional

   b. Faculty

   c. Faculty Assistants

   d. Clerical-Technical

   e. Students

   f. Other

6. Rated Capacity of the Office

7. Departmental Assignment of the Room

8. Type of Room

9. Function Served by the Room

10. Institutional Code

Enrollment Data

For the Fall Term, 1966 data were requested by level of student, separately for on and off campus, for the following:

1. Head Count Number of Students

2. Student Credit Hours

3. Student Contact Hours

CHAPTER III

INVENTORY OF EXISTING FACILITIES

The inventory process of this study required information on both a building and room basis. This chapter first presents summary tables of building information and then room inventory summaries.

It is important to recognize that the building information summaries contain some evaluative considerations. The discussion of the condition and suitability of existing facilities might have been included in the following chapter since it does involve the concept of evaluation. However, the analysis of the condition and suitability of the physical plants of these five institutions is included early in this chapter because it is a necessary and basic point of reference for the room inventory information and utilization analyses which follow. It is not enough to know the amount of space nor how well it is used. Something must also be known about the basic condition of the space that exists. Before passing judgment on the use of existing space, some knowledge of its suitability for present purposes is important.

Building Inventory Summary

The five institutions reported that in the aggregate they owned 9,081,543 gross square feet of buildings. Table 3.1 shows the distribution of this space by institution.

Table 3.1

Gross Square Feet
by
Institution

Institution	Gross Square Feet	Percentage of Total
The Citadel	1,218,198	13.4
Clemson University	3,002,942	33.1
South Carolina State College	626,566	6.9
University of South Carolina	2,763,040	30.4
U.S.C. Branches	195,445	2.2
Winthrop College	1,275,352	14.0
Total	9,081,543	100.0

Table 3.2 indicates the percentage of gross square feet by date of original construction. For all institutions combined, 48 per cent of the buildings have been built since 1950. For individual institutions, however, construction since 1950 ranges from 19 per cent at Winthrop College to 64 per cent at Clemson University.

Table 3.3 provides a cumulative summary of the percentages in Table 3.2. The sixth line of this table is of particular interest. While 51 per cent of the total gross square feet for all campuses was constructed prior to 1950, this average is representative only of the University of South Carolina; for other institutions the range is from 35 per cent at Clemson University, 38 per cent for the University of South Carolina Branches, and 45 per cent at South Carolina State College, to 69 per cent at The Citadel and 78 per cent at Winthrop College.

Table 3.2

Percentage of Gross Square Feet
by
Date of Original Construction

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College	Total
Prior to 1900		6		7	6	17	6
1900-1909		1		1	13	14	3
1910-1919		2	13	8		17	6
1920-1929	28	5	9	7	8	12	10
1930-1939	29	14	13	15	11	10	16
1940-1949	12	7	10	13		8	10
1950-1959	17	46	46	28			29
1960-1966	13	18	9	20	62	19	19
Date Unknown	1	*	0	1	0	3	1

*Less than 1 per cent.

Table 3.3

Cumulative Percentage of Gross Square Feet
by
Date of Original Construction

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College	Total
Prior to 1900		6		7	6	17	6
Prior to 1910		7		8	19	31	9
Prior to 1920		9	13	16	19	48	15
Prior to 1930	28	14	22	23	27	60	25
Prior to 1940	57	28	35	38	38	70	41
Prior to 1950	69	35	45	51	38	78	51
Prior to 1960	86	81	91	79	38	78	80
Prior to 1966	99+	99+	100	99+	100	97+	99+

+Remaining percentage equals "Date Unknown."

As part of the Building Information Inventory the institutions were asked to evaluate each building on two bases.

A. The condition of each building was rated on the basis of the following categories:

   1. Satisfactory condition--will require only normal maintenance and repair for the next ten years.
   2. Requires major renovation--now needs (or will need in the next five years) major remodeling.
   3. Should be razed.

B. The suitability of each building was rated on the basis of its adequacy for the programs housed in it according to the following categories:

   1. Adequate--The units now housed in this building can function efficiently and no change is anticipated during the immediate future (next ten years).
   2. Fair--The units now housed in this building are crowded for space, but the kind of space is suited to their purposes; OR, the program suffers minor handicaps because of the nature of the space.
   3. Poor--Extreme overcrowding hampers the efficiency of the units housed here.
   4. Remodeling is required to make the space suitable for the program housed in this building.
   5. Should be Replaced--The space is so poorly suited to its present purpose that replacement is necessary.

Site visits to each of the campuses were made in order to verify the building ratings submitted by each institution. No substantial reasons were found for changing the ratings made by the institutions.

Table 3.4 indicates the percentage of gross square feet on each campus categorized by the present condition of the facilities. For all buildings on all campuses the institutions judge that one-half of the space is in satisfactory condition, forty-four per cent requires major renovation, and six per cent should be razed. The percentage of gross square feet which requires major renovation ranges from 69 per cent at The Citadel to 10 per cent at South Carolina State College.

Whether or not the percentage figures shown for facilities requiring major renovation are precisely correct, they do result in two conclusions. First, immediate attention in the form of financial support must be given to correcting serious deferred maintenance problems. Second, the relative urgency of these problems is reflected by Table 3.4; that is, the problem is most critical at The Citadel, followed by the University of South Carolina and Clemson University, Winthrop College, and South Carolina State.

Table 3.5 shows the gross square feet on which the percentage figures in Table 3.4 are based. Nearly four million gross square feet are rated as requiring major renovation. The greater amounts exist at the University of South Carolina, Clemson University, and The Citadel.

Table 3.4

Percentage of Gross Square Feet
by
Condition of Building

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College	Total
Satisfactory Condition	25	52	64	50	62	64	50
Requires Major Renovation	69	43	10	47	38	31	44
Should be Razed	6	5	26	3	0	5	6

Table 3.5

Gross Square Feet
by
Condition of Building

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College	Total
Satisfactory Condition	310,097	1,558,190	399,673	1,391,040	122,195	818,376	4,599,571
Requires Major Renovation	835,690	1,289,833	65,506	1,293,100	73,250	399,218	3,956,597
Should be Razed	72,411	154,919	161,387	78,900		57,758	525,375
Total	1,218,198	3,002,942	626,566	2,763,040	195,445	1,275,352	9,081,543

Table 3.6 shows the percentage of gross square feet rated by the institutions according to its suitability for the programs now housed in the facilities. For the total space on all campuses, 39 per cent is rated adequate, 27 per cent as fair, 5 per cent as poor. Remodeling is needed for 22 per cent of the space and 7 per cent is judged as requiring replacement. The highest percentage of remodeling is needed at the University of South Carolina; a substantial percentage is required at Clemson University; a significant percentage is indicated for The Citadel. For both South Carolina State College and the regional campuses of the University of South Carolina a large percentage of the space requires replacement.

Again, immediate attention in the form of financial support should be given to updating outmoded facilities and to replacing space for which alterations are judged to be a poor investment.

Table 3.7 enumerates the gross square feet which formed the basis for the percentages listed in Table 3.7. Nearly two million gross square feet of space requires major remodeling. More than 600,000 square feet should be replaced.

It should be noted that data concerning the amount of space currently air-conditioned were not collected. Nor was the need for air-conditioning reflected in the ratings of existing facilities with respect to their condition and suitability. Addition of this consideration might materially affect the actual funds required by the institutions for alterations and improvements to their present physical facilities.

Table 3.6

Percentage of Gross Square Feet
by
Suitability for Present Purposes

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College	Total
Adequate	36	30	65	33	52	58	39
Fair	38	33	2	20	16	35	27
Poor	9	6	0	5	0	3	5
Remodeling Required	11	26	4	38	0	0	22
Should be Replaced	6	5	29	4	32	4	7

Table 3.7

Gross Square Feet
by
Suitability for Present Purposes

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College	Total
Adequate	434,701	914,809	405,162	911,140	100,800	745,352	3,511,964
Fair	460,254	987,875	13,570	542,400	31,331	441,150	2,476,580
Poor	107,559	166,464		148,400		33,817	456,240
Remodeling Required	144,173	733,514	28,501	1,047,000			1,993,188
Should be Replaced	71,511	160,280	179,333	114,100	63,314	55,033	643,571
Total	1,218,198	3,002,942	626,566	2,763,040	195,445	1,275,352	9,081,543

Although the ratings of buildings on the basis of condition and suitability represent separate evaluative characteristics, the judgments involved in making these ratings are not independent. It is difficult to imagine, for example, how the condition of a building could be rated as "should be razed" and its suitability simultaneously rated as "adequate."

Because of this interaction of judgments, Table 3.8 was developed. This table shows the percentage of gross square feet as a function of both condition and suitability.

No major discrepancies of judgment such as that cited in the example above are evident in this table. It is perhaps somewhat difficult to understand how the condition of a building can be rated as "requires major renovation," while on the basis of suitability it is evaluated as "should be replaced." Perhaps this reflects a realization that space which should be replaced is not likely to be replaced and therefore renovation is the only reasonable recourse. In any event only one per cent of all the space is so rated.

Table 3.8 suggests that 36 per cent of the space on all campuses combined is both in satisfactory condition and adequate for its present purposes. In general, the table again reflects the need for routine maintenance and repair to these facilities as well as the necessity for a considerable amount of renovation to make them suitable for the programs housed in them.

Tables 3.9 and 3.10 are at least of passing interest. They indicate, respectively, condition and suitability by the decade in which the facilities were constructed.

As might be expected, a high degree of relationship exists between buildings in satisfactory condition and recency of construction. The high percentage (25%) of space categorized as "should be replaced" for the 1940 decade reflects, of course, the post-World War II temporary buildings. It is surprising, however, to find 23 per cent of the space which requires major renovation in the 1950 decade.

Table 3.10 also indicates a high degree of relationship between recency of construction and the suitability of the facilities. Again, however, 26 per cent of the space which requires remodeling was constructed in the 1950's. That 29 per cent of space rated as "poor" should have been constructed during the present (1960's) decade suggests the need for more adequate planning of facilities prior to construction.

Table 3.8

Percentage of Gross Square Feet
by
Condition of Building and Suitability for Present Purposes

	The Citadel	Clemson	South Carolina State	University of South Carolina	U.S.C. Branches	Winthrop	Total
Satisfactory Condition and							
Adequate	20	30	64	33	52	53	36
Fair	6	12	0	10	10	9	9
Poor	*	3	0	4	0	2	2
Remodeling Required	0	7	0	4	0	0	3
Should be Replaced	0	0	0	0	1	0	*
Requires Major Renovation and							
Adequate	16	*	1	0	0	6	3
Fair	32	21	2	10	6	26	18
Poor	8	3	0	1	0	0	3
Remodeling Required	12	19	4	34	0	0	19
Should be Replaced	0	*	3	1	31	0	1
Should be Razed and							
Adequate	0	0	0	0	0	0	0
Fair	0	0	0	0	0	0	0
Poor	*	*	0	0	0	*	*
Remodeling Required	0	0	0	0	0	0	0
Should be Replaced	6	5	26	3	0	4	6

*Less than 1 per cent.

Table 3.9

Percentage of Gross Square Feet
by
Condition and Date of Original Construction
for
All Institutions

	Satisfactory Condition	Requires Major Renovation	Should be Razed
Prior to 1900	1	12	13
1900-1909	3	3	2
1910-1919	4	7	21
1920-1929	4	16	28
1930-1939	3	32	5
1940-1949	11	7	25
1950-1959	38	23	1
1960-1966	36	*	0
Date Unknown	*	*	5

*Less than 1 per cent.

N.B.: Each column represents 100%.
Satisfactory condition based on 4,599,571 gross square feet.
Requires Major Renovation based on 3,956,597 gross square feet.
Should be Razed based on 525,375 gross square feet.

Table 3.10

Percentage of Gross Square Feet
by
Suitability and Date of Original Construction
for
All Institutions

	Adequate	Fair	Poor	Remodeling Required	Should be Replaced
Prior to 1900	1	8	9	12	12
1900-1909	4	0	7	3	5
1910-1919	4	7	0	8	17
1920-1929	4	14	*	14	25
1930-1939	6	13	42	31	14
1940-1949	12	8	1	6	21
1950-1959	28	44	12	26	1
1960-1966	40	6	29	*	*
Date Unknown	1	*	*	0	5

*Less than 1 per cent.

N.B.: Each column represents 100%.
Adequate based on 3,511,964 gross square feet.
Fair based on 2,476,580 gross square feet.
Poor based on 456,240 gross square feet.
Remodeling Required based on 1,993,188 gross square feet.
Should be Replaced based on 643,571 gross square feet.

Room Inventory Summary

The original design of this study proposed that three attributes of each room in all buildings be identified: type of room (e.g., classroom, office, etc.), department to which the space was assigned (e.g., Botany, Chemistry, etc.), and the function served by the space (e.g., Instruction, Research, etc.). In the course of the survey two important modifications to these original intentions were necessary.

First, because of the restrictions of time placed upon the study, it became apparent that not all rooms could be inventoried. Since certain auxiliary enterprises such as residence halls and related spaces were of little concern to the major purposes of this study, it was agreed that reasonable approximations to the total assignable square feet for certain facilities would be acceptable on a building-by-building basis.

Second, some of the institutions found it impossible to identify rooms on a departmental basis because major relocations were occurring concurrent with the inventory process.

The decision to permit the amount of assignable square feet to be specified on a building basis, rather than a room-by-room basis, for certain selected facilities created major data processing difficulties. A preliminary analysis of the data suggested that they were not submitted on a comparable basis by the five institutions.

Primarily two problems were evident. First, rather than "reasonable approximations" to the assignable square feet for certain buildings, some institutions reported the gross square footage. This meant that data could not be meaningfully added together since the total would consist of an admixture of assignable and gross square feet. It also meant that similar types of space could not be compared among institutions

since some had reported assignable square feet while others provided information on the basis of gross square feet. Second, while the intent was to limit the approximations of assignable square feet on a building basis to certain selected facilities, the institutions varied widely in their application of this agreement. Again, this meant that comparisons between instititions for certain types of space could not be meaningfully made on the basis of assignable square feet.

Despite these difficulties a procedure was adopted which provided a reasonable solution to the problem. Because some data were submitted on the basis of assignable square feet and some on the basis of gross square feet, it was necessary to find a common base for purposes of comparison both within and among institutions. The only possible common base was gross square feet since data for this unit of measurement were available for all buildings on all campuses. The problem, therefore, was solved by pro-rating all assignable square feet data "back to" gross square feet. Specifically, the assignable square feet reported on a room-by-room basis was summed over type of room within a given building. The totals by type of room were converted to percentages which were used to prorate the gross square feet in the building. When all assignable square feet data had been so converted, it could then be added to data reported on a gross square feet basis. In addition to using this procedure for the type-of-room dimension it was also applied to the analysis of the function classification.

Two tables which might otherwise have been included in this report cannot be presented because of incomplete data. These are the amount of assignable square feet by type of room and by function. The loss of these two tables is not of great significance. Tables showing actual amounts of

assignable square feet of space are frequently converted to percentages of the total for ease of comprehension and interpretation. Since the procedure outlined above permitted the computation of percentages by type-of-room and by function, the essential data for comparing relative amounts of space within and among the institutions is summarized in Tables 3.11 through 3.13 as percentages of prorated gross square feet.

Square Feet by Type of Room

Table 3.11 is based on the total building space in each institution. The largest percentage of space in each institution is devoted to residence halls, married student housing, faculty housing, and related facilities Percentages range from 31 per cent at Clemson University to 58 per cent at the University of South Carolina.

In very large measure, the first five broad categories of space in Table 3.11 represent the types of space directly related to the major purposes of institutions of higher education: instruction, research, and public service. It is interesting to note that these primary types of space account for less than half the total on all campuses, and less than one-third on three of them. It is interesting to note these percentages because it is this fact which makes the task difficult for those college and university administrators who are charged with the responsibility of a building program. Much of the "overhead" space, which ranges from 53 per cent to 75 per cent, as indicated in Table 3.11, is supported neither by state financing nor by Federal funds; nor is it glamorous enough to attract private donors. Nevertheless it constitutes important supporting space to the major purposes of these institutions. Without it these purposes could not be accomplished.

In anticipation of the discussion later in this report concerning classroom utilization, the reader's attention is directed to the first line of Table 3.11 which indicates that classroom space constitutes only 7 to 10 per cent of the space on the main campuses of these five institutions. Instructional laboratories comprise 5 to 15 per cent. In combination direct instructional spaces and their related service areas represent a range from 13 per cent to 23 per cent of the total space for the five campuses.

Table 3.11 indicated percentages of gross square feet by major type-of-room category for all space on campus. Table 3.12 represents the same kind of table but excludes residence halls and related spaces from the total.

Again, the reader's attention is directed to the relatively small part of the total non-residential space which is devoted to classrooms and class laboratories.

Again, even after residential space is removed from consideration, supporting spaces constitute from 29 per cent to 54 per cent of the space in these five colleges and universities.

Neither Table 3.11 nor Table 3.12 provide a basis for evaluating the use of space by these institutions. Nor should comparisons be made between the percentages which obtain in one institution and those which characterize any other. The data in these two tables can indicate to the expert eye, however, certain symptomatic evidence of items to be probed further. For example, one apparent symptom is the low percentage of library space at South Carolina State College. Another is the apparent paucity of research laboratory space at the University of South Carolina. The relatively small amount of instructional laboratory space at The Citadel suggests a further exploration of this statistic. The relatively small amount of supporting

space at Clemson University and Winthrop College might suggest a need for additional space of this kind.

Table 3.13 shows the percentage of gross square feet for all buildings by detailed categories of type of room. This table should be of interest primarily to the institutions themselves in validating the inventory information which they submitted. Unusually high percentages for any one type of room may prompt a study of the original categorization. In addition, if the table indicates no space of a given type exists at an institution, this fact should be verified.

Table 3.11

Percentage of Gross Square Feet
All Buildings
by
Major Type-of-Room Categories

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
Classrooms	9	9	8	7	21	10
Class Laboratories	5	11	15	6	19	7
Other Laboratories	-0-	11	*	2	4	1
Offices & Conference	7	11	9	10	14	7
Library-Study	4	5	2	5	11	3
Sub-Total	25	47	34	30	69	28
Special	13	5	13	4	1	5
General	10	12	12	6	6	18
Supporting	6	5	4	2	23	2
Residential & Related	46	31	37	58	1	47

*Less than 1 per cent.

Table 3.12

Percentage of Gross Square Feet
Excluding Residence Halls and Related Spaces
by
Major Type-of-Room Categories

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
Classrooms	17	13	13	16	21	19
Class Laboratories	8	17	23	13	19	14
Other Laboratories	-0-	15	*	7	4	2
Offices & Conference	14	16	14	24	14	13
Library-Study	7	7	3	11	11	6
Sub-Total	46	68	53	71	69	54
Special	32	7	20	10	1	9
General	16	18	20	15	7	33
Supporting	11	7	7	4	23	4

*Less than 1 per cent.

Table 3.13

Percentage of Gross Square Feet
All Buildings
by
Detailed Type-of-Room Categories

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
Classroom	9	9	8	7	20	9
Classroom Service	*	*	*	*	*	1
Classroom Total	9	9	8	7	20	10
Class Laboratory	4	9	14	5	17	6
Class Laboratory Service	1	2	1	1	2	1
Class Laboratory Total	5	11	15	6	19	7
Non Class Laboratory	-0-	7	*	2	2	-0-
Non Class Laboratory Service	-0-	4	-0-	*	1	-0-
Non Class Laboratory Total	-0-	11	*	2	3	-0-
Laboratory Service	-0-	-0-	*	*	*	1
Laboratory Total	5	22	15	8	4	8
Office	6	9	8	9	10	5
Office Service	1	1	*	*	1	1
Office Total	7	10	8	9	11	6
Conference	*	1	*	1	3	*
Conference Service	*	*	*	*	*	*
Conference Total	*	1	*	1	3	1
Office-Conference Total	7	11	9	10	14	7
Study Room	1	2	1	1	5	1
Stack	2	2	1	4	6	2
Study Service	*	*	*	*	*	*
Study Total	4	5	2	5	11	3
Armory	*	*	*	*	-0-	-0-
Armory Service	*	*	*	*	-0-	-0-
Armory Total	1	*	1	1	-0-	-0-
Athletic-Physical Education	2	1	2	2	-0-	3
Athletic Seating	9	*	4	*	-0-	-0-
Athletic Phys. Ed. Service	1	1	2	1	-0-	1
Athletic Physical Education Total	12	2	8	3	-0-	4
A-V, Radio, TV	-0-	*	*	*	-0-	*
A-V, Radio,TV Service	-0-	*	-0-	*	-0-	*
A-V, Radio, TV Total	-0-	*	*	*	-0-	*
Clinic	-0-	*	*	*	-0-	-0-
Clinic Service	-0-	-0-	-0-	*	-0-	-0-
Clinic Total	-0-	*	1	*	-0-	-0-
Demonstration	-0-	*	*	-0-	-0-	1
Demonstration Service	-0-	*	*	-0-	-0-	*
Demonstration Total	-0-	*	1	-0-	-0-	1
Field Service	*	2	2	-0-	-0-	*
Other Special	*	*	*	*	1	-0-
Special Total	13	5	13	4	1	5

Table 3.13 (Continued)

Assembly	2	1	3	*	4	5
Assembly Service	*	*	*	*	-0-	1
Assembly Total	3	1	3	1	4	6
Exhibition	*	*	-0-	*	-0-	*
Exhibition Service	*	-0-	-0-	*	-0-	-0-
Exhibition Total	1	*	-0-	*	-0-	*
Food	-0-	2	2	-0-	2	2
Food Service	-0-	2	1	-0-	-0-	4
Food Total	-0-	4	3	-0-	2	6
Health	1	*	*	*	-0-	1
Health Service	*	*	*	-0-	-0-	*
Health Total	1	*	1	*	-0-	1
Lounge	2	1	4	*	-0-	1
Lounge Service	*	-0-	-0-	*	-0-	*
Lounge Total	2	1	4	*	-0-	1
Merchandising	1	6	-0-	*	-0-	3
Merchandising Service	*	*	*	-0-	-0-	*
Merchandising Total	1	6	*	*	-0-	4
Recreation	2	*	*	*	-0-	*
Recreation Service	*	*	*	-0-	-0-	-0-
Recreation Total	2	*	*	*	-0-	*
Other General	-0-	-0-	*	4	-0-	-0-
General Total	10	12	12	6	6	18
Data Processing	-0-	*	*	-0-	-0-	*
Data Processing Service	-0-	-0-	-0-	*	-0-	*
Data Processing Total	-0-	*	*	*	-0-	*
Shop	3	2	*	*	-0-	1
Shop Service	*	*	-0-	-0-	-0-	*
Shop Total	3	2	*	*	-0-	1
Storage	3	2	2	*	-0-	1
Storage Service	-0-	-0-	*	-0-	-0-	*
Storage Total	3	2	3	*	-0-	1
Vehicle Storage	*	*	1	-0-	-0-	-0-
Vehicle Service	-0-	*	*	*	-0-	-0-
Vehicle Total	*	*	1	*	-0-	-0-
Other Supporting	*	-0-	-0-	1	23	-0-
Supporting Total	6	5	4	2	23	2
Residence-Single	22	21	27	44	-0-	44
One Family Dwelling	1+	3	5	*	1	2
Multiple Family Dwelling	18	6	5	14	-0-	1
Central Food Stores	3+	-0-	-0-	-0-	-0-	-0-
Central Laundry	1+	-0-	-0-	-0-	-0-	-0-
Residential Total	46	30	37	58	1	47

*Less than 1 per cent.

Square Feet by Function

The third dimension for which the five colleges and universities were asked to classify their space is known as the "Function Category." This category classifies space by the major purposes of an institution of higher learning(instruction, research, and public service)--plus certain supporting services (library, administrative-institutional services and auxiliary services).

To report the amount of space devoted to instruction, or to research, or to public service appears at first glance to be relatively straightforward. It is not. The best example of the complexity of classifying space by function is illustrated by a faculty office. It is possible that a faculty member may devote some of his time to instruction, some to research, some to public service, and some to administration. It is likely that all of these functional activities are pursued in some measure within the confines of his office. A definitive and accurate assessment of the amount of space devoted to each function involves the proration of a given type of space on some appropriate basis.

In the present study appropriate mechanics were provided for the proration of space. However, the institutions were encouraged not to prorate space unless it seemed absolutely necessary. This admonition followed from the limited time schedule, as well as an attempt to simplify as much as possible the complexities attendant upon the initiation of a systematic inventory process.

None of the institutions found it necessary to prorate space on the basis of function. It is likely that in the future some of them will find it desirable to do so. At that time some of the values reported in the tables which follow will change. Within the broad purposes of the present study, however, the data are adequate enough to serve as illustrative basic statistics.

Table 3.14 reports the percentage of gross square feet in each institution for all functions. Just as in the type-of-room analysis so again in the case of function, auxiliary spaces (residence halls and related facilities) constitute a large percentage of the space on the five campuses. Likewise instructional space represents a small portion of the total, ranging from 21 per cent at The Citadel and the University of South Carolina to 35 per cent at South Carolina State College.

Table 3.14 is based on all space in all buildings. Table 3.15 is based only on space which was functionally categorized as Instruction, Research, Public Service, Library, or Administration and Institutional Service; that is, Auxiliary, Non-Institutional, and Unassigned spaces are excluded. On the basis of this non-residential space, facilities classified as instructional in purpose range from 50 per cent at Clemson University to 79 per cent at South Carolina State College. Administrative and Institutional Service space ranges from 11 per cent at the University of South Carolina to 39 per cent at The Citadel.

Table 3.14

Percentage of Gross Square Feet
by
Function--All Functions

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
Instruction	21	26	35	21	50	34
Research	-0-	13	-0-	2	4	*
Public Service	-0-	1	-0-	*	-0-	-0-
Library	4	4	2	5	10	2
Administrative & Service	16	8	7	4	3	6
Auxiliary	59	44	55	68	31	55
Non-Institutional	-0-	1	*	-0-	-0-	-0-
Inactive	-0-	1	1	*	-0-	3
Alterations	-0-	1	-0-	*	-0-	*
Unfinished	-0-	1	-0-	-0-	2	*

*Less than 1 per cent.

Table 3.15

Percentage of Gross Square Feet
by
Function--Excluding Auxiliary, Non-Institutional, and Unassigned

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
Instruction	51	50	79	65	75	81
Research	-0-	25	-0-	7	6	*
Public Service	-0-	3	-0-	1	-0-	-0-
Library	10	7	4	16	15	6
Administrative & Service	39	15	17	11	4	13

*Less than 1 per cent.

CHAPTER IV

UTILIZATION

Completion of a space inventory is a necessary first step in a space utilization study. An inventory, however, yields data only concerning "how much" of "what kind." Analysis of "how well" the space is being used or "how much more" is needed requires criteria against which to evaluate that which exists. These criteria generally are called space factors. Many levels of space factors are possible from very gross measures (e.g., square feet per student enrolled in the institution) to very refined indices (e.g., 4 square feet per weekly student hour for an organic chemistry teaching laboratory).

An over-all space factor such as 100 square feet per full-time-equivalent student is of limited utility. While such a measure may be useful as an average value for a particular group of institutions, it cannot be applied individually to institutions because the amount of space required by various educational programs differs greatly.

At a somewhat finer level of detail, it is possible to develop several factors based on the concept of square feet per student; for example, 10 square feet per student for classrooms; 10 square feet per student for teaching laboratories; 10 square feet per student for office space; etc. As averages such factors have a limited utility for some projection purposes. However, as an aggregate they have the same limitation of ignoring important program differences between institutions that a single gross statistic does. Whether a single measure of square feet per student is used or whether it is subdivided into five, ten, twenty, or one hundred pieces, the total result is the same.

The importance of program differences as they relate to space factors is illustrated in Table 4.1. Line 3 of this table indicates that the numbers of hours per week which students spend in organized groups for purposes of instruction range from 11.9 hours per week to 22.0 in these five South Carolina colleges and universities. Hours per week in classrooms range from 9.8 to 18.0. The average number of hours per week of laboratory instruction varies from 1.7 to 3.4. In view of these differing program demands among the institutions, a fixed value of classroom-space-per-student would disadvantage some of them, or provide an abundance for some, depending on the actual value used.

Table 4.1

Enrollment and Weekly Student Hours

		The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
1. Head Count Enrollment	HCE	2106	5540	1809	10353	1773	3068
2. Total Weekly Student Hours	TWSH	46409	114796	39850	160042	21027	61751
3. TWSH/HCE		22.0	20.7	22.0	15.5	11.9	20.1
4. Classroom Weekly Student Hours	CWSH	37862	91433	26926	129085	17448	37446
5. CWSH/HCE		18.0	16.5	14.9	12.5	9.8	12.2
6. Class Lab Weekly Student Hours	LWSH	7089	21165	10071	22050	3018	7291
7. LWSH/HCE		3.4	3.8	5.6	2.1	1.7	2.4

Two principles should guide the development of space factors:

1. They must recognize program differences within an institution and between institutions.
2. They must be appropriate to the kind of space being evaluated.

The application of these principles can be shown best by four illustrations:

1. Classroom Space Factors: The amount of classroom space required is related to the number of hours per week a classroom seat is required and the number of square feet necessary to accommodate that seat. As will be shown below in greater detail, this statement leads to the development of a classroom space factor based on square feet per weekly student hour.
2. Teaching Laboratory Space Factors: As in the case of classrooms, laboratory space needs are based on the number of hours per week a laboratory station is required and the number of square feet necessary to provide that station. Unlike classrooms, however, laboratories require widely varying amounts of space per station among the many areas of study. Hence, it is necessary to develop teaching laboratory space factors on the basis of square feet per weekly student hour for each area of study.
3. Office Space Factor: Unlike classrooms, office space is not scheduled and the concept of hours per week is inappropriate. Since offices provide a working space for faculty, staff, clerks, technicians, graduate assistants, etc., an office space factor should be based on square feet per (f.t.e.) person.

4. Library Space Factor: Library spaces typically consist of reading spaces, stack spaces, and work spaces for processing library materials. The amount of reading space required is a function of the number of students to be seated at one time and the square feet required to seat one student. The stack space required is a function of the number of volumes to be housed and the number of volumes which can be accommodated per square foot. Space factors for library processing areas may be developed in a manner similar to office space or as a percentage function of the reading and stack space.

Extensive effort by many individuals has been applied to the development of space factors for the many kinds of space found on college and university campuses. The results of this effort either have gone unpublished or have received little notice by most institutions. Within certain broad ranges there is substantial agreement among the individuals who have developed these factors, although the methodology and technique employed by them may differ considerably.

Space factors have not been, and probably need not be, developed for all types of space. While a unit area of space might be developed for stadium seating, for example, it is probable that the number of seats required depends more on the success of the athletic teams performing in the stadium than on any interacting relationships of students, staff, and educational program.

In the space utilization analysis which follows it is important to recognize that a complete and detailed evaluation has not been possible.

Space factors have not been developed for some of the types of space which exist in the colleges and universities participating in this study. Without a detailed and time-consuming analysis of the institutional programs it would be presumptuous to apply an assumed criterion.

In some instances, even though specific space factors have been developed somewhat less refined measures have been used either because necessary data were not available or the basic design of the study did not require such data.

Despite efforts to remove unintentional errors of fact and classification in the basic data, some discrepancies probably remain.

Classroom Utilization

The utilization of classrooms is best evaluated on the basis of a space factor which relates weekly student hours to assignable square feet in classrooms. Generally accepted ranges for a classroom space factor are from 0.7 to 1.00 assignable square feet per weekly student hour. A classroom space factor which has received relatively wide acceptance is .83 ASF/WSH. It is based on the following assumptions:

1. Classrooms can be scheduled, on the average, 30 hours per week.
2. When a classroom is scheduled, 60 per cent of the seats are used, on the average.
3. Each seat requires, on the average, 15 assignable square feet.

As a consequence of these assumptions a space factor of .83 ASF/WSH results:

30 weekly class hours per room x 60% "fill" = 18 weekly student hours per station

$$\frac{\text{15 assignable square feet per station}}{\text{18 weekly student hours per station}} = .83 \text{ ASF/WSH}$$

Table 4.2 shows how the public South Carolina colleges and universities compare with this optimal space factor. Note tnat values above .83 represent relatively poorer utilization, while values below .83 constitute more intensive utilization.

Table 4.2 indicates two utilization values. The first column is based only on those classrooms which were actually scheduled during the Fall Term, 1966. On this basis the institutions vary from .86 at the University of South Carolina to 1.59 at The Citadel. The second column of Table 4.2 is based on the total space which institutions reported as

Table 4.2

Classroom Utilization

	Assignable Square Feet per Weekly Student Hour	
	Scheduled Classrooms	All Classroom Space
The Citadel	1.59	1.74
Clemson University	1.58	1.91
South Carolina State College	1.01	1.06
University of South Carolina	0.86	0.94
U.S.C. Branches	1.29	1.45
Winthrop College	1.42	1.89

classroom space as well as related service space. This is the generally accepted basis for the 15 assignable square feet assumed in the classroom space factor. On this basis, the assignable square feet per weekly student hour ranges from 0.94 at the University of South Carolina to 1.91 at Clemson University.

None of the institutions reach the level of optimum classroom utilization, although the University of South Carolina and South Carolina State are within acceptable limits. At The Citadel, Clemson University, and Winthrop College, more classroom space exists than is required by present programs and enrollment levels. At optimum utilization levels the excess is approximately double the need at each of these three institutions.

It is of interest to analyze some of the reasons for these low levels of utilization. Since the space factor for classroom utilization is based on room use, station use, and assignable square feet per station, some insight can be gained by evaluating each institution against each of these three assumptions.

The first assumption is that classrooms can be scheduled, on the average, 30 hours per week. The data for the institutions show the following weekly class hours:

	Weekly Class Hours
The Citadel	19.5
Clemson University	21.3
South Carolina State College	21.6
University of South Carolina	30.4
U.S.C. Branches	25.3
Winthrop College	20.9

Only the University of South Carolina approached the assumed level of room utilization.

The second assumption is that 60 per cent of the seats will be occupied when the rooms are scheduled. The following percentages were found:

	Percentage of Seats Used when Room is Scheduled
The Citadel	63
Clemson University	47
South Carolina State College	87
University of South Carolina	55
U.S.C. Branches	52
Winthrop College	64

Three institutions, South Carolina State College, Winthrop College, and The Citadel exceeded the 60 per cent level for "seat use."

Since this percentage depends primarily on the capacity of the rooms in relation to the size of the groups meeting in them, it is also interesting to compare the average number of stations per room and the average class size for groups meeting in classrooms:

	Average Stations Per Room	Average Class Size
The Citadel	34.7	21.9
Clemson University	50.4	23.8
South Carolina State College	35.1	30.4
University of South Carolina	55.8	30.6
U.S.C. Branches	38.1	19.7
Winthrop College	43.8	26.7

The third assumption involved in the classroom space factor relates to square feet per station. The assumed optimal value is 15 assignable square feet. The actual values are indicated below for each institution. The first value is based on scheduled classrooms, only; the second reflects total classroom space and related service areas.

	Assignable Square Feet per Station	
	Scheduled Rooms	All Classroom Space
The Citadel	19.5	20.7
Clemson University	15.9	17.6
South Carolina State College	19.0	19.7
University of South Carolina	14.4	15.3
U.S.C. Branches	16.8	18.7
Winthrop College	16.8	23.5

These data suggest that, with the exception of the University of South Carolina, classrooms in these institutions have been designed with

more square feet per seat than is usually required--at least as an average. The fact that a substantial portion of the low level of utilization in classrooms arises from the basic design of the facilities may make improved utilization of these classrooms difficult to achieve.

This discussion of classroom utilization in the five colleges and universities necessarily concludes with the observation that each of the institutions could improve the use of its classroom space. Whether any of them will, or should, depends on a complex set of interacting factors. Improved classroom utilization requires attendant operating or capital dollar increases. In some instances it may not prove worth the investment.

Basically, improved classroom utilization involves the three evaluative measures which constitute the classroom space factor. If room utilization can be improved, or station use increased, or assignable square feet per station reduced, then the over-all utilization reflected in the space factor is enhanced.

Improved room utilization may be accomplished in two ways, one of which is more theoretical than practical. One method of improving room utilization is to redistribute students into smaller sections. Unless existing section sizes are large, this approach to improved utilization is not practical. Reducing section sizes increases the number of staff necessary, thereby increasing operating costs--probably far beyond whatever value might be attached to the improved use of space.

Another approach to improved utilization is to convert existing classroom space to other uses thereby reducing the basic number of classrooms. Provided other types of space are needed, and if classrooms

can be converted to these other uses, this represents a possible course of action. Undoubtedly, it requires capital funds for the necessary conversion from classroom space to some other use.

Improved station utilization is also possible in two ways, although one method is self-defeating. Station utilization might be improved by removing classroom seats, but this increases the average square feet per station, so no real improvement is made. Fundamentally, station utilization is improved by holding constant (or reducing) the amount of classroom space during a period of time when enrollments are increasing. A greater number of students in the same amount of classroom space results in improved utilization. Frequently, however, it is not possible to accommodate increased enrollments without the addition of other types of space--faculty offices, library facilities, or residence halls. A clear-cut example of this exists at The Citadel. Before additional students can be accepted and classroom use thereby be improved, additional residential space is required to accommodate the additional students.

The third approach to improved classroom utilization is to reduce the assignable square feet per station. In practice this is difficult to accomplish and nearly always expensive. Most rooms do not lend themselves to slicing off a piece which can be realistically developed for other uses. Only a detailed room by room, on the scene analysis will suggest possible courses of action. Experience suggests that the number of possibilities are minimal for improving utilization by reducing the square feet per station. However, new facilities which are being planned should certainly consider this factor in the design of classrooms.

Finally, the reader is reminded of an earlier admonition. The observation that classroom utilization is low in some of these institutions needs to be kept in perspective. The total space evaluated in this section on classroom utilization represents only 7 to 10 per cent of the space on the main campuses of these five institutions. Low classroom utilization should not be generalized as characteristic of the total facilities of these colleges and universities. Moreover, in at least one institution low classroom utilization has resulted from a recent decision to more effectively use faculty time. Often, faculty resources can be more efficiently used by increasing section sizes. The consequence is lower room utilization, at least until increased enrollments over a period of years can serve to bring the program and facility needs back into balance. Certainly no institution should be penalized for poor classroom utilization where this has resulted from an attempt to use more efficiently available operating funds.

Class Laboratory Utilization

The evaluation of class laboratory utilization requires the same type of space factor as classrooms. A class laboratory space factor is based upon weekly student hours for class laboratory instruction and the assignable square feet in class laboratory rooms plus related service areas. While the same elements are involved in a class laboratory space factor as for classrooms, the values used in the assumption differ from those used for classrooms. A class laboratory space factor is based on the following assumptions.

1. Class laboratories can be scheduled, on the average, 20 hours per week. (A value of 24 hours per week has been used by some institutions.)
2. When a class laboratory is scheduled, 80 per cent of the seats are used, on the average.
3. Because class laboratories require different amounts of square-feet-per-station, depending upon the instructional subject matter, the number of assignable square feet per station is a variable quantity. Assignable square feet per station (including related service areas) typically varies from 32 assignable square feet per station (for Business courses, for example) to 160 assignable square feet per station (for Nuclear Engineering courses and similar academic areas).

As a consequence of these assumptions a series of space factors for class laboratories results:

20 weekly class hours per room X 80% "fill" = 16 weekly student hours per station.

$$\frac{\text{X assignable square feet per station}}{\text{16 weekly student hours per station}} = \text{ASF/WSH}$$

If X equals:	Then ASF/WSH is:
32	2.00
40	2.50
48	3.00
56	3.50
64	4.00
72	4.50
80	5.00
96	6.00
112	7.00
128	8.00
144	9.00
160	10.00

Because some of the institutions were unable to provide information with respect to the departmental assignment of class laboratory space it has not been possible to evaluate class laboratory utilization on a subject matter area basis. However, a minimal analysis can be made.

With respect to the criterion that class laboratories can be scheduled, on the average, 20 hours per week, the five South Carolina colleges and universities indicated the following average hours per week of class laboratory use:

	Weekly Class Hours
The Citadel	15.3
Clemson University	17.7
South Carolina State College	12.1
University of South Carolina	23.9
U.S.C. Branches	13.4
Winthrop College	10.8

The University of South Carolina was the only institution which found it possible to schedule its class laboratories more than 20 hours per week.

For the second criterion, which assume that 80 per cent of the stations are occupied when the room is in use, the South Carolina institutions reached these levels of utilization:

	Percentage of Seats Used When Room is Scheduled
The Citadel	69
Clemson University	64
South Carolina State College	66
University of South Carolina	57
U.S.C. Branches	53
Winthrop College	56

None of the institutions reached the optimum level of 80 per cent station utilization when these class laboratories were scheduled.

A comparison of the average room capacity and the organized laboratory groups meeting in these rooms shows the following data:

	Average Stations per Room	Average Class Size
The Citadel	28.2	19.4
Clemson University	25.0	16.0
South Carolina State College	28.1	18.4
University of South Carolina	20.6	11.7
U.S.C. Branches	24.9	13.3
Winthrop College	37.6	21.0

Because of the extensive program differences in these institutions, it is not appropriate to assume that any single assignable-square-feet-per-station value can be applied to all of them. Actual average square feet per station are shown below for each institution.

	Average Square Feet per Station in Scheduled Class Laboratories
The Citadel	38.1
Clemson University	58.3
South Carolina State College	39.3
University of South Carolina	36.6
U.S.C. Branches	32.3
Winthrop College	22.7

All of these values seem reasonable on the basis of the educational program information available. Class laboratories in agriculture and engineering require relatively greater amounts of space per station than many other programs of study. This fact probably accounts for the larger average amount at Clemson University.

Table 4.3 shows two utilization values for class laboratories. The first column is based only on those class laboratories which were scheduled for use during the Fall Term, 1966. The second column is based upon all class laboratory and related service space as identified by the institutions.

Table 4.3

Laboratory Utilization

	Assignable Square Feet per Weekly Student Hour	
	Scheduled Class Laboratories	All Class Laboratory Space
The Citadel	3.6	5.4
Clemson University	5.2	11.2
South Carolina State College	4.9	6.5
University of South Carolina	2.7	4.3
U.S.C. Branches	4.5	7.7
Winthrop College	4.0	7.9

Generally accepted ranges for the values shown in Table 4.3 are from 2 to 3 assignable square feet per weekly student hour for scheduled class laboratories and 4 to 6 square feet when all class laboratory space is considered. Class laboratory utilization appears to be fairly good at the University of South Carolina and close to acceptable limits at The Citadel. More class laboratory space appears to be available at South Carolina State College, the U.S.C. Regional Campuses, and Winthrop College, than is required by present program needs. Two factors make an assessment of the utilization at Clemson University difficult. First, Clemson University has a heavy preponderance of academic programs in which the space required for a laboratory station necessarily exceeds the usual averages which obtain for class laboratories. Second, a number of rooms classified as class laboratories were not scheduled. Time did not permit a detailed room-by-room analysis to determine whether or not some of these rooms might have been more properly classified as non-class (i.e., research) laboratories.

Despite the limitations imposed by data of insufficient specifity, it seems fair to conclude that more class laboratory space exists in these institutions than is required for current enrollment levels.

Certain theoretical, as well as practical, approaches to improved room utilization were discussed above in connection with classroom utilization. These same techniques can be applied to improving class laboratory utilization, although the improvement involves many practical problems. Conversion of instructional laboratories to research laboratories is sometimes possible in institutions which require such space. Beyond this possibility there are few alternatives for converting class laboratories to other purposes. Since, as in the case of classrooms, a considerable amount of the low level of utilization results from a greater capacity in class laboratories than the classes typically scheduled in them, improved class laboratory utilization will be difficult to achieve.

Again, the reader is reminded that class laboratories and their related service areas represent only 5 to 15 per cent of the total facilities in these colleges and universities. In combination classrooms and class laboratories constitute 13 to 23 per cent of the total space. Improved utilization in both classrooms and laboratories is desirable, but it may prove difficult to achieve. Primarily it will result from enrollment increases at each of the institutions. These enrollment increases may create the need for other facilities such as library space, offices, and residential facilities.

Other Instructional Facilities Utilization

Most institutions have a number of specialized instructional areas or programs supporting the instructional process which do not lend themselves to evaluation on the basis of hours of use. Facilities included in this category are special class laboratories, individual study laboratories, home demonstration houses, laboratory schools, armory facilities, audio-visual, radio, and television facilities, and instructional (non-medical) clinics. In the course of time it may be possible to develop space factors for the evaluation of each of these facilities. For purposes of this study they have been grouped together under the concept of other instructional facilities.

Because the amount of other instructional facilities varies considerably with the program of the institution no single value can be recommended for all institutions. It seems reasonable to assume however that between 3 and 8 square feet per full-time equated student should be provided for other instructional purposes. Values at the higher level of this range ought to apply to those institutions offering programs requiring laboratory schools and/or home demonstration facilities.

Table 4.4 indicates the assignable square feet and assignable square feet per full-time equivalent student at each of the institutions. All values appear to be reasonable in terms of the institutional programs.

Table 4.4

Other Instructional Space

	Existing Assignable Square Feet	Assignable Square Feet per Student
The Citadel	14,489	5.95
Clemson University	19,235	3.39
South Carolina State College	12,690	7.64
University of South Carolina	29,113	3.14
U.S.C. Branches	382	0.26
Winthrop College	23,525	7.80

Non-Class Laboratory Utilization

The concept of hours of use in evaluating the utilization of facilities is appropriate only for instructional spaces which are scheduled. Non-Class Laboratories, typically used for graduate student training and/or research programs, usually are not scheduled.

Complex systems for evaluating non-class laboratory needs have been developed. However, few who have worked with the problem of assessing research space needs are prepared to defend, with a firm degree of confidence, the evaluative measures which have been developed.

In the present study only two institutions, Clemson University and the University of South Carolina, have significant amounts of research laboratory space. Since these spaces were not identified by departmental assignment, no meaningful analysis can be made. At present graduate student enrollment levels, the 225,000 assignable square feet of research space at Clemson University appear to be adequate. The 40,000 square feet of such space at the University of South Carolina is considerably less than one might expect to find on a university campus, but insufficient information is available to form a reasonable judgement in this instance.

It is not the function of a space utilization study to make program recommendations. However, this discussion of research space cannot be closed without observing the relatively few graduate students being trained and the relative paucity of research space to support graduate student training in these South Carolina public colleges and universities.

Office Utilization

Office space includes offices and conference rooms as well as the service areas related to them. A generally accepted criterion for faculty offices is 120 square feet per full-time equivalent person. Allowances for conference rooms and service areas range from 15 to 20 square feet per f.t.e. faculty. A criterion of 140 assignable square feet per full-time equivalent faculty is used in this study.

Administrative offices and related spaces require more space per person than faculty offices. For purposes of this study, 180 assignable square feet per f.t.e. administrative staff is used. This criterion is based on an assumed average of 150 square feet of office space and 30 square feet for conference and office related space.

Table 4.5 shows existing office space in relation to present numbers of occupants. Offices are identified by the function they serve--instruction, research, and so on. Within each functional category the first value indicates assignable square feet of total office type space (office, conference, and related) per occupant. The second line within each functional category indicates assignable square feet per occupant for offices only.

In all instances the amount of instructional, research, and public service office space appears to be adequate. Administrative office space apparently is sufficient at all institutions except the University of South Carolina where a considerable deficiency exists.

While these data suggest that the amount of office space is more than adequate to the need in most instances, it is not valid to assume that

additional staff can be housed in existing space. While it may be possible to put two faculty members in an office which has 150 square feet of space, it does not result in an average of 120 square feet per occupant. More importantly, to place two faculty members in one office negates the fundamental academic consideration that a private faculty office is necessary. A private office not only provides for maximum faculty productivity, but also assures a student that he can counsel with a faculty member in confidence.

Because Table 4.5 is based on averages it ignores this critical consideration of the need for private faculty offices. Table 4.6 shows for each institution the total number of faculty offices and the number which are shared by two or more staff members. Perhaps by some judicious planning the institutions can provide private faculty offices in all instances, either in existing space or in new facilities.

Another limitation of the averages presented in Table 4.5 is that they represent only a quantitative analysis. Visits to the several institutions suggest that the physical entity called an office, despite the amount of space, is a less than desirable environment in many instances. Paint, improved lighting, adequate furniture, and similar items need immediate attention in several areas at all institutions in order to provide a more appropriate environment for faculty and staff.

Table 4.5

Office Space
Assignable Square Feet per Occupant
for
Total Office Type Space and for Office Only by Function

	The Citadel	Clemson University	South Carolina State College	University of South Carolina	U.S.C. Branches	Winthrop College
Instructional	167	151	143	148	221	181
Office Only	143	138	137	133	135	136
Research		137				
Office Only		129				
Public Service		172		707		
Office Only		125		620		
Library	Included with Library Space					
Administrative	187	246	244	134	252	186
Office Only	137	153	162	108	252	160
Auxiliary	189	188	135	227		
Office Only	172	188	122	186		
All Types	176	169	170	149	227	182
Office Only	141	138	142	130	156	143

Table 4.6

Number of Faculty Offices

	Total Number of Offices	Number Shared	Percentage of Shared Offices
The Citadel	165	31	19
Clemson University	548	54	10
South Carolina State College	126	20	16
University of South Carolina	748	87	12
Winthrop College	191	29	15

Library Utilization

Libraries typically contain three kinds of space: reading space, book stacks, and library processing areas such as card catalogs, circulation desks, acquisition areas and so on. Varying amounts of office space, classrooms, and other types of space may also be contained in the physical facility called a library.

Reading space is usually evaluated on the basis of an assumed percentage of the student body which might be seated at one time and an assumed number of assignable square feet per reader. That twenty-five per cent of the students could be seated in library study space is a generally accepted criterion, although this percentage is sometimes increased by making a larger allowance for graduate students. The number of square feet per reader station has been variously estimated as ranging from 15 to 30 square feet. In this study 25 square feet per reader has been used. In combination, these assumptions (that the library reading space should accommodate 25 per cent of the student body and that 25 square feet per reader are necessary) result in a space requirement of 6.25 assignable square feet per full-time-equated student.

Space requirements for books range from 10 volumes per square foot to 20, in direct proportion to the size of the collection. A value of 12 volumes per assignable square foot has been assumed in this study.

Library processing areas typically require from 15 to 25 per cent of the combined reader and stack space. A value of 20 per cent has been used in this evaluation.

Table 4.7 indicates for each of the three types of library space the assignable square feet available for use in the Fall of 1966, the minimum amount required as of that time, and the difference between the two. While this table is of some interest, its limitations preclude any valid conclusions for two reasons. First, it is difficult to delineate reading space and stack space, particularly in open-stack libraries. Second, library areas tend to be interchangeable; reading space today may be stack space tomorrow. Hence it is more meaningful to develop library space needs on the basis of the criteria suggested above, but apply the evaluation to the total library space rather than its components.

Table 4.8 compares total existing library space with the minimum required. The "minimum required" is based on seating 25 per cent of the full-time-equated students, 12 volumes per square foot for existing collections, plus 20 per cent of the space required for readers and books. This table suggests that The Citadel and Clemson University still have room for additional volumes and/or readers in existing facilities. South Carolina State College, the University of South Carolina and its regional campuses, and Winthrop College were all operating beyond a reasonable capacity.

A third table has also been prepared for consideration of the reader. In all of the institutions, with the possible exception of Winthrop College, the number of volumes per student seems to be quite low. Table 4.9 sets forth some assumed ratios of volumes per f.t.e. student for each institution and then compares the minimum required library space with existing facilities. While this analysis further emphasizes the need for additional library space at South Carolina State College, the University of South Carolina and its regional centers, and Winthrop College, it also suggests that the space now available at The Citadel and Clemson University will permit the upgrading of their collections.

Table 4.7
Library Space by Type
Assignable Square Feet

	Existing[1]	Minimum Required	Difference
READING SPACE			
The Citadel	9,986	15,213	- 5,227
Clemson University	40,592	35,419	+ 5,173
South Carolina State College	4,486	10,381	- 5,895
University of South Carolina	13,958	57,863	-43,905
U.S.C. Branches	5,598	9,119	- 3,521
Winthrop College	6,095	18,850	-12,755
STACK SPACE			
The Citadel	16,893	7,833	+ 9,060
Clemson University	26,240	21,666	+ 4,574
South Carolina State College	1,906	6,667	- 4,761
University of South Carolina	77,488	62,500	+14,988
U.S.C. Branches	6,481	6,079[2]	+ 402
Winthrop College	21,910	18,333	+ 3,577
PROCESSING SPACE[3]			
The Citadel	3,884	5,376	- 1,492
Clemson University	15,250	13,366	+ 1,884
South Carolina State College	1,111	1,278	- 167
University of South Carolina	18,559	18,289	+ 270
U.S.C. Branches	299	2,406	- 2,107
Winthrop College	1,425	5,601	- 4,176

[1]Does not include 24,073 assignable square feet of unfinished space at Clemson University nor 1,668 assignable square feet at the U.S.C. Regional Campuses.

[2]Estimated value based on assumed requirement of 50 volumes per f.t.e. student.

[3]Minimum required processing space is based on sum of existing reader and stack space.

Table 4.8

Total Library Space for Existing Collection Size
Assignable Square Feet

	Minimum Required Total Library Space	Existing Total Library Space	Difference
The Citadel	27,655	30,763	+ 3,108
Clemson University	68,505	82,082	+ 13,577
South Carolina State College	20,458	7,503	- 12,955
University of South Carolina	132,436	110,005	- 22,431
U.S.C. Branches	18,238	12,329	- 5,909
Winthrop College	46,420	29,430	- 16,990

Table 4.9

Total Library Space for Assumed Collection Size

	Assumed Volumes per Student	Minimum Required Total Library Space	Existing Total Library Space	Difference
The Citadel	50	30,424	30,763	+ 339
Clemson University	80	87,839	82,082	- 5,757
South Carolina State College	70	24,085	7,503	- 16,582
University of South Carolina	100	162,016	110,005	- 52,011
U.S.C. Branches	50	18,239	12,329	- 5,910
Winthrop College	70	43,740	29,430	- 14,310

Physical Education Facilities Utilization

Physical education facilities are sometimes considered to be class laboratories for purposes of evaluating their utilization. Such a procedure provides an adequate measure of their use by organized classes, but does not recognize the non-scheduled recreational or intramural use of physical educational spaces.

This study proposes that one student station and its related service areas should be available for each 10 undergraduate students. Estimates of the amount of space required for each physical education station and its related services vary from 96 to 150 square feet. A value of 100 square feet per station (including related services) has been used here. Thus, it is recommended that for each full-time-equated undergraduate student 10 square feet of physical education space is required. This does not include spaces primarily used for intercollegiate athletics nor for spectator seating in connection with such events.

Table 4.10 shows the existing physical education spaces and the required amount based on 10 square feet per full-time-equated undergraduate student. This table suggests that the amount of physical education space at The Citadel, South Carolina State College, and Winthrop College was reasonably adequate. Major deficiencies existed at the time of this study at both Clemson University and the University of South Carolina.

Table 4.10

Physical Education Space
Excluding Intercollegiate Athletic Space

	Existing Assignable Square Feet	Minimum Required Square Feet	Difference
The Citadel	23,228	24,340	- 1,112
Clemson University	38,136	54,390	- 16,254
South Carolina State College	15,671	15,780	- 109
University of South Carolina	55,983	83,060	- 27,077
Winthrop College	26,521	29,940	- 3,419

Student Health Facility Utilization

Space requirements for student health facilities vary considerably among colleges and universities depending on the amount of responsibility which the institution accepts for student health care. Where infirmary facilities are provided the assignable square feet per student tends to decrease as numbers of students increase. This is true because certain minimal facilities are necessary to operate a health center whether it contains 10 beds or 100 beds. More accurately, an increase from 10 beds to 100 beds need not require a proportionate increase in health service facilities.

For purposes of this evaluation the standards recommended in "A Restudy of the Needs of California in Higher Education" have been used. These standards are:

First 2,000 students--	4.0 assignable sq.ft. per full time equivalent student
Next 3,000 students--	3.0 assignable sq.ft. per full time equivalent student
Second 5,000 students--	2.5 assignable sq.ft. per full time equivalent student
Third 5,000 students--	2.0 assignable sq.ft. per full time equivalent student
Beyond 15,000 students--	1.5 assignable sq.ft. per full time equivalent student.

On the basis of these recommended standards Table 4.11 shows the required assignable square feet in comparison with the existing facilities for each institution.

With the exception of The Citadel, all institutions had a space deficiency in student health facilities. The deficiency was particularly serious at the University of South Carolina and Clemson University. Less than adequate facilities were available at South Carolina State College and Winthrop College.

Table 4.11

Student Health Facilities

	Existing Assignable Square Feet	Minimum Required Square Feet	Difference
The Citadel	10,670	9,302	+ 1,368
Clemson University	8,259	18,668	- 10,409
South Carolina State College	3,968	6,644	- 2,676
University of South Carolina	6,800	27,645	- 20,845
Winthrop College	8,024	11,048	- 3,024

General Use Facilities

In addition to student health facilities each institution usually provides various facilities of institution-wide utility. Included in this classification are auditoriums, chapels, museums, student unions, recreational spaces, non-residential food facilities, and similar facilities.

For general use facilities 10 to 15 square feet per full-time equated student normally provides adequate facilities. As Table 4.12 indicates, only the University of South Carolina and its regional campuses fall within this recommended range. All other institutions appear to have more than adequate amounts of general use space available. The reader is cautioned not to place too much credence on the exact values shown in this table. Some of the problems discussed earlier in this report concerning whole-building estimates of assignable square feet were particularly evident in some of the reporting for facilities on which this table is based. It can be anticipated that on the occasion of future reporting by these institutions some of the values in this table may be reduced.

Table 4.12

General Use Facilities

	Existing Assignable Square Feet	Assignable Square Feet per Full-time Equated Student
The Citadel	71,529	29.39
Clemson University	121,247	21.40
South Carolina State College	44,457	26.76
University of South Carolina	122,183	13.20
U.S.C. Branches	7,982	5.47
Winthrop College	63,193	20.95

Storage and Other Support Facilities

Storage and related support facilities are a necessary part of the operation of any college or university. This category of space includes central storage rather than "at-hand" storage. Space which stores materials which by their nature must be close at hand should be classified as service to a primary space category.

Normally 2 to 4 square feet per full-time-equated student is sufficient for purposes of storage space needs. Table 4.13 indicates that Winthrop College has less than this amount, the University of South Carolina has storage space within this range, while the remaining institutions have storage space well in excess of this recommended value.

Table 4.13

Storage and Other Support Facilities

	Existing Assignable Square Feet	Assignable Square Feet per Full-time Equated Student
The Citadel	28,380	11.66
Clemson University	61,306	10.81
South Carolina State College	19,462	11.72
University of South Carolina	20,566	2.22
Winthrop College	2,368	0.77

Physical Plant Shops

The amount of space necessary for physical plant shops is directly related to the amount of facilities to be maintained. Two to three per cent of the existing assignable square feet of the total facilities to be maintained is usually sufficient for physical plant shops.

Because assignable square feet were not reported for all facilities an estimate has been made by assuming 60 per cent of the gross square feet to be assignable. These estimates, as well as the percentage of this total represented by physical plant shops, are shown in Table 4.14. With the exception of The Citadel, all institutions had minimal amounts of physical plant shop space.

Table 4.14

Physical Plant Shops

	Gross Square Feet--Total	Estimated Assignable Square Feet	Shop Assignable Square Feet	Percentage of Estimated Assignable Square Feet
The Citadel	1,218,198	730,919	31,593	4.3
Clemson University	3,002,942	1,801,765	28,817	1.6
South Carolina State College	626,566	375,940	1,272	0.3
University of South Carolina	2,763,040	1,657,824	9,178	0.6
Winthrop College	1,275,352	765,211	8,096	1.1

CHAPTER V

RECOMMENDATIONS

Hopefully, this summary report of a space study of five public colleges and universities in South Carolina marks a beginning. It is a paradox of space utilization studies that after the data are collected and summarized the real task begins. Inevitably such studies lead to the conclusion that improvements are possible. Between these possible improvements and actual increases in levels of utilization lie several complex, interacting factors. These factors include projected institutional enrollments, relative proportions of students by level, class sizes, numbers of faculty and staff, operating and capital budgets--indeed, the full range of factors which derive from the institution's definition of its instructional, research, and public service programs. Because improved utilization can only be accomplished within the framework of the total educational program of a college or university, such a study as is reported here cannot, in good faith, chart a specific course for recommended improvements. However, certain recommendations can be made. The degree to which these recommendations can be implemented can only be judged by the institutions themselves. Such judgment inevitably rests on day-to-day decisions based on a long-range educational plan.

General Recommendations

1. It is strongly recommended that the inventory process initiated as a part of this study become a continuing process in each of the colleges and universities.
2. In order to implement this first recommendation, it is suggested that each institution identify one individual with responsibility for the space inventory process and that analyses of the data be made which will enhance the administrative decision-making process.
3. To further assure these two recommendations, it is urged that, either by voluntary cooperation or by request of an appropriate State of South Carolina agency, yearly summaries of existing space and evaluative reports concerning its use form the basis for institutional statements concerning total long-range building needs.
4. Immediate impetus can be given to these three recommendations by inclusion of these five colleges and universities within the study sponsored by federal Comprehensive Planning Funds under the Higher Education Facilities Act. It is recommended that these institutions be included in that study.
5. Patience and understanding is urged upon those who must finally decide the level of capital outlay support and its distribution to the institutions. Some of the problems noted in this report can be corrected, but time measured in years will be needed. Other problems may never be capable of reasonable solutions. A hard-line stance against additional facilities until present levels of utilization are improved is NOT recommended, since it might preclude the necessary conditions for improvement.

Specific Recommendations

1. Routine maintenance and repair of existing facilities is critically needed in varying degrees at the five institutions. Further, many facilities require greater or lesser amounts of up-dating. Inadequate lighting is one example. It is recommended that the institutions prepare a five-year plan of "catch-up" alterations and improvements for existing facilities and that these plans be supported with State funds to the maximum extent possible.

2. Improved utilization of existing facilities in each of the five institutions is possible and desirable. It is recommended that each institution study its use of classroom and class laboratory spaces and initiate a program of improved levels of utilization. In some instances conversion of classrooms or class laboratories to other uses may be considered. In other cases it may be profitable to wait for increased enrollments to match the space already available. A judicious combination of both these approaches is probably most appropriate.

3. In certain instances faculty and staff offices are overcrowded and in other cases the physical characteristics of the offices are inadequate. It is recommended that immediate attention be given to this problem by (a) conversion of existing classroom or class laboratory spaces to office space, (b) physical improvements to existing offices, and/or (c) construction of new facilities.

4. Since facility needs result from institutional programs, it is not appropriate in a space utilization study to conclude that an enlarged program should be initiated because a small amount of space exists. While the amount of research space which now exists may be equal to the need, the relatively few numbers of graduate students being trained raises a serious question of whether this fact is consistent with the manpower requirements of the expanding business-industrial enterprises in South Carolina.

5. Library space appears to be inadequate at several institutions. Increased facilities need to be provided where this has not already occurred since the inception of this study. Moreover, library collections need to be increased in several institutions.