

A PLANNING APPROACH TO THE PROVISION
AND THE OPTIMAL USE OF INSTRUCTIONAL
SPACE AT THE UNIVERSITY OF MANITOBA

A Thesis
Submitted to
The Faculty of Graduate Studies

In Partial Fulfillment
of the Requirements for the Degree of
Master of City Planning

by
Frank Steve John LeClair
May 1971



ACKNOWLEDGMENTS

There are countless people to whom the author is greatly indebted, and this acknowledgment is but a token of expression of gratitude.

This work draws heavily upon studies which have and are presently being carried out. Without the access to these studies, namely that of the Planning Secretariat and the Campus Planning Office at the University of Manitoba, this thesis would have been greatly hindered. In this respect, the author wishes to thank Mr. E. A. Hillman, Director of the Planning Secretariat, and Professor R. N. Allsopp, Director of Campus Planning Office, for their assistance in the writing of this thesis.

Finally, a special word of thanks is due to Professor V. J. Kostka, Head of the Department of City Planning, for his advice and assistance while supervising this thesis.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT.....	i
LIST OF ILLUSTRATIONS.....	iv
INTRODUCTION.....	v
 Chapter	
I. THE UNIVERSITY OF MANITOBA FROM PAST TO PRESENT.....	1
Teaching: Its Beginnings.....	1
The Site Controversy.....	6
The Era of Expansion.....	13
Conclusion.....	15
II. A UTILIZATION STUDY OF INSTRUCTIONAL SPACE AT THE UNIVERSITY OF MANITOBA.....	21
Instructional Space Analysis:.....	23
Terminology.....	24
Determining Minimum and Optimum Classroom and Laboratory Utilization.....	40
Costs of Poor Utilization.....	51
Conclusion.....	53
III. THE RECOGNIZING AND IMPROVING OF POOR UTILIZATION.....	55
Causes and Suggestions.....	57
A. Building labelling or assigning...	57
B. The dying day.....	60
C. Hours of building use per week....	64
D. Equivalent time: occupancy and credits.....	66
E. The abundance of choice.....	70
F. Other considerations.....	72
Conclusion.....	77

continued

Chapter	Page
IV. POINTS TO PONDER BEFORE BUILDING CONSTRUCTION.....	79
The Future and Education.....	79
Programming.....	82
Flexibility.....	84
A. Expandability.....	85
B. Transforming.....	88
C. Servicing provisions.....	89
D. Multi-purpose space.....	91
E. Convertibility.....	93
Conclusion.....	94
SUMMATION AND RECOMMENDATIONS.....	96
APPENDICES	
Appendix A.....	101
Appendix B.....	115
BIBLIOGRAPHY.....	128

LIST OF ILLUSTRATIONS

MAPS

page

1. BUILDING LOCATIONS OF FACULTIES OR SCHOOLS WITH SPACE NEEDS.....	50
2. CAMPUS REGIONS.....	56
3. BUILDINGS OVER FIVE STORIES.....	87

FIGURES

1. THE UNIVERSITY OF MANITOBA - 1932.....	18
2. THE UNIVERSITY OF MANITOBA - 1953.....	19
3. THE UNIVERSITY OF MANITOBA - 1970.....	20
4. ELEMENTS WHICH REQUIRE SPACE.....	27
5. THESIS DIAGRAM.....	28
6. HYPOTHETICAL ROOM TIMETABLE.....	31

INTRODUCTION

In past years, planning physical facilities at universities in general has been either non-existent or carried out in an informal and unsystematic manner. Generally speaking "rules of thumb" and personal persuasiveness were the two prime methods used to obtain new physical facilities and in so doing, guided the growth of many campuses. Today this approach is no longer adequate due to the tremendous increase in enrollments and limited financial resources. Therefore, a more sophisticated analytical approach is necessary in an effort to provide facilities for those who are in need of them and in a location where they can be optimally used. One such approach is the numeric method of space utilization, which is presented in this thesis.

Chapter I will provide an historical sketch of the University of Manitoba. From this outline it will be possible to appreciate the air of uncertainty in which the University developed, thereby resulting in an unsystematic approach in providing new facilities. Also, this chapter will serve to contrast the previously stated approach with that of the systematic or numeric approach

in providing new instructional facilities at the University. Finally, within this chapter, one should be aware of the cyclical nature of history, that is, history repeating itself in relation to the financial situation of the University. For example, in the 1930's and 1940's there was a scarcity of finances; the 1950's and 1960's saw an abundance of monies, while in the 1970's there seems to be a recession, resulting once more with a scarcity of finances as was the case in the 1930's and 1940's. The important difference is that now university planning can accept these changes in governmental policy and generate alternative futures which are considerably less sensitive to the turns of the wheel of fortune.

Chapter II, entitled, "A Utilization Study of Instructional Space at the University of Manitoba," provides a discussion on instructional space analysis and costs of poor utilization. In addition, this study will make it possible, through numerical manipulation, to point out Faculties or Schools which are in dire need of additional physical facilities. This is in direct contrast to using "rules of thumb" or persuasiveness, to obtain new facilities in so far as with this study there are facts and

figures which prove that facilities are needed and by whom they are needed. Naturally, by knowing which faculties or schools are in immediate need of facilities in the future, one can therefore plan accordingly.

Chapter III points out the causes of poor utilization at the University of Manitoba and suggests some possible solutions to alleviate them thereby reducing the inefficiency and costs which they incur. The latter portion of this chapter will deal with the efficient use of space which is available. It is hoped with greater efficiency and substantial reductions in unnecessary costs, the savings could be allocated to other needed areas.

We have realized the need for supplying instructional facilities through the utilization study and through an examination of the causes of poor utilization and its solutions. Now, before the construction of the building can commence, attention must be focussed upon one final word of caution, which is found in the following chapter. In dealing with the building program, Chapter IV illuminates, as one example, the multiple definitions of flexibility. Due to the varied interpretations of such a term, the building program can be either improved or totally destroyed. In the case of the latter,

all previous stages of the numeric method of space utilization would have been in vain.

Finally, a brief summary will be presented as well as a list of recommendations, which will bring this thesis to an end.

CHAPTER I

THE UNIVERSITY OF MANITOBA FROM PAST TO PRESENT

In reviewing the history of the University of Manitoba, the problems which it has encountered over the years will become evident, and a better understanding of its present difficulties will be acquired. The following pages will primarily deal with the growth of the University of Manitoba from a historical point of view. In so doing, hopefully, the University's past will make it possible to cope more effectively with the future.

Teaching: Its Beginnings

In 1870, Manitoba became a province and seven short years after that event, the University of Manitoba was founded.

It was formed by the federation of three existing colleges: St. Boniface College, which traced its beginning to the coming of Fathers Provencher and Dumoulin in 1818; St. John's College, which looked back to the mission of Rev. John West in 1820; and Manitoba College, which sprang from the Presbyterian faith of the Selkirk Settlers of Kildonan and the pastorate of Rev. John Black, begun in 1851.

-
1. W. L. Morton, One University: A History of the University of Manitoba, 1877-1952, McClelland and Stewart Limited, 1957, p. 17.

The establishment of the University of Manitoba was not an easy task and only men with considerable faith and determination could have accomplished such a feat. Mr. R. C. Lodge expresses the determination of one such man in this way:

It is to the credit of Lieutenant-Governor Morriss that as he now and then admitted in conversation, he was able to round out his term of service (he retired from the governorship in 1877) with the fulfilment of his ambition to secure for the Province of Manitoba a university in which the colleges could play their part and in which there was room for future affiliations and future expansions.²

Concurrent with the establishment of the University of Manitoba, the Colleges of Wesley and Trinity, the former Wesleyan Methodist; the latter Episcopalian Methodist, were also being established with hopes that one day after the necessary conditions of adequate staff and equipment were met, they might become affiliated with the University of Manitoba. This dream became a reality when in 1884 the two Methodist churches united, and in 1888, Wesley College affiliated with the University.

2. R. C. Lodge, editor, Manitoba Essays Written in Commemoration of the Sixtieth Anniversary of the Manitoba, The MacMillan Company of Canada Limited, Toronto, 1937, p. 21.

The church colleges, of course, received benefactions³ while the University looked to the Government for financial help with hopes of receiving a land grant from them in an effort to acquire a source of revenue.

"In 1878 friends of the University appealed to Ottawa for a grant of land."⁴ Seven years later, "the Better Terms Act"⁵ came into being. One clause of this Act stated:

An allotment of land not exceeding one hundred and fifty thousand acres of fair average quality shall be selected by the Dominion Government and granted as an endowment to the University of Manitoba for its maintenance as a University capable of giving proper training for that purpose upon some basis or scheme to be framed by the University and approved by the Government.⁶

After having received this generous grant of land from the Government, the Council of the University appointed a Committee which was known as the Land Board⁷ to oversee the terms of transfer, the selection, the patenting and the ensuing sale of the land. By 1888, the Committee

3. Ibid., p. 30.

4. Ibid.

5. Ibid.

6. Ibid.

7. Morton, Op. Cit., p. 33.

reported that only 14,000 acres had been selected but by 1891 they were able to report that the selection of the lands had been completed and by 1898 the patents had been issued thereby placing the promised lands into the hands of the University.

While the Committee was endeavouring to complete the selection and patenting of the land allotment, another significant issue emerged: "This was the agitation to have the University advance from its original status as an examining and degree-conferring body and become a teaching university."⁸ In response to this new idea of a teaching university, "St. Boniface College adopted an attitude of determined opposition"⁹ while the Protestant Colleges called for an agreement whereby they could continue teaching a number of subjects in an effort to retain some connection between themselves and the students who wish to attend their colleges. The third view on the matter of a teaching university is related to us by W. L. Morton:

The one exception to the model of denominational and classical college was the Manitoba College of Medicine. For effective instruction and study

8. Lodge, Op. Cit., p. 31 (NB. It should be noted that at this time the University was only an examining body and not a teaching institution.)

9. Ibid., p. 33.

in the Medical College, it was necessary that the students had some grounding in natural science. From that college came then, a growing pressure for more and better instruction in the natural sciences. This pressure was reinforced by the rising prestige of the natural sciences, the example of their admission to the old universities and the new in Britain and the United States, and by the growing public feeling that the natural sciences were "practical", while the old classical curriculum was not.¹⁰

After hearing these three points of view a Committee was set up in an effort to reach a satisfactory agreement between those concerned. The recommendations consisted of letting the University undertake teaching in the Departments of Natural Science, Mathematics and Modern Language but no further subjects were to be taught unless a three-fourths vote was given by the Council. This solution seemingly appeased the Medical College and the Protestant College but St. Boniface College remained rather unhappy with the whole situation. "Archbishop Tache protested formally and at length against the proposed change in the constitution of the University as contrary to the Act of 1877 and to the understanding on which it rested".¹¹ But to no avail, the University Council voted and the result

10. Morton, Op. Cit., p. 41.

11. Ibid., p. 44-45.

was in favor of the University assuming the duty of teaching. "The appointment of university professors in Natural Science, Modern Languages and Mathematics had been authorized, but money for the payment of salaries was not available from the Government".¹² Consequently, the three colleges united their forces to teach the Natural Sciences. These lectures of course, were frequented by the students from the Medical College and quite naturally grew very rapidly. To accommodate this growth the term was lengthened from six to eight months and an urgent demand was therefore felt for more facilities.¹³

The Site Controversy

The Federal and Provincial Governments agreed that a site known as "Old Driving Park"¹⁴ which consisted of 6.6 acres should be designated for educational purposes and more specifically, the home of the University of Manitoba. Due to the increasing number of students wanting to enroll in the Natural Science courses, a

12. Lodge, Op. Cit., p. 37.

13. Ibid., p. 38.

14. Morton, Op. Cit., p. 51.

building was erected on the Broadway site "in 1901 at a cost of \$60,000.00, the money being secured from the Province by mortgaging the land grant."¹⁵

A plain angular building of the homely, buff Manitoba brick of the period, it blinked earnestly southward at tree-lined Broadway, and personified the new beginning the unpretentious and industrious university had made after many trials. The university, as distinguished from its component colleges, at last had a dwelling place, and a building suitably designed and equipped for the teaching of its special responsibility, the natural sciences.¹⁶

At this point the University was truly a teaching university with professors from the colleges becoming part time staff members of the University and teaching for half their time on salary from the University. Also, it was the very first time that the University had its own building.

The growth of the University by the incorporation of additional departments and the increase in the number of students led to an agitation in the council, in the newspapers, and in public meetings connected with the University, for a larger site.¹⁷

15. Lodge, Op. Cit., p. 43.

16. Morton, Op. Cit., p. 56-57.

17. Lodge, Loc. Cit.

The result of this concern for a larger site brought offers from the Tuxedo Park^K Company of 150 acres of land near the new City Park on the south side of the Assiniboine River, west of the city. There was another offer of about 50 acres in Kildonan on the east side of the Red River.¹⁸ It was felt by the University Council that a decision must be made between the two site offers which had been posed to them, and the site which they presently occupied on Broadway. It seemed to them that the Broadway site was the least desirable and that a decision between the other two would meet the approval of the Government. The University Council forged ahead and selected the Tuxedo site. The Government, as it turned out, never approved of the Tuxedo site and favoured continuation at the Broadway site with the realization that adjacent land would be expropriated to accommodate future expansion. It must be kept in mind that to the Government the selection of a site for the University involved more than just merely fixing a location. But, as far as they were concerned, the immediate large financial expenditure in the erection of buildings was the most important factor.

18. Ibid.

In any event the Government was not in a position to follow up any alternative location with a building program. The fact of the matter was that the Government had already made heavy provincial expenditures in education with the founding of the Agricultural College which the Greenway Government had committed them to in 1892. By 1906, the Agricultural College had buildings valued at \$250,000.00 on its temporary Tuxedo location.¹⁹ In 1912, a new site in St. Vital, approximately seven miles from the centre of Winnipeg, in a loop of the Red River, was chosen by the Roblin Government as the new home of the Agricultural College.

During 1911 and 1912 construction was rushed, in order that the buildings might be opened in the latter year. The buildings were large, massive and ugly; the original capital grants were generous, the costs heavy and increasing. It was evident that the Government and Legislature had decided to support the Agricultural College lavishly, by all past standards, whatever might be done for the University, still seeking re-organization and a permanent site, and struggling to accommodate a growing staff and student body in overcrowded buildings.²⁰

By 1920, immediately after the war, the University was incredibly overcrowded despite the erection of

19. Morton, *Op. Cit.*, p. 79.

20. Ibid., p. 87.

emergency buildings on the Broadway site. W. L. Morton expresses the situation in this manner:

The two university buildings, the old Law Courts and the Deaf and Dumb Institute, were swamped; space had to be obtained where it offered. Rooms were rented in houses on Vaughan Street, and there lectures were given in all the rooms from parlour to kitchen. The completion of the new Legislative Building on Broadway made space available in the old Legislative Buildings on Kennedy Street. Some room was found behind the Power Building behind the Law Courts; some further space in the Deaf and Dumb Institute. Thus, the University struggled to clothe itself in the caste-off garments of the Provincial Government, but only to outgrow them in its lusty adolescence. In 1919, therefore, the decision was taken to erect temporary buildings on the Broadway site, attached to and running south to Broadway from the University Building. In 1921, these part brick, part stucco buildings were completed and in their lengthy term of service were to point to the epigram that nothing is so lasting as the provisional. But the makeshift buildings gave the hard-pressed university the lecture theatres, laboratories and offices which made it possible to house the swelling enrollment.²¹

But by 1929, the emergency buildings on Broadway were again overcrowded, so much so, that the students rose in protest, marched on the Parliament Buildings and

21. Ibid., p. 125.

presented a petition of their grievances to the Premier. In reply to this display of agitation and concern, the Government appointed a Commission to settle, once and for all, the question of a site for the University. The Commission, after taking into consideration the financial investment of the Government in the Agricultural College and the estimates of four million dollars to develop the Tuxedo site and six million dollars to develop the Broadway site, recommended that the University and the Agricultural College amalgamate on the St. Vital site (that is, the present Fort Garry Campus). "In 1930, the Government announced the setting apart of 137 acres on the Red River adjoining the new site recently occupied by the Agricultural College"²² as the new home of the University. Thus after approximately a generation of uncertainty and agitation, the question of a permanent site for the University was finally settled. New buildings were at once begun and within two years the Arts Building and the Science Building were erected and occupied. The buildings, "in a collegiate Gothic style and limestone masonry which set against the massive brick and limestone trim of the

22. Lodge, Op. Cit., p. 45.

agricultural buildings, proclaimed them newcomers to the Campus".²³ With the site location settled, the University "offered each college a site of seven and a half acres with the use of the facilities of the University and invited them to move to Fort Garry".²⁴ However, the invitation was not immediately acted upon and it was not until some years later that St. Paul's College and St. John's College moved out to the Campus.

In any event, the University decided to leave the First and Second Years of Arts and Science and the First Year of Engineering on the Broadway site. This was in an effort to take advantage of the recommendation from Dr. W. S. Learned, of the Carnegie Foundation who suggested "that the Broadway site be developed as a Junior College".²⁵ Nevertheless, after some intensive study of the matter it was found that the concept of the Junior College could not fit into the secondary school system of Manitoba and in 1945 it was announced that the College would be moved to the University Campus. It might also be noted that the Act of 1933, abolished the

23. Morton, Op. Cit., p. 143.

24. Ibid., p. 144 (see also ff. 1 Free Press, April 6, 1932).

25. Ibid., p. 154.

University Council, the last connection with the constitution of 1877 and established the senate in its place.

With the war over, literally hundreds of veterans returned to the University and for the next four or five years the University was plagued with the lack of accommodation, the lack of staff and the lack of books. To appreciate the influx of the veterans one need only compare the University's enrollment figures in 1944-45 of 3,256 to that of 1946-47 of 7,360²⁶ an increase of 4,104 students in one year. To try to accommodate this tremendous increase in students, and the spatial problems which they posed, the building program surged ahead as fast as was possible.

The Era of Expansion

As Morton says, "from the spring of 1947 the campus was alive with the unwanted thudding of hammers and the chinking of masons' chisels".²⁷ The building program included such structures as: a large wing added to the Home Economics Building, a large wing added to the Engineering Building, construction of a Library Building, construction of a Student's Union Building, and the

26. Ibid., p. 172.

27. Ibid., p. 177.

erection of two temporary gymnasiums from aircraft hangars. One must be aware that although a number of buildings were being built, the 1950 flood caused considerable damage to the basements and buildings themselves and undoubtedly a considerable portion of the budget was allocated for the repair and restoration of these physical structures. Morton, however, seems convinced that the post-war prosperity would alleviate many of the problems of yesteryear.

The crowning of the effort of many years was made easier by the steadily mounting prosperity of the post-war years. It became possible to win slowly increased provincial grants, and to begin the restoration of staff salaries to levels approaching those of comparable universities.²⁸

In retrospect it seems that perhaps Morton was right about the mounting prosperity because from the late 1950's to the present time, many buildings, to name only a few, such as: the new Agricultural Research Building, St. John's College, St. Paul's College, Fletcher-Argue Building, Duff Roblin Building, Animal Science Building, Parker Building, Armes Building, Architecture Building, Fine Arts Building, Music Building, Law Building, University College, Women's Residence, Isbister Building, Swimming Pool, New Education Addition, New Student's Union Building, have

28. Ibid., p. 191.

been built in a span of some fifteen years. This is by no means a complete list and does not take into account those buildings which are presently under construction or those being contemplated within the next few months. The great number of buildings constructed within this relatively short span of time is rather remarkable when one considers the history of the University itself.

Conclusion

From the history of the University of Manitoba it can be realized that a long and agonizing growth process has been in operation from its initial stages. The early years were mainly concerned with two significant issues, the first was to find a permanent location and the second was to become a teaching institute instead of just a degree conferring body. It was not until 1930, some fifty-three years after the birth of the University of Manitoba, that a permanent site was finally located. One of the main reasons for the choice of the final site was the agitation precipitated by the incredible overcrowded conditions which were endured by the students in the late 1920's. After the site was settled upon, the years of depression came, followed by World War II. Throughout these years, it was financially impossible to add any new

buildings.

The end of the war saw many veterans returning from overseas and entering the University to start or complete their education. Naturally, the University just could not accommodate these tremendous increases because of the same old problem which had plagued it in the past, that is, the lack of space. As the University strived to accommodate the tremendous enrollment increase, another catastrophe, the 1950 flood, made its bid to drain away the University's funds. However, within a few years of the flood, they gained their balance and for the next fifteen years embarked upon an extensive building program. To obtain some idea of the magnitude of this program, three pictorial representations of the University of Manitoba in the years 1932, 1953 and 1970 are included. And so, as it is sometimes philosophically stated, "all good things must come to an end," or at least slowed down, financially, we have come to this stage once again, at the University of Manitoba. That is, the University has progressed through an early period of lack of financial resources in the 1930's and '40's, to a period of abundant financial resources in the 1950's and '60's. Now, it seems, with the tightening up of governmental spending, the days of

rapid physical growth have come to an end. It is time to assess the operation and utilization of one's institution to ensure that the available finances are being spent to produce a most efficient operation. In other words, it is a time when institutional planning should not be considered a luxury, but a necessity.



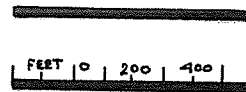
1932

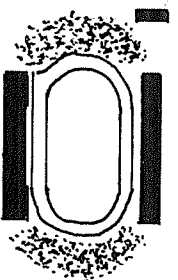


FEET 0 200 400



1953





1970

11



FEET 0 200 400

CHAPTER II

A UTILIZATION STUDY OF INSTRUCTIONAL SPACE
AT THE UNIVERSITY OF MANITOBA

It seems from the foregoing that in the early years of growth, the University of Manitoba was only allowed to add physical facilities at times when there existed a dire need and when public sentiment was strong enough to promote action. For example, in 1920 the University, then located on Broadway Avenue, was extremely overcrowded. Morton says that even the kitchens of rented houses were being used as classrooms. The culmination of this situation saw the erection of temporary emergency buildings on the site. In 1929, overcrowding again appeared, which resulted in the obtaining of a permanent site for the University itself and the addition of the Tier and Buller Buildings two years later. Then, just after the Second World War, the University was again plagued with that all too familiar problem of not enough space for the increasing student enrollment. The crisis situation was met with the addition of more facilities. Consequently, it is within this framework that one must view the next phase of growth which can be dated for all intents and purposes as the late 1950's.

These years can be characterized as W. L. Morton suggests by the steadily mounting prosperity of the post-war years and the possibility of winning "increased provincial grants from the government by the University."²⁹ Reflect for a moment on this tremendous change of events; previously it was building out of necessity, now it is building out of opportunity.

The University, quite naturally, took full advantage of this most fortunate turn of events and embarked upon a long-awaited building program. As the institution grew both in physical facilities and enrollment, it became evident that a whole new gamute of questions arose. It was in this atmosphere that the University adopted a concept of planning. "Planning as a process for rational decision-making is particularly appropriate for a university."³⁰ It "is a continuous process which relates people and their aspirations to the limitations of fiscal resources and the accommodations of physical facilities."³¹ Because the total problem is so complex,

29. Morton, Op. Cit., p. 191.

30. Knowles, Asa S., editor-in-chief, Handbook of College and University Administration: General, McGraw-Hill Book Company, New York, 1970, Volume I, p. 4-5.

31. Ibid., p. 5.

large colleges and universities often create a special planning network whose sole purpose is to carry on studies related to policy matters.

A good past in the case of a college (or university) building is one in which all the reasons for its being have been taken into account. The building that results is a synthesis of those reasons; a physical translation of the academic philosophy, policies, expectations, and needs of a particular institution.³²

Instructional Space Analysis

The translation of an educational program into physical facility requirements is a very difficult task. It requires a constant evaluation and re-evaluation of the primary space generators, the existing space and the development of new facilities. But before beginning the study of utilization of instructional space at the University, it is necessary to become familiar with some of the terms and definitions used in this study.

32. Jamrich, John X., To Build or Not to Build, A Report on the Utilization and Planning of Instructional Facilities in Small Colleges: A Report from Educational Facilities Laboratories, The Georgian Lithographers, Inc., 1964, p. 7. (The parenthesis are my own)

Terminology. 33

1. Student Station. The total facilities necessary to accomodate one student for a given period of time, usually one hour. A student station may apply to a classroom, teaching laboratory, teaching gymnasium, music practice room, or other areas where a student is involved.

2. Period. As used in space utilization, a period is a unit of time of approximately one hour. The terms period and hour are used synonomously.

3. Weekly Student Contact Hour. A unit of measure which represents one hour of instruction given to one student in one week. (As this measurement is based on a weekly effort, the utilization data of an institution on the quarter or semester system may be compared.) Some institutions use the terms student station period of occupancy, student contact hour, or student clock hour to indicate the same unit of measure.

4. Station Utilization. A percentage of student stations occupied when the room is in use. Some institutions use the term size ratio.

33. Source of Terminology

Bareither, Harlan D., and Schillinger, Jerry L., University Space Planning, Translating the Educational Program of a University into Physical Facility Requirements, University of Illinois Press, URBANA, CHICAGO-LONDON, 1968, p. 17.

5. Net Assignable Square Feet per Station. The number of square feet needed to accommodate one student in the particular subject field being evaluated. In this thesis, the square feet per station includes support areas such as preparation rooms, balance rooms, supply rooms, and so forth.

6. Room Utilization. A number of hours per week that a room (meaning either classroom, seminar, laboratory, or studio) is occupied by a regularly scheduled class. Some institutions use the terms weekly room hours, or weekly scheduled hours.

7. Square Feet per Weekly Student Hour. The number of square feet required to accommodate one student for one contact hour in a specific type of scheduled instructional space. Some institutions refer to this as a space factor. This value will be used in space projections and is a value that gives in one number an index of net assignable square feet per student station, station occupancy, and room period usage.

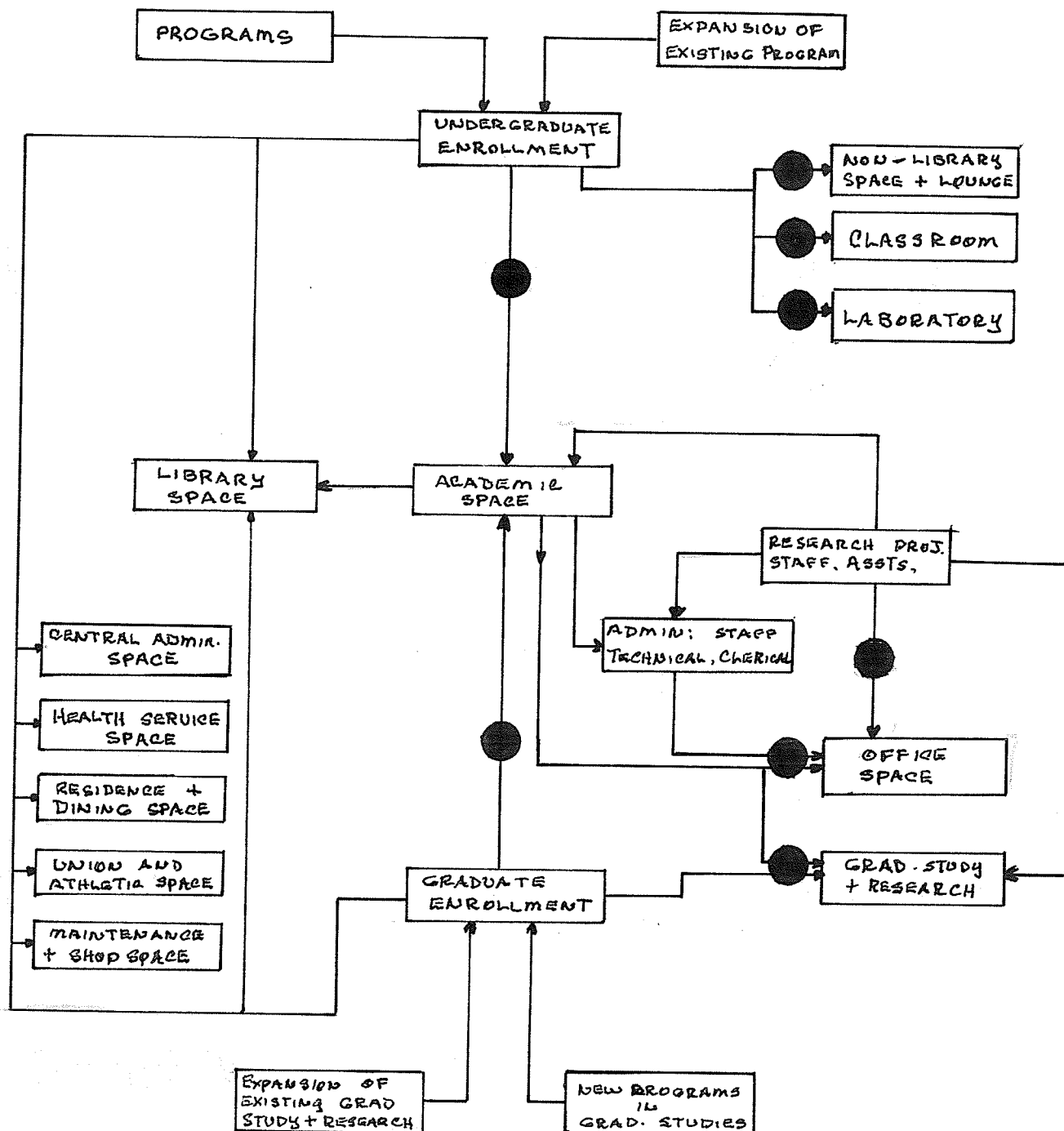
8. Teaching Laboratory Area Per Weekly Student Contact Hour. 1 student in a laboratory for one hour in one week = 1 weekly student contact hour, or,

$$\frac{\text{average area per station}}{\text{hours per week of lab use} \times \text{station utilization}}$$

On the following Figure 4 are a number of elements in a University setting which require space. At this time focus will be given to two of these elements, that is, classroom and seminar space, and teaching laboratory space. At this time it is also necessary to focus attention upon the accompanying Figure 5, which portrays in a diagrammatical form, the essence of this thesis.

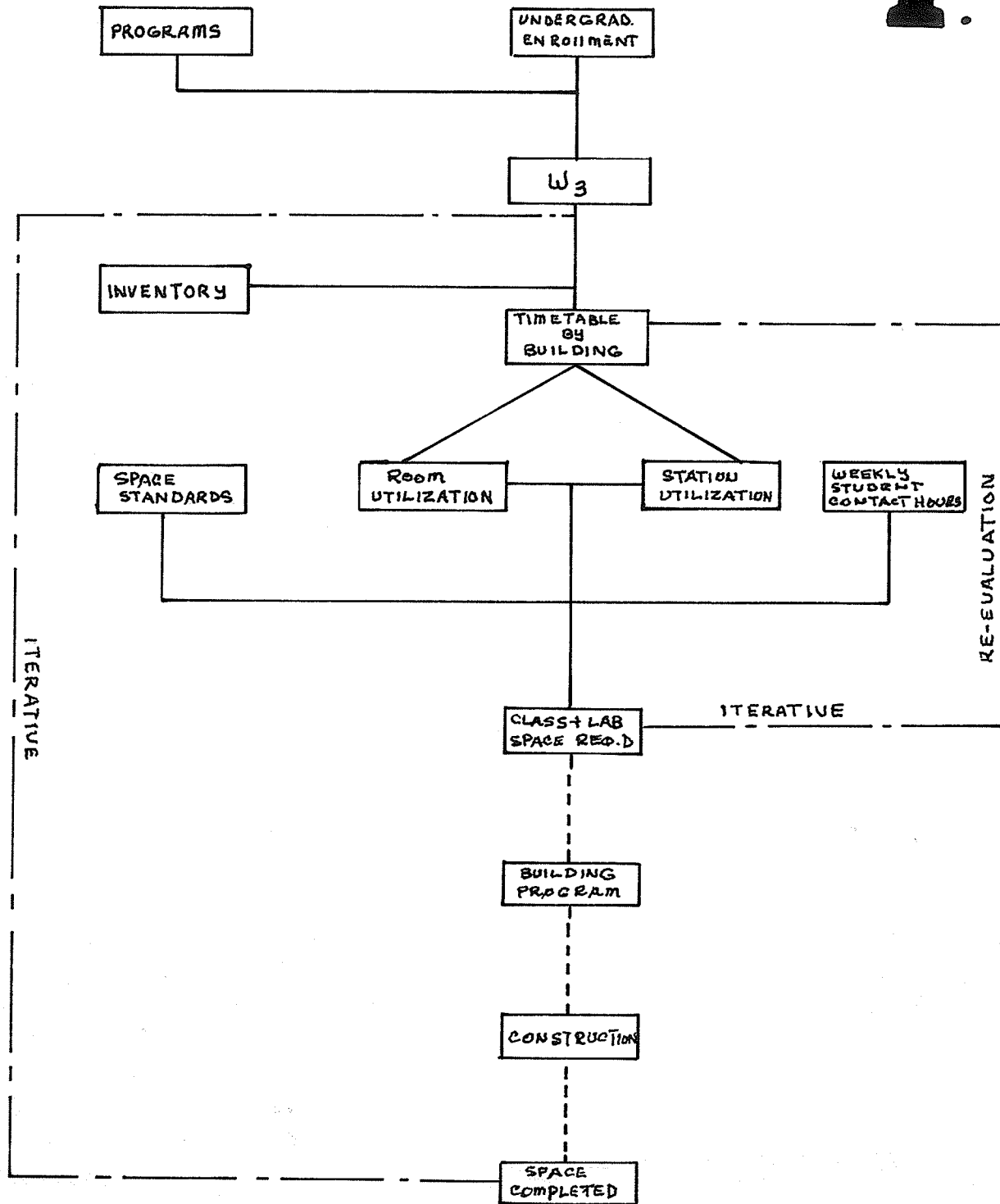
Obviously, one of the first steps to be taken before any consideration of future instructional space needs by a faculty or school, is to obtain the necessary data. The information needed in this instance can be obtained from two sources, a space inventory will provide complete and thorough knowledge of the existing physical facilities. This type of information will provide knowledge of the existing situation as well as facilitate in the re-arranging, reporting and updating of space as changes take place. Undoubtedly, the inventory must have considerable flexibility to supply the needed reports in various formats.

In regard to classroom and laboratory space, the inventory can supply the necessary information on such items as: the building number; floor number; room description - category, type, number of stations; room area in square feet; environment - room finish, condition of



● denotes specific faculty policy (which may or may not exist) regarding size of resource being generated e.g. specific policy on maximum student/staff ratio, minimum office size, etc.

F.5



furniture, lighting, ventilation; electrical supply - AC/DC; water supply - hot, cold, distilled; gases - natural, compressed air, vacuum, steam, nitrogen, others; audio-visual aids - T.V. monitor, T.V. screen, T.V. broadcast, blinds, projection screen. Some of these items are used in the utilization study. The space inventory at the University of Manitoba which commenced during the summer of 1969 has been completed and in addition has an updating procedure which is designed to handle renovations and re-allocations of space. The system itself will make it possible for a more comprehensive analysis of the existing blend, allocation and utilization of the facilities at the University. Also the survey will be of undeniable assistance in future planning projects because the definitions of space type are such that they can be grouped to correspond to various methods of projecting space needs.

The departmental fact sheets, which henceforth will be referred to as the "W3" sheets, that is, What are students doing? Where are students doing it? When are students doing it?, contain the following information:

- a) credit hours
- b) course number
- c) building in which lecture took place
- d) room in which lecture took place
- e) number of registrants
- f) number of instructors
- g) number of assistants
- h) capacity of the room
- i) slot or time in which the course was held
- j) contact hours

In essence, the "W3" sheets are a list of all the scheduled instruction which was taught at the University during 1969-70. With the acquisition of this information, along with the space inventory, it is now possible to attempt a utilization study on the existing facilities to determine their efficient use.

The first requirement is to encourage the Departments and Schools to standardize and use the space inventory when relating such information as room capacities, building numbers instead of building names, room numbers, etc. Once this is accomplished, the "W3" information will be easier to decipher and put to better use. After bringing the space inventory and the "W3" information together, a re-examination of the scheduled instruction at each faculty or school is done by building. From these timetables it is then possible to calculate room utilization and station utilization (see Figure 6).

F6

HYPOTHETICAL ROOM TIMETABLE

Room or laboratory number: X
 Building number: XX
 Room or laboratory capacity: 20

Hour	Monday	Tuesday	Wednesday	Thursday	Friday
8:30	73-126, 18 ₁	73-127, 14 ₄			
9:40				73-126, 18 ₁	73-127, 14 ₄
10:40		73-126, 18 ₁	73-127, 14 ₄		
11:40	73-131, 4 ₆		73-128, 6 ₇		73-133, 4 ₈
12:40	73-128, 6 ₇		73-133, 4 ₈	73-131, 4 ₆	73-132, 6 ₉
1:40	73-133, 4 ₈	73-131, 4 ₆			73-132, 6 ₁₀
2:40		73-129, 6 ₁₄	73-130, 4 ₁₂		
3:40	73-130, 14 ₁₂	73-129, 6 ₁₅			
4:40				73-130, 4 ₁₂	

It will be realized that the timetable consists of a 45 hour week with classes being held at certain hours throughout. For each hour of the day that the room or laboratory is being used two numbers are inserted. The first number, for example, at 8:30 a.m. Monday, is "73:126" which refers to the course that is being taught in that room. The second number, in this instance, "18" refers to the number of registrants enrolled in that course.

As for room utilization, add the number of hours the room is being used and a per centage is obtained. In this case the room is being used a total of 22 hours out of a possible 45 hours or 48.8%. On the other hand, station utilization is the number of hours the room is used, multiplied by the capacity or $22 \text{ hours} \times 20 \text{ capacity} = 440$ potential stations. This figure is then compared to the actual enrollment accumulated in the twenty-two hours of use, that is, $240 \text{ stations used} / 440 \text{ potential stations} \times 100 = 54.5\%$. The results of carrying out this procedure can be seen on Tables I, II and III.

These tables include the First Term only but should suffice to provide an overall view of the actual room and station utilization for the Academic Year, 1969-70 at the University of Manitoba.

TABLE I

WEEKLY CLASSROOM AND SEMINAR ROOM UTILIZATION FOR SCHEDULED INSTRUCTION
FIRST TERM 1969/70 REGULAR DAY SESSION

Buildings	Total Classrms Avail.	Classrm-hrs Available (45 hr/wk)	Slot 1-5 Mornings	Slot 6-10 Mid-day	Slot 11-15 Afternoons	Total Classrm-hrs Used	% Weekly Classrm Use
Agric. Bldgs.	14	630	110	91	37	238	38%
Arch. Bldgs.	5	225	50	24	14	88	39%
Arts, Comm, Soc. Wk, Tier, Isb, Argue Bldg.	50	2250	652	616	535	1803	80%
Univ. College	20	900	208	231	158	597	66%
St. John's College	8	360	67	79	26	172	48%
St. Paul's College	9	405	94	92	26	212	52%
Science Complex	22	990	229	173	110	512	52%
Sc, Comm, Soc. Wk. Average*							67%
Education Bldgs.	30	1350	176	196	52	424	31%
Engin. Bldgs.	33	1485	217	79	158	454	31%
Fine Arts Bldg.	1	45	4	3	0	7	15%
Home Econ. Bldg.	5	225	9	34	10	53	24%
Law Bldg.	10	450	48	30	13	91	20%

TABLE 1 - continued

WEEKLY CLASSROOM AND SEMINAR ROOM UTILIZATION FOR SCHEDULED INSTRUCTION
FIRST TERM 1969/70 REGULAR DAY SESSION

Buildings	Total Classrms Avail.	Classrm-hrs Available (45 hr/wk)	Slot 1-5 Mornings	Slot 6-10 Mid-day	Slot 11-15 Afternoons	Total Classrm-hrs Used	% Weekly Classrm Use
Music Bldg.	3	135	9	15	12	36	27%
Pharmacy Bldg.	2	90	18	9	0	27	30%
Phys.Ed.Facilities	1	45	0	6	0	6	13%
Admin. Bldg.	3	135	9	6	4	19	14%
Totals	<u>216</u>	<u>9720</u>	<u>1900</u>	<u>1684</u>	<u>1155</u>	<u>4739</u>	

* Scheduling in these three faculties and the School of Social Work is co-ordinated and therefore many classrooms are used by more than one faculty. For purposes of this study the overall utilization for this area is given.

Source: Preliminary Analysis of Space Utilization for
Scheduled Instruction on the Fort Garry Campus,
 The University of Manitoba Planning Secretariat,
 No. 3, p. 7.

TABLE II

WEEKLY LABORATORY AND STUDIO UTILIZATION FOR SCHEDULED INSTRUCTION
FIRST TERM 1969/70 REGULAR DAY SESSION

Buildings	Total Labs Avail.	Lab-hrs Avail. (45 hr/wk)	Laboratory hours used			Total Lab-hrs Used	% Weekly Lab Use
			Slot 1-5 Mornings	Slot 6-10 Mid-day	Slot 11-15 Afternoons		
Agric. Bldgs.	12	540	17	25	66	108	20%
Arch. Bldgs.	5	225	37	41	39	117	52%
Arts, Comm, Soc. Wk, Tier, Isb, Argue Bldg.	5	225	34	34	68	136	60%
Univ. College	3	135	14	29	20	63	47%
St. John's College	0	---	---	---	---	---	---
St. Paul's College	3	135	7	0	40	47	35%
Science Complex	52	2340	241	31	486	758	32%
Education Bldgs.	6	270	43	32	16	91	34%
Engin. Bldgs.	24	1080	91	53	102	246	23%
Fine Arts Bldg.	10	450	32	76	80	188	42%
Home Econ. Bldg.	15	675	84	6	81	171	25%
Law Bldg.	0	---	---	---	---	---	---

TABLE II - continued

WEEKLY LABORATORY AND STUDIO UTILIZATION FOR SCHEDULED INSTRUCTION
FIRST TERM 1969/70 REGULAR DAY SESSION

Buildings	Total Labs Avail.	Lab-hrs Avail. (45 hr/wk)	Laboratory hours used			Total Lab-hrs Used	% Weekly Lab Use
			Slot 1-5 Mornings	Slot 6-10 Mid-day	Slot 11-15 Afternoons		
Fully Scheduled Practice Rooms							
Music Bldg.	17	765	255	255	255	765	100%
Pharmacy Bldg.	6	270	9	10	39	58	21%
Phys.Ed.Facilities	3	135	38	42	21	101	75%
Admin. Bldg.	0	---	---	---	---	---	---
Totals	<u>161</u>	<u>7245</u>	<u>902</u>	<u>634</u>	<u>1313</u>	<u>2849</u>	

Source: Preliminary Analysis of Space Utilization for
Scheduled Instruction on the Fort Garry Campus,
The University of Manitoba Planning Secretariat,
No. 3, p. 8.

TABLE III

*AVERAGE STATION UTILIZATION FOR SCHEDULED INSTRUCTION
FIRST TERM 1969/70 REGULAR DAY SESSION

	Total Classrms. Available	Average Classrm-Station Utilization	Total Labs Avail.	Average Lab-Station Utilization
Agric.Bldgs.	14	45%	12	63%
Arch.Bldgs.	5	78%	5	100%**
Arts,Comm,Soc.Wk.Complex Tier,Isb,Argue Bldgs.	50	63%	5	60%
Univ. College	20	62%	3	64%
St.John's College	8	78%	0	---
St.Paul's College	9	69%	3	90%
Science Complex	22	48%	52	47%
Education Bldgs.	30	63%	6	71%
Engin. Bldgs.	33	48%	24	58%
Fine Arts Bldg.	1	61%	10	100%**
Home Econ. Bldg.	5	47%	15	78%
Law Bldg.	10	73%	0	---
Music Bldg.	3	41%	17	100%
Pharmacy Bldg.	2	67%	6	79%
Phys.Ed. Facilities	1	71%	3	78%
Admin. Bldg.	3	64%	0	---

* Defined as the percentage of stations used when the room is in use.

** Stations are assigned to specific students for virtually the entire session. Station utilization is therefore considered to be 100%.

Source: Preliminary Analysis of Space Utilization for
Scheduled Instruction on the Fort Garry Campus,
The University of Manitoba Planning Secretariat,
No. 3, p. 9.

Enough analysis has been done, however, to indicate utilization is almost the same in both terms and minor differences are insignificant when related to the overall utilization picture.³⁴

Table I is mainly concerned with the weekly room utilization of classroom and seminar rooms for scheduled instruction during First Term, while Table II is concerned with the laboratory and studio utilization for scheduled instruction during First Term. Also, these two tables show the number of hours used per slots 1-5, 6-10, and 11-15 (note: for an explanation of the slot system, see Appendix B). Table III shows the station utilization for scheduled instruction for the First Term day session for both classrooms and laboratories. From these three tables it is possible to appreciate the actual room and station utilization for the Academic Year of 1969-70.

Interestingly enough, as John X. Jamrich points out, "instructional space in our colleges and universities does account for approximately half the capital outlay".³⁵

34. Preliminary Analysis of Space Utilization for Scheduled Instruction on the Fort Garry Campus, The University of Manitoba Planning Secretariat, No. 3, p. 2.

35. Jamrich, Op. Cit., p. 26.

In view of this, it would seem reasonable to assume that if the amount of instructional space that is seemingly needed could be reduced in some manner, then other priorities requiring finances could be worked into the budget.

Only an informed look into the use of existing facilities can reveal whether those facilities are being used efficiently and whether they can be employed to yield additional use so as to reduce, or even render unnecessary, the need for new buildings.³⁶

The fact that instructional space accounts for a large portion of the capital budget, according to John X. Jamrich, and the priorities situation, it is with great interest that our attention be turned to the situation which exists at the University of Manitoba. In so doing, it is necessary that the method for determining minimum and optimum classroom and laboratory utilization at the University be presented at this time, in order that the following Charts become more comprehensible and meaningful.

36. Ibid., p. 4.

Determining Minimum and Optimum Classroom and Laboratory Utilization.

The method of projecting space at the University of Manitoba will briefly explain the factors used. It should be realized from the outset, however, that these factors are not final and therefore, can be modified or changed if necessary.

1. Classrooms and Seminar Rooms. As documented in the Planning Secretariat Report No. 3, entitled Preliminary Analysis of Space Utilization for Scheduled Instruction on the Fort Garry Campus, it seems reasonable to expect an optimum room utilization of 30 hours out of a 45 hour week, or 67%. This does not include special seminars, conferences, meetings, evening or weekend use and this is why the 30 hour optimum has been used to allow for these other activities. The optimum station utilization, that is, the percentage of stations occupied when a room is in use, is tentatively set at 60%. Due to the fact that many faculties or schools may have difficulty in reaching the optimum utilization figure at this time, a lower minimum standard was also proposed. It is 22.5 hours out of a possible 45 hour week, or 50% room utilization and 50% station utilization. In classrooms, numerous studies have designated that the

average square foot net per station be 15 square foot net. Consequently, this figure was adopted as a factor in this study. It is possible at this time to determine the classroom area required per one weekly student contact hour for both minimum and optimum utilization through these calculations:

$$\text{minimum utilization: } \frac{15}{.50 \times 22.5} = 1.33 \text{ sq. ft. net}$$

$$\text{optimum utilization: } \frac{15}{.60 \times 30} = .83 \text{ sq. ft. net}$$

These figures will be used in the forthcoming charts to project the space needed by a particular faculty or school.

2. Laboratories and Studios. In the case of laboratories and studios, it was felt that an appropriate maximum or optimum room utilization would be 24 hours out of a 45 hour week, or 53%. The minimum acceptable utilization was set at 18 hours out of a possible 45 hour week, or 40%. Station utilization in both cases, the minimum and optimum utilization was pegged at 70%. The hourly used proposed allows for a component of unscheduled time, that is, time used for clean-up, preparation and extra hours of student work outside the normal laboratory periods. The area for laboratory station by department varies and for the sake of these calculations an average area per station can be found on the first page of

Appendix A. The calculations needed to determine the undergraduate laboratory space required per weekly student contact hour, can be calculated as indicated:

$$\text{minimum utilization} = \frac{\text{average area per station (include service space)}}{18 \times .70}$$

$$\text{optimum utilization} = \frac{\text{average area per station (include service space)}}{24 \times .70}$$

This, then, is the method which has been used to determine the following Charts I and II. The two charts, one for classroom and seminar rooms, the second for laboratories and studios, compare the actual room and station utilization of classroom and seminar rooms and laboratories and studios to that of an optimum utilization figure. 'Classroom and seminar' rooms henceforth will be referred to as classrooms, and 'laboratories and studios' will be referred to as laboratories.

With respect to Chart I, on the whole, the station utilization figures seem to be quite good. Of course, there are a few which are low and could be improved. Room utilization, on the other hand, is extremely low except for two faculties, that is, the Faculties of Arts and Science. A great deal of improvement could be

CHART I

COMPARISON OF ACTUAL AND OPTIMUM UTILIZATION FOR
CLASSROOM AND SEMINAR ROOM 1969/70

Faculty or School	Classroom Use Per 45 Hr. Week	Station Use Per 45 Hr. Week	Space Required Per Weekly Student Hour Contact	Weekly Student Hour	Classroom Space Required, Sq. Ft. Net	
Agriculture:						
Actual	17	.45	1.96 sq. ft. net	6156	12065	
Optimum	30	.60	.83 sq. ft. net	6156		5109
Architecture:						
Actual	17	.78	1.13 sq. ft. net	8770	9910	
Optimum	30	.60	.83 sq. ft. net	8770		7279
Arts:*						
Actual	27	.68	.82 sq. ft. net	78954	64742	
Optimum	30	.60	.83 sq. ft. net	78954		65531
Education:						
Actual	14	.63	1.70 sq. ft. net	15651	26606	
Optimum	30	.60	.83 sq. ft. net	15651		12990
Engineering:						
Actual	14	.48	2.23 sq. ft. net	11026	24587	
Optimum	30	.60	.83 sq. ft. net	11026		9151
Fine Arts:						
Actual	7	.61	3.51 sq. ft. net	375	1316	
Optimum	30	.60	.83 sq. ft. net	375		311
Home Economics:						
Actual	10	.47	3.19 sq. ft. net	2378	7585	
Optimum	30	.60	.83 sq. ft. net	2378		1973

CHART I - continued

COMPARISON OF ACTUAL AND OPTIMUM UTILIZATION FOR
CLASSROOM AND SEMINAR ROOM 1969/70

Faculty or School	Classroom Use Per 45 Hr. Week	Station Use Per 45 Hr. Week	Space Required Per Weekly Student Hour Contact	Weekly Student Hours ^a	Classroom Space Required, Sq. Ft.	Net
Law:						
Actual	9	.73	2.28 sq.ft.net	3302	7528	
Optimum	30	.60	.83 sq.ft.net	3302		2740
Music:						
Actual	12	.41	3.04 sq.ft.net	940	2857	
Optimum	30	.60	.83 sq.ft.net	940		780
Nursing:						
Actual	6	.64	3.90 sq.ft.net	2513	9800	
Optimum	30	.60	.83 sq.ft.net	2513		2085
Pharmacy:						
Actual	13	.67	1.72 sq.ft.net	1058	1819	
Optimum	30	.60	.83 sq.ft.net	1058		878
Phys.Ed:						
Actual	6	.71	3.52 sq.ft.net	1710	6019	
Optimum	30	.60	.83 sq.ft.net	1710		1419
Science:						
Actual	23	.48	1.35 sq.ft.net	43009	58062	
Optimum	30	.60	.83 sq.ft.net	43009		35697

* Includes commerce and social work
 a See Appendix A

accomplished in this area in the rest of the faculties and schools.

As for Chart II the comparison of laboratory space suggests improvement is possible in a number of faculties and schools excluding the Faculties of Agriculture, Arts, and in the School of Physical Education. It is evident then, that in the case of laboratory space there is a shortage in Architecture, Arts, and Physical Education. In classroom space, Arts and Science are the main areas of concern. When both laboratory and classroom space are seen as one, it is evident that the Faculty of Arts is in dire need of instructional space of any kind. The School of Physical Education, it is felt, should be the second on the list of priorities for additional facilities, while the Faculty of Architecture and the Faculty of Science should seemingly rate third and fourth, respectively.

It might be noted here that the priority rating for those faculties and schools in need of instructional space was accomplished in this way. One point was given for higher than optimum station utilization in both classrooms and laboratories, and one point was given for twenty or more hours of use in classrooms and laboratories.

CHART II

COMPARISON OF ACTUAL AND OPTIMUM UTILIZATION FOR
LABORATORIES AND STUDIOS 1969/70

Faculty or School	Laboratory Use Per 45 Hr. Week	Station Use Per 45 Hr. Week	Space Required Per Weekly Student Ave. Area ^a per stn. 100	Per Weekly Student Hour Contact	Weekly Student Contact Hours ^a	Laboratory Space Required, Sq. Ft.	Space Sq. Ft. Net
Agriculture:							
Actual	9	.63	17.6		2660	46816	
Optimum	24	.70	5.95		2660		15827
Architecture:							
			61				
Actual	23	1.00	2.65		11107	29433	
Optimum	24	.70	3.63		11107		40318
Arts:							
			25				
Actual	21	.71	1.67		3784	6319	
Optimum	24	.70	1.48		3784		5600
Education:							
			55				
Actual	15	.71	5.16		2097	10820	
Optimum	24	.70	3.27		2097		6857
Engineering:							
			75				
Actual	10	.58	12.9		6437	83037	
Optimum	24	.70	4.46		6437		28709
Fine Arts:							
			81				
Actual	19	1.00	4.26		3348	14262	
Optimum	24	.70	4.82		3348		16137
Home Economics:							
			116				
Actual	11	.78	13.5		2990	40365	
Optimum	24	.70	6.9		2990		20631

CHART II - continued

COMPARISON OF ACTUAL AND OPTIMUM UTILIZATION FORLABORATORIES AND STUDIOS 1969/70

Faculty or School	Laboratory Use Per 45 Hr. Week	Station Use Per 45 Hr. Week	Space Required Per Weekly Student Hour	Weekly Student Contact Hour ^a	Laboratory Space Required, Sq. Ft. Net
Pharmacy:			88		
Actual	10	.79	11.1	910	10101
Optimum	24	.70	5.2	910	4732
Phys. Ed:			250		
Actual	33	.78	9.71	2500	24275
Optimum	24	.70	14.8	2500	37000
Science:			60		
Actual	14	.47	9.11	28544	260035
Optimum	24	.70	3.57	28544	101902

a See Appendix A

b See Appendix A

The result is shown on the following Chart III.

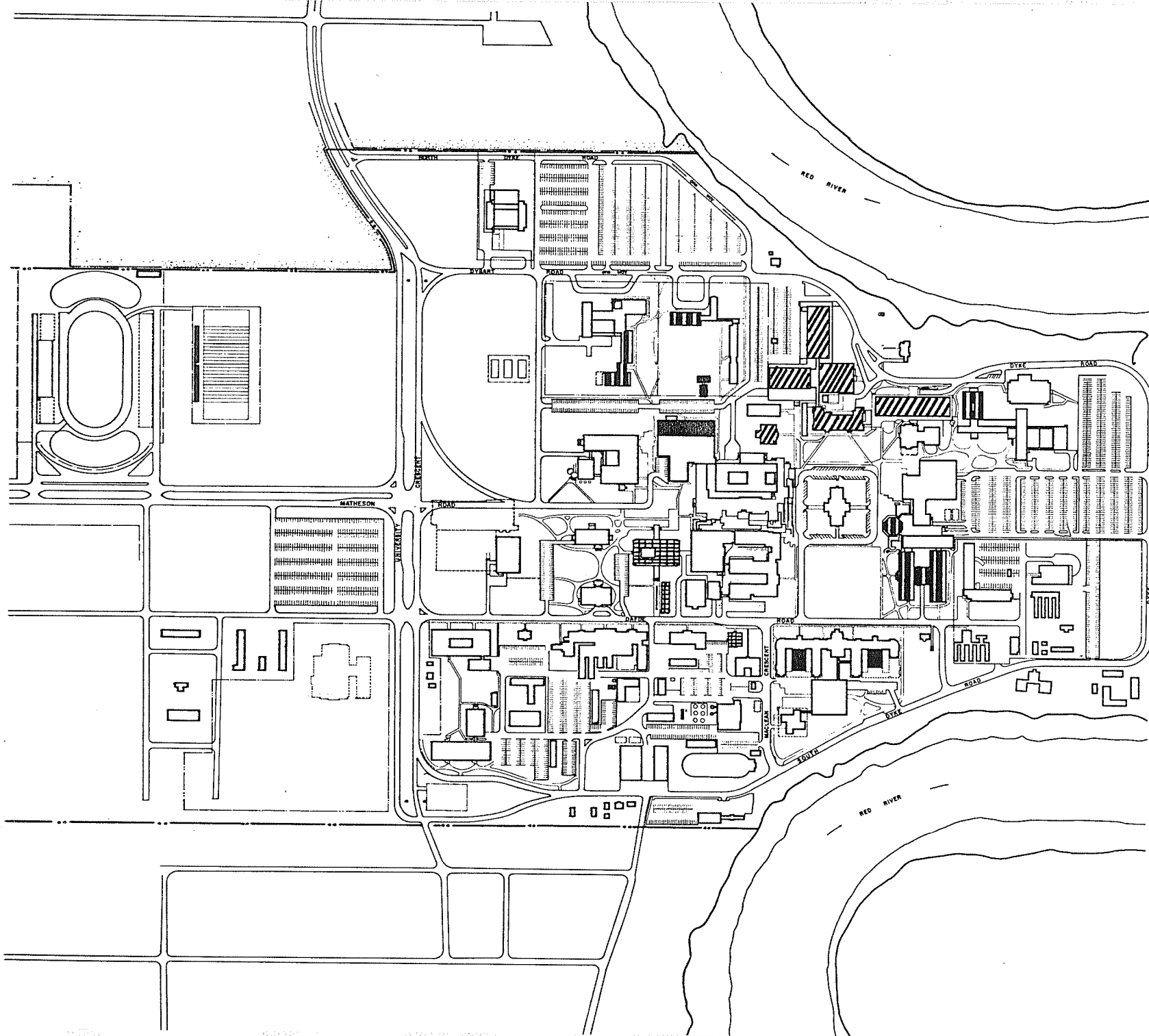
CHART III

Faculty or School	Classrooms		Laboratories		Total Points
	Rm.Util.	Stn.Util.	Rm.Util.	Stn.Util.	
Architecture	--	1	1	1	3
Science	1	--	--	--	1
Arts	1	1	1	1	4
Physical Education	--	1	1	1	3





The School of Physical Education was rated higher than the Faculty of Architecture because Physical Education is using less facilities than Architecture. In fact, Architecture is using five classrooms and five laboratories whereas Physical Education is using only one classroom and three gymnasiums (see Appendix A). Therefore, it is felt that Architecture can function temporarily with the facilities they are now using, whereas Physical Education can hardly be expected to continue with such meagre facilities. Consequently, it was felt that Physical Education's need for additional facilities was more pressing and so rated the higher position.

On the accompanying Map 1 the designated areas indicate which faculties and/or schools are in need of additional instructional space. By plotting them, it becomes evident that one can either (a) locate the new facilities within the same area, as in an 'infill' program or, (b) due to parking problems, congestion, road capacity, utility lines, or other physical and social problems, drain off some of these existing problems by moving the faculty in question or a part of it to another location where a new building would have to be constructed. "The utilization of 'infill' sites is considered desirable and is consistent with the concept of all-weather pedestrian streets".³⁷ in the case of the Faculty of Arts the decision was to relocate the School of Commerce (now a faculty) from its location in the Arts complex, that is, the Isbister Building, to the same building complex with the School of Physical Education. (See Appendix A for building names and location) The effect of this manoeuvre would be: one, to provide the

37. An Outline of the Physical Planning Proposals For the Growth of the Fort Garry Campus, DRAFT, University of Manitoba, Campus Planning Office, September, 1970, p. 12.



LEGEND

-  ARTS
-  PHYS. ED.
-  ARCH.
-  SCIENCE



SPACE NEEDS
BY FACULTY
OR SCHOOL

MAP-1

UNIVERSITY OF MANITOBA
CAMPUS PLANNING OFFICE

Faculty of Arts with the vacated Commerce space; two, to consolidate the School of Physical Education in a complex which they had been in need of for some time; three, to add regional facilities; four, to generate another node from which to expand and 'infill'. As far as the Faculty of Architecture and the Faculty of Science are concerned, an 'infill' program should be considered most applicable due to the fact that there is available space within the immediate site of the now permanent buildings to permit new construction to take place. In the case of Architecture this approach would consolidate its temporary outposts into a permanent fixed structure.

Costs of Poor Utilization

As was previously alluded to, low utilization, whether station or room, is an expensive luxury that institutions can ill afford. For example, referring back to Charts I and II, if the University were to accept low utilization as a fact of life, they would be required to provide 232,896 sq. ft. net of classroom space and 525,463 sq. ft. net of laboratory space if no facilities whatsoever existed. These figures are obtained by first

calculating space required per weekly student contact hour from the utilization rates and the average sq. ft. net per station (see Appendix A). The ensuing figure is then multiplied by the weekly student contact hour projection resulting in the space required by that faculty or school. These figures are then added together, resulting in the amounts previously referred to. If this procedure is again carried out for the optimum utilization rates, the figures are of this magnitude: classroom, space required is 145,943 sq. ft. net; laboratory space required is 277,893 sq. ft. net. The difference is, in classrooms, 86,953 sq. ft. net and in laboratories, 247,570 sq. ft. net.

It must be pointed out that these differences in sq. ft. net of space do not allow for more student contact hours because they were calculated using the same weekly student contact hour projections. The differences are, however, the result of a variety of low utilization rates. If one were to cost these differences at \$45. per sq. ft. net for the construction of classroom space and \$55. per sq. ft. net for the construction of laboratory space, the result would be an excessive spending of \$3,900,000. for classrooms and \$13,600,000. for

laboratories (see Appendix A). These figures are over and above the finances needed to provide the same amount of space if the optimum utilization percentages were achieved. Therefore, it is financially undesirable to accept low utilization percentages.

Conclusion

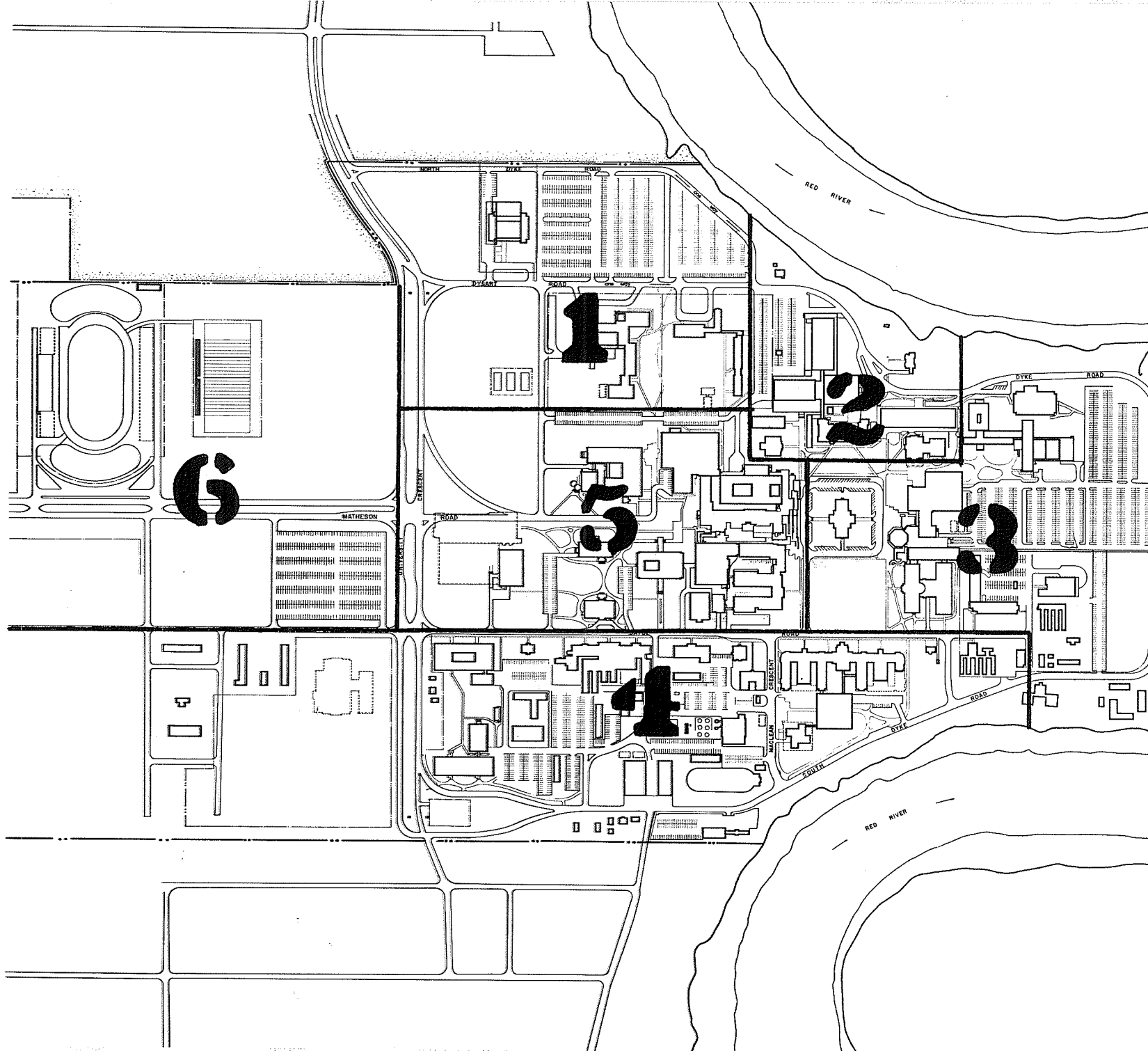
Through the utilization study it is found that certain faculties or schools are in fact in need of physical facilities, that is, instructional classrooms or laboratories. This procedure also establishes the difference between an actual need and a potential need. The actual need is one in which both the station and room utilization is at/or above the designated optimum utilization figure. The potential need, on the other hand, is one in which (a) either the station or room utilization is approaching the optimum utilization figure, or (b) both the station and room utilization are approaching the optimum utilization figure. This kind of information will benefit the campus planner in so far as he will at least have some indication where the instructional space shortages will be in the years to come if the enrollment growth is known, and he can then

take steps to alleviate the impending situation before it reaches a critical stage. Also the allocation of funds to the building program can be made in advance of the actual need and ensure the success of providing the space required in the future. Here, then, is a chance to have an indicator of future needs which permits one to plan for the future as best he can.

CHAPTER III

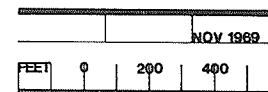
THE IMPROVEMENT OF THE EXISTING UTILIZATION
SITUATION AT THE UNIVERSITY OF MANITOBA

From the previous chapter, it is obvious that there is a problem concerning utilization at the University of Manitoba. There are a number of faculties and/or schools which are well below the standard of room and station utilization which has been set for them. In addition, it is without debate that low utilization, whether station or room, costs a great deal of money. The cost is not only found in the construction of the facilities as has been pointed out, but it is also found in the daily operation of the building, that is, its heating, lighting, cleaning, provision of staff, plus the many other general caretaking duties. Consequently, it is with these thoughts that our attention is turned to the causes of poor utilization in an effort to improve the existing situation. Before discussing the various causes, I should like to take this opportunity to divide the University of Manitoba into regions (see accompanying Map 2). I do this now, for the sake of convenience and in an effort to present the upcoming information in a more comprehensible manner.



LEGEND REGIONS

- 1 NORTH
- 2 NORTH-EAST
- 3 EAST
- 4 SOUTH
- 5 CENTRAL
- 6 WEST



CAMPUS
REGIONS

MAP-2

UNIVERSITY OF MANITOBA
CAMPUS PLANNING OFFICE

Causes of Poor Utilization and Their Solutions

Some of the most common factors limiting optimum utilization as seen by John X. Jamrich in his book To Build or Not to Build, Fredric C. Wood in Chapter 8, "Space Requirements for Physical Facilities", found in the Handbook of College and University Administration, General, Volume One, and in the Twenty-Third edition of The American School and University, are the following:

A) Building labelling or assigning. One of the greatest killers of high utilization is the practise of "building labelling or assigning buildings to specific schools, colleges, or departments."³⁸ This policy is an extremely fatal one in so far as the sharing of the instructional facilities for use by other faculties, schools or departments for the teaching of their particular subjects, is not carried out to the extent that it should be. There seems to be some reluctance to schedule one's classes in a building that is foreign to him.

The University of Manitoba has been in the

38. The American School and University
A yearbook devoted to the Design, Construction, Equipment, Utilization and Maintenance of Educational Buildings and Grounds, Twenty-Third Annual Edition. American School Publishing Corporation, New York 16, New York, 1951-52, p. 122.

habit of labelling buildings. For example, in the North-East Region there exists buildings such as: the Pharmacy Building, the Geology Building, the Home Economics Building. The South Region has the Dairy Science Building, the Agricultural Engineering Building, the Animal Science Building, and the Agricultural Building, to name only a few in this region. The Central Region is dotted throughout with such buildings as the Engineering Buildings, the Education Building, the Architecture Building, the School of Art and the School of Music. Consequently, this could be one factor which is causing low utilization in some regions. To investigate this premise further it is suggested that our attention be directed first to the East Region. Found within are buildings such as the Tier, Isbister, Fletcher-Argue, and University College. The names of these buildings give no indication of their use. In fact, they are a major portion of what is referred to as the Arts Complex. The second region to be considered is the Central Region in which may be found the Engineering Buildings. In the case of the latter, the function of the buildings is designated by their label. With reference to the following chart, it is evident that there is lower instructional space

utilization in the Engineering Buildings than in the Arts Complex. Also, it is noticeable that the utilization of instructional space (that is, classroom-room and station utilization and laboratory-room utilization) in the Arts Complex is higher than the optimum.

CHART IV COMPARISON OF INSTRUCTIONAL SPACE
UTILIZATION OF THE ENGINEERING
BUILDINGS AND THE ARTS COMPLEX
TO THE OPTIMUM

Buildings	Classroom Utilization		Laboratory Utilization	
	Room	Station	Room	Station
Engineering Bldg.	31%	48%	23%	58%
Optimum	67%	60%	53%	70%
Arts Complex	80%	63%	60%	60%

Source: Tables II, III, IV, Chapter II

Consequently, this example demonstrates that labelling may hinder optimum utilization. One solution to this problem would be to abolish the labelling of buildings. The buildings could be named so that there is no indication of the kind of instruction that is being performed in the building. For example, the buildings could be named after prominent individuals who have served the University in one capacity or another. Finally, the idea that classrooms and laboratories are

to be used by all Faculties and Schools and nobody has jurisdiction over them, should be impressed upon those who continually shy away from this concept. It might be noted here that because the Central Region of the University was used in the example, it should not be assumed that it is the only region that suffers from this characteristic as indicated by the previous listing of labelled buildings.

B) The dying day. Another interesting cause of poor utilization is the so-called "dying day" phenomena. It is characterized by a substantial decline in the number of hours a classroom is used as the day progresses.

The percentage of scheduled instructional hours in classrooms and laboratories for first term at the University of Manitoba can be seen on the accompanying Chart V. With reference to classrooms, it is evident that the University is consistent with the pattern that produces poor utilization, that is, the percentage of classroom hours falls off drastically as the day progresses. If it is considered that each of the 216 classrooms can be used for nine hours a day for a ten-week period, that is, First Term, then there are $216 \times 5 \times 9 \times 10 = 97,200$ (100%) hours of potential classroom use. However, as previously stated, the optimum hours of classroom use is 67% or

CHART V

PERCENTAGE OF TOTAL SCHEDULED HOURS FIRST TERM FOR
CLASSROOMS AND LABORATORIES BY SLOT 1969/70

Classrooms			Laboratories		
Slots*	1-5	40%	Slots	1-5	32%
	6-10	36%		6-10	22%
	11-15	24%		11-15	46%

Source: Preliminary Analysis of Space Utilization for
Scheduled Instruction on the Fort Garry Campus

* For brief explanation of the slot system, see Appendix B.

CHART VI

DIFFERENCE BETWEEN THE OPTIMUM AND
ACTUAL CLASSROOM UTILIZATION BY
SLOTS FOR FIRST TERM 1969/70

Slots	Optimum	Actual*	Difference
1-5	21,708	19,000	2,708
6-10	21,708	16,840	4,868
11-15	21,708	11,550	10,158
Total	65,124	47,390	17,734

* See Table II, Columns 3, 4, 5, Chapter II of this thesis.

$.67 \times 97,200 = 65,124$. If this total of optimum hours of classroom use is divided by the three sets of slots, then each set would consist of an optimum use of 21,708 hours. This optimum is then compared to the actual percentages of scheduled use by slot set, so that it is possible to calculate the number of classroom hours lost by poor room utilization for First Term, that is, 17,734 (see Chart VI). This total, then, is an accumulation of the number of hours of classroom space lost per slot set. It can be seen that there is an increasing loss of hours as the day progresses, but what is just as startling is the total hours of classroom use lost in First Term as a result of the "dying day" phenomena.

The situation with laboratories does not follow the "dying day" phenomena, but as seen on Chart V, however, it is evident that there is a small number of laboratories in session in the morning and a tremendous drop-off of laboratory use in the mid-day period. If the 161 laboratories were used for nine hours per day for a ten-week period, there would be $161 \times 9 \times 5 \times 10 = 72,450$ hours available. In retrospect, it is found that the optimum laboratory room utilization is 53% or 38,398 hours. By spreading these optimum hours throughout the

day and comparing them to the actual room utilization obtained in First Term of 1969/70, it is found that a potential 9,908 hours of laboratory use is lost, with the greatest number of hours, namely 6,132, lost in the mid-day period (See Chart VII).

CHART VII

DIFFERENCE BETWEEN THE OPTIMUM AND ACTUAL LABORATORY AND STUDIO UTILIZATION BY SLOT FOR FIRST TERM 1969/70

Slots	Optimum	Actual _a	Difference
1-5	12,792	9,020	3,772
6-10	12,472	6,340	6,132
11-15	13,134	13,130	4
Totals	38,398	28,490	9,908

Source: See Table III, Columns 3,4,5, Chapter II of this thesis.

Obviously, better use can be made of the mid-day laboratory periods and perhaps the morning period.

Taken together, that is, classrooms and laboratory periods, there is a total loss of 27,642 hours of use which is made up of 6,480 hours in slots 1-5, 11,000 hours in slots 6-10, and 10,162 in slots 11-15.

It would seem, as in the previous situation,

that the problem is not knowing when classrooms and laboratories are empty and therefore available for use. Consequently, the solution would seem to be in centralizing the scheduling of classrooms and laboratories in a key official who would know "when" and "where" space was available. Also there should be an effort to increase the use of the afternoon slots in regard to classrooms and the mid-day slot in relation to laboratories.

C) Hours of use by building per day of the week.

Another factor which adds to the problem of achieving the optimum utilization rate is the number of hours that a building is used during a typical forty-five hour week. On the accompanying Chart VIII it is noticed that Friday has the least amount of instructional hours. It would seem that Friday is a very unpopular day for scheduling classes. Interestingly enough, it is reported that the cause of the poor use of facilities on Fridays is to be found in the attitudes of employers, parents and the general public and is, to a large extent, beyond the control of Colleges and Universities themselves.³⁹

39. Jamrich, Op. Cit., p. 35.

CHART VIII

HOURS OF USE BY BUILDING PER DAY
OF THE WEEK

<u>Building</u>	<u>Mon.</u>	<u>Tues.</u>	<u>Wed.</u>	<u>Thurs.</u>	<u>Fri.</u>
Trailers (Arch.)	10	6	10	--	8
Trailers (Student Union)	6	3	3	6	0
Hut J	6	14	8	20	10
Pembina Hall	18	--	--	--	--
Tache Hall	12	9	9	6	12
Admin. Bldg.	35	2	8	6	13
School of Music	17	16	12	16	14
School of Art	18	44	24	28	12
Law Building	58	64	73	60	24
New Engin. Bldg.	38.5	40	25	15	11
Engineering Bldg.	166	180	135	138	141
New Educ. Bldg.	24	16	16	19	8
Education Bldg.	165	152	129	176	133
Architecture	68	88	78	87	58
Pharmacy Bldg.	61	35	36	32	24
Roblin Bldg.	73.5	66	77	87	92.5
Geology Bldg.	18	24	32	26	25
Buller Biological	61	80	106	101	84
Parker Chemistry	183	130	159	160	144
Armes Lecture Bldg.	92	74	96	73	87
Allen Physics Bldg.	30	24	76	54	48
St. Paul's College	96	122	121	128	90
St. John's College	72	70	78	74	54
University College	207.5	169.5	207	191.5	173.5
Tier Building	433	370	409	370	338
Isbister Building	147.5	164	147	149.5	112
Fletcher-Argue Bldg.	27	20	31	19	25
Home Ec. Bldg.	98	95	113.5	69	83
Food Science Bldg.	--	--	4	--	4
Dairy Science Bldg.	10	14	14	17	10
Crop Research Bldg.	9	6	12	12	4
Animal Science Bldg.	35	34	30	26.5	22
Agric. Lecture Block	25	12	20	19	15
Agric. Eng. Shed	2	4	--	--	--
Agric. Engineering	23	20	24	17	16
Agricultural Bldg.	43.5	35.5	52.5	44	38.5
Totals	2361.5	2203	2375	2246.5	1933.5

Source: Computer Print Out - February 3, 1971.

Many students take on part-time employment to finance the College (and University) education. They must fit class schedules into the hours of their employment...⁴⁰

Consequently, Friday might have to be accepted as a day which will always be plagued with poor room and station utilization due to the outside influences which were previously mentioned. However, it seems that the first six hours of the nine-hour day should be held to our previously set standards and an acceptance of poor utilization for the remaining three hours.

The solution to this particular aspect goes deeper than problems such as fragmented scheduling of classes or not knowing when or where space is available within the immediate area. This problem, as previously stated, goes beyond the control of the University, however, it should be considered as an important factor in attaining optimum utilization.

D) The equivalent time factor - occupancy and credits. Interestingly enough, whenever room and station utilization is the topic under discussion, inevitably the discourse is turned to the question of why do students

40. Loc. Cit. (The parenthesis are mine.)

spend so much time in classrooms or laboratories?

In many cases the response to the question is in relation to the number of credit hours a student is receiving for that particular course.

Another entrenched pattern in the academic world; and one that may cause considerable controversy if it is explored has to do with the question of whether or not we should require room and student-station occupancies by students exactly equivalent to the number of semester hours of work which they carry.⁴¹

For example, in this context, a Bachelor of Arts Degree could consist of fifteen courses with six hours of credit for each course. Or, put another way, thirty half-courses with three hours of credit for each half-course. This represents three hours of credit for a three-hour lecture course.

The whole credit system which is our measure of whether or not you get a degree is tied completely to the sitting time of a student. He has to sit fairly successfully, of course, and especially during the final examination, but if he has not sat the required number of hours you're probably not going to give him a degree. Now, let's just frankly ask, is it absolutely necessary that a student sit under a college teacher for 15 hours a week, for (20) weeks a year, for (3) years, in order to achieve the bachelor's degree? Ask the question, why not 12 hours a week, why not 10? What is there sacred about 15 hours a week?⁴²

41. Ibid., p. 36.

42. Loc. Cit., (my parenthesis around the figures which pertain to the University of Manitoba.)

Fortunately, in our colleges and universities there seems to be an increased emphasis upon independent study.

The classroom box is busted. The ancient habit of teaching everything to a class in something called a classroom is fading away. Group-contact hours per week are declining as the individual student, freed from the indenture of the group, is found more often nowadays in the library or other locations for independent study.⁴³

This, of course, doesn't mean that students need never come in contact with professors or groups of students because "it is in talking over issues that he learns to be wise rather than just smart."⁴⁴

John X. Jamrich cites an experiment which took place at the University of Michigan regarding independent study. Instead of spending four hours in a classroom listening to an instructor's lecture, some sections of a particular course were given the opportunity to spend only three hours in formal classroom sessions and the

43. Parker, Floyd G. and Smith, Max S., editors, Planning Community Junior College Facilities: A Look Into the Twenty-first Century. Proceedings of a Conference sponsored by the College of Education and continuing Education Service and the Council of Educational Facility Planners. Michigan State University, East Lansing, Michigan, 1968, p. 2-3.

44. Ibid., p. 3.

fourth hour in independent study. Guide questions were issued to help direct their fourth hour of independent study. The results of the experiment showed that the control groups and experimental groups scored approximately the same.⁴⁵ The experiment was carried out for only one term in 1957 and indicated that lecture time is not as important as one is led to believe. Consideration must also be given to the traditional concept that credit hours must equal the number of hours a student spends in the classroom. Evidently, from this experiment, the two do not have to be equal in order for the student to achieve success. If the Michigan experiment was implemented in some faculties, there would be an extra hour available in which another class could be held.

Naturally, one hour doesn't seem like much of a saving until a faculty is designated and their lecture sections are added up and looked at as to the number of hours taught per year. This total is then reduced by one-third, which is the number of hours saved per academic year.

Consequently, the Faculty of Arts was designated and found to have 418 sections accounting for 1,254 lecture

45. Jamrich, Op. Cit., p. 37.

hours per week. (See Appendix B for lecture sections in the Faculty of Arts.) If we consider that the winter session has not less than twenty weeks of lectures, the Faculty of Arts has a total of $1254 \times 20 = 25,080$ lecture hours per year. Taking one-third of that total, there would be a saving of 8,360 lecture hours per winter academic year. In other words, there would be 8,360 hours available for other classes to use, thereby reducing the need for additional classroom space. A word of caution must be injected here about the pressure that would be placed on the Library facilities, and other types of space suitable for independent study or discussion groups. It might be that the hour saved in lecture time by the student would be spent using the study facilities provided in the Library. This could present a tremendous demand for added Library facilities or other suitable facilities, which might present a greater capital outlay than providing the classroom space. In any event, it is suggested that this particular facet be studied in much greater detail than can be done at this time.

E) The abundance of courses. The number of courses offered is another cause of poor utilization because presented with the number of alternatives, it only stands to

reason that many courses will attract a small enrollment. In Appendix B, pages 121 to 127, there is a listing of undergraduate courses, both classroom and laboratory, which have an enrollment between five and fifteen registrants. It was felt that professors who had an undergraduate enrollment of less than five registrants would probably not reserve instructional space but these small groups would more than likely make use of professors' offices, lounges or other available areas, and therefore they were eliminated from this tally. Also eliminated were courses which had enrollments between five and fifteen registrants but could not be found to have registered for the use of a classroom or laboratory. In addition, the 400 courses are included while the 600 and 700 courses have been excluded because they are definitely post-graduate courses. The 400's, on the other hand, are in some instances Honours courses, while in other cases they are a part of a four-year undergraduate curriculum. Therefore, it was felt necessary to include them.

In total, there are 222 courses that have registrants between five and fifteen. Upon comparing the enrollment with the number of stations available in the room where the course is being given, it is noticed that

there is a significant difference in the majority of cases. Consequently, it is no wonder that station utilization in many cases is extremely low.

One solution to this problem and probably the most drastic would be to "consider the elimination of courses which enroll fewer than 10 students; this will not only improve utilization of teaching space, but will improve the utilization of faculty time."⁴⁶ Also, it would be advisable to consider the yearly repetition of the low registrant courses, thereby indicating in which campus regions they most frequently occur, and then provide some facilities, either small seminar rooms or larger rooms with movable partitions in those regions.

Efficiency requires that spaces be interchangeable in their use and that there be a proper proportion of various room sizes--small rooms for seminars or little groups, large ones for lecture sections, and some that can be expanded from small to large and then reversed again when the need arises. The availability of economical, acoustically adequate operable walls to divide a room in two is another answer to this problem.⁴⁷

F) Other considerations. Since it is considered that Friday afternoons will usually be a time when station

46. Knowles, Op. Cit., p. 4-114.

47. Jamrich, Loc. Cit.

and room utilization will be low because of students working on Friday nights and Saturdays; students wanting to go home for the weekend if they live out of town; the common practice of the weekend being a time for athletic endeavours; plus many other pleasures and activities. It was felt that optional hours for the scheduling of classes, other than late Friday afternoon should be considered in so far as an effort is being made to enhance utilization.

Throughout the foregoing, it will be realized that calculations were made on the basis of a 45 hour week, that is, Monday through Friday from 8:40 to 5:30. Upon examination of the Calendar circulated by Evening Session, it became apparent that all of the courses which they offered as part of the winter session in 1969/70 started at 7:00 o'clock. With the practise of regular day session ending at 5:30 p.m. and evening session beginning at 7:00 p.m., the result is that every classroom and laboratory at the University of Manitoba is sitting empty for $1\frac{1}{2}$ hours per day. In terms of total idle hours, there are 377 instructional classrooms and laboratories empty for four days (Monday-Thursday), for $1\frac{1}{2}$ hours, equalling 2,262 hours of inactivity.

It is suggested that some use be made of at least one hour of this idle time, perhaps as an alternate to the heavy scheduling of Friday afternoons. There is also the possibility of scheduling T.V. lectures in this time period, that is 5:30 p.m.-6:30 p.m., so that additional academic staff would not be needed.

The accompanying Chart IX shows the buildings, rooms, and times that are being used by Evening Session. From this chart, it would seem that greater use could be made of the facilities. More precisely, it is suggested that we have a day which starts at 8:40 a.m. and finishes at 10:00 p.m. This would allow regular day students to select courses in evening if they wish and have one three-hour lecture in contrast to three one-hour lectures. If the concept of "equal hours for equal credits" is loosened, and the concept of the thirteen-hour lecture day is accepted, then a tremendous number of possibilities are issued forth.

Another course of action to improve utilization is to examine buildings in which utilization is low, and ascertain the exact problem. Interestingly enough, one such example arose during the utilization study of the summer of 1970. A large classroom was plagued with

CHART IX

EVENING WINTER SESSION COURSES

1969/70

Building	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Tier Bldg.	306 - 7-10pm	306 - 7-10pm	410 - 7-10pm	303 - 7-10pm		202 - 9:30-12:30
	204 - 7-8 pm	213 - 7-10pm	213 - 7-10pm	403 - 7-10pm		204 - 10:30-12:30
	215 - 7-10pm	313 - 7-10pm	Lab TBA 7-10pm	408 - 7-10pm		401 - 9:30-12:30
	213 - 7-10pm	408 - 7-10pm		306 - 7-10pm		303 - 9:30-12:30
	403 - 7-10pm	308 - 7-10pm		417 - 7-10pm		
	417 - 7-10pm	401 - 7-10pm				
		410 - 7-10pm				
Armes	204 - 7-10pm		Lab TBA 7-10pm			
	201 - 7-10pm					
Education Bldg.	313 - 7-10pm	319 - 7-10pm	319 - 7-10pm	314 - 7-10pm		314 - 9:30-12:30
	318 - 7-10pm	321 - 7-10pm	314 - 7-10pm	318 - 7-10pm		319 - 9:30-12:30
	321 - 7-10pm	313 - 7-10pm	318 - 7-10pm	326 - 7-10($\frac{1}{2}$)pm		313 - 9:30-12:30
	314 - 7-10pm	318 - 7-10($\frac{1}{2}$)pm	313 - 7-10pm	319 - 7-10($\frac{1}{2}$)pm		326 - 9:30-12:30
	319 - 7-10pm	326 - 7-10($\frac{1}{2}$)pm		321 - 7-10pm		
Isbister Bldg.	235 - 7-10pm			203 - 7-10pm		102 - 9:30-12:30
	236 - 7-10pm					
University College	238 - 7-10pm	237 - 7-10pm	241 - 7-10pm	244 - 7-10pm		241 - 9:30-12:30
	237 - 7-10pm	241 - 7-10pm	238 - 7-10pm	240 - 7-10pm		386 - 9:30-12:30
	241 - 7-10pm	240 - 7-10pm	385 LAB 7-10pm	241 - 7-10pm		237 - 9:30-12:30
	235 - 7-10pm	244 - 7-10pm	237 - 7-10pm	LAB TBA 7-10pm		235 - 9:30-12:30
		384 - 7-9:30pm	236 - 7-10pm	384 - 7-10pm		240 - 9:30-12:30
				375 - 7-10pm		375 - 9:30-12:30
				396 - 7-10pm		

CHART IX - continued

EVENING WINTER SESSION COURSES1969/70

Building	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Architecture Building		121 - 7-10pm				
School of Art		TBA - 7-10pm TBA - 7-10pm	TBA - 7-10pm TBA - 7-10pm	TBA - 7-10pm TBA - 7-10pm		
St. Paul's College			1 - 7-10pm			
Music Bldg.						222 - 9-12pm 308 - 9-12pm
Total Rooms Used	19	20	16	20	0	17
Total Hours	56	59½	48	60	0	50

Source: The University of Manitoba
Evening Session Course for
Credit Towards Degrees
1969-70, Winnipeg, Manitoba,
 p. 4-5.

extremely low station utilization and it was not until further investigation that it was found that the room had a ventilation problem. So much so that it was almost impossible to lecture in the room to a large class for any length of time. Therefore, it would be wise to become extremely familiar with the underlying causes of low utilization.

The pressure of keeping "available" space always on the short side seems to promote good utilization. Consequently, it would be advisable to provide enough instructional space, but not an excess. And finally, utilization studies should be considered a necessity every year. This would provide an opportunity to compare the yearly progress of the institution.

Conclusion

It is apparent that there are a number of techniques which can be used to improve both room and station utilization. Some are infringing on areas which have been left to "tradition" and naturally are extremely volatile and controversial, while other techniques can and are being readily accepted in many universities.

For instance, the idea of "naming" buildings after

prominent individuals rather than "labelling" them, thereby indicating the kind of instruction that is being performed in them, has been readily accepted. On the other hand, the idea of changing the three credit courses to one two-hour lecture period from three one-hour lecture periods would probably raise a terrific amount of discussion. It is felt that in these periods of discussion, numerous points of view can be aired and explored in an effort to accept the more controversial techniques or develop new, more acceptable techniques.

Because utilization is more than a matter of arithmetic, there is no single recipe for improvement which will apply to each and every college. Our institutions of higher education vary in their purposes, curricula, and character. That in fact, is why their levels of utilization vary. These differences must be respected.⁴⁸

In any event, it is important that all aspects concerning utilization be discussed in detail to ensure a most satisfactory solution to this complicated problem.

48. Ibid., p. 35.

CHAPTER IV

POINTS TO PONDER BEFORE BUILDING CONSTRUCTION

At this stage the need for the construction of a new facility or facilities is of the utmost importance to bring successfully all of the previous work to a satisfactory conclusion. In addition, the question that we must direct our attention to is, what do all of the forthcoming technological changes mean to an institution, such as the University of Manitoba which is considering the erection of new facilities for future use.

The Future and Education

It is quite apparent that the approach to education has been gradually changing in the past and will probably continue to change in the years to come. For example, there has been a considerable amount of literature written on the individualistic approach to education. That is, the student, instead of attending group lecture or laboratory periods, will have at his disposal a so-called 'electronic carrel'. It will plug into such devices as: a T.V. screen, a tape recorder, computer, test-scoring machinery, films, and so on, with the mere press of a button on his control panel.

It would seem that the tools of the past, that is, chalk, blackboard, book and professor are gradually

giving way to the self-teaching aids.

The significant fact is not that this equipment exists, but that hitherto it has been so little used by institutions probing the frontiers of human knowledge. Hubert Wilke, educational director of the Teleprompter Corporation (which was a pioneer in the application of technology to pedagogy) said: "Almost every field of human endeavour is assisted by the tools of modern technology. There is no reason why the teaching profession should not be so assisted."⁴⁹

This then, is one view of the changes which could take place in the future; that is, independent individual study. Of course, in terms of space, the emphasis would be placed on private individual study areas.

Another assessment of the situation is that each year a tremendous number of students swell the near-saturated enrollments of our colleges and universities. The future outlook seems to be one of continuing this thirst of knowledge. In addition, the body of knowledge which these students are so dedicated to consume is expanding at a rapid rate. So much so, that it is almost impossible to keep up with the wealth of literature that is written pertaining to one's area of concern. The result of these circumstances in terms of

49. Bricks and Mortarboard: A Report on College Planning and Building, Educational Facilities Laboratories Inc., New York, 1964, p. 30.

the provision of space is that educators must come into contact with large numbers at every opportunity. Consequently, large classrooms and laboratories could be provided to facilitate this objective.

If the over-all pattern is hard to grasp, equally complex in microcosm is the individual institution, especially the large-to-enormous university that will increasingly dominate the scene in higher education. Large or small, the institution must provide space for scores of very different purposes: instructional space that will accommodate the conventional lecture, the unknowable requirements of laboratory science, the needs of individual study...space for storing recorded knowledge and trying to keep abreast of its exponential growth rate; space for a whole array of educational facilities...⁵⁰

Therefore, when one is challenged to provide facilities for such a myriad of activities it can be realized that it is by no means an easy task to meet. It can be said that:

Facilities planning will continue to move away from the more traditional image of the land consuming "green pasture" type of campus and even greater diversity will result as college planners learn to cope with and accept the new media and innovative educational methods.⁵¹

But to what extent and how fast will these innovations

50. Ibid., p. 164.

51. Planning Community Junior College Facilities, p. 13.

be upon us is anybody's guess. Therefore, it is without question that certain steps must be taken. The two concepts which are deemed most important at this stage of planning are programming and flexibility.

Programming

It can be said that the prelude to any good building design is creative, effective and thorough programming. Expressed in another manner:

One architect said of programming that it "makes of architecture a purposeful art; without it a project has about the same direction as a child's building of blocks." Certainly the importance of a well-considered and carefully presented written building program cannot be over-estimated.⁵²

Many reports suggest that a program architect, that is, one who acts as a liaison between the architectural firm and the "users", along with the "users" of the intended building or buildings form a Program Committee and discuss the space and equipment needs of the department or departments that eventually will occupy the premises. It is felt that the Program Architect could be the vital link between the commissioned architectural firm and the academics who would comprise the remainder of the committee.

52. Dental School Planning: prepared by Public Health Service. Publication Number 940, United States Government Printing Office, Washington, 1962, p. 4.

The Program Committee would take on the awesome task of bringing together all of the required information such as: their educational philosophy, curriculum, the identification of space and its function, the relationships of the departments to each other, and so on, in an effort to produce a document which could be considered as a written building program. This document would hopefully contain all the information that the Architectural Firm would need to commence their first studies. These preliminary studies, besides providing an indication of costs, serve other functions as well. Firstly, they indicate areas which, because of some oversight, had not been considered by the Programming Committee. Secondly, they avoid last minute, ill-considered compromises by scaling at an early stage exuberant ambitions to a realistic budget. From the educators' point of view programming is not an easy task, because they realize that in a long run, no course of action would be more hazardous than to limit the new building or buildings to the demands of current programs and methods when such changes loom on the horizon.

They in fact attempt to fulfil their obligation by serving on the Program Committee. To the educator, then, programming is of great value. "It is a chance

to analyze thoroughly the implications of a changing philosophy...and to plan a school adaptable both to current needs and future possibilities."⁵³ In addition, programming serves the Architectural Firm in still another capacity.

To the architect, it provides a concise and definite statement of the school's requirements--something he must have to design a building which is not only handsome but functional and flexible, pleasant and healthful to work in, and economically sound. He will use the program from the moment he begins his preliminary sketches until he completes his final design, and it will continue to serve as a yardstick for measuring all later modifications.⁵⁴

Therefore, it must be realized that this step of programming which comes in the final stages of the overall planning process is a very necessary and important exercise to the successful culmination of a space need.

Flexibility

When one considers the impending changes that most assuredly will be taking place in the realm of education in the future, it is understandable that the

53. Ibid., p. 5.

54. Loc. Cit.

word "flexibility" is beoming one which will be receiving increased attention and use. Essentially, it is a word which is defined as being easily adapted to fit various uses. Surely, today, this is the guiding principle with which new structures are designed, especially on a campus. However, as is the case when words become popular, they have a tendency to be used as a "catch-all", thereby acquiring many interpretations.

It is important here to understand the varied interpretations of the word "flexibility", especially since the construction stage is upon us and clear meanings are essential in the initial stages of architectural considerations.

Flexibility has been used to mean:

A) Expandibility. It should be evident that "land is a valuable resource particularly in the central area of the university campus where distances between the various academic and service facilities must be kept to a minimum and where there are many competing uses for land."⁵⁵ Consequently, it must be kept in mind that if the traditional less than five storey walkup is still

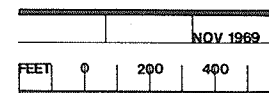
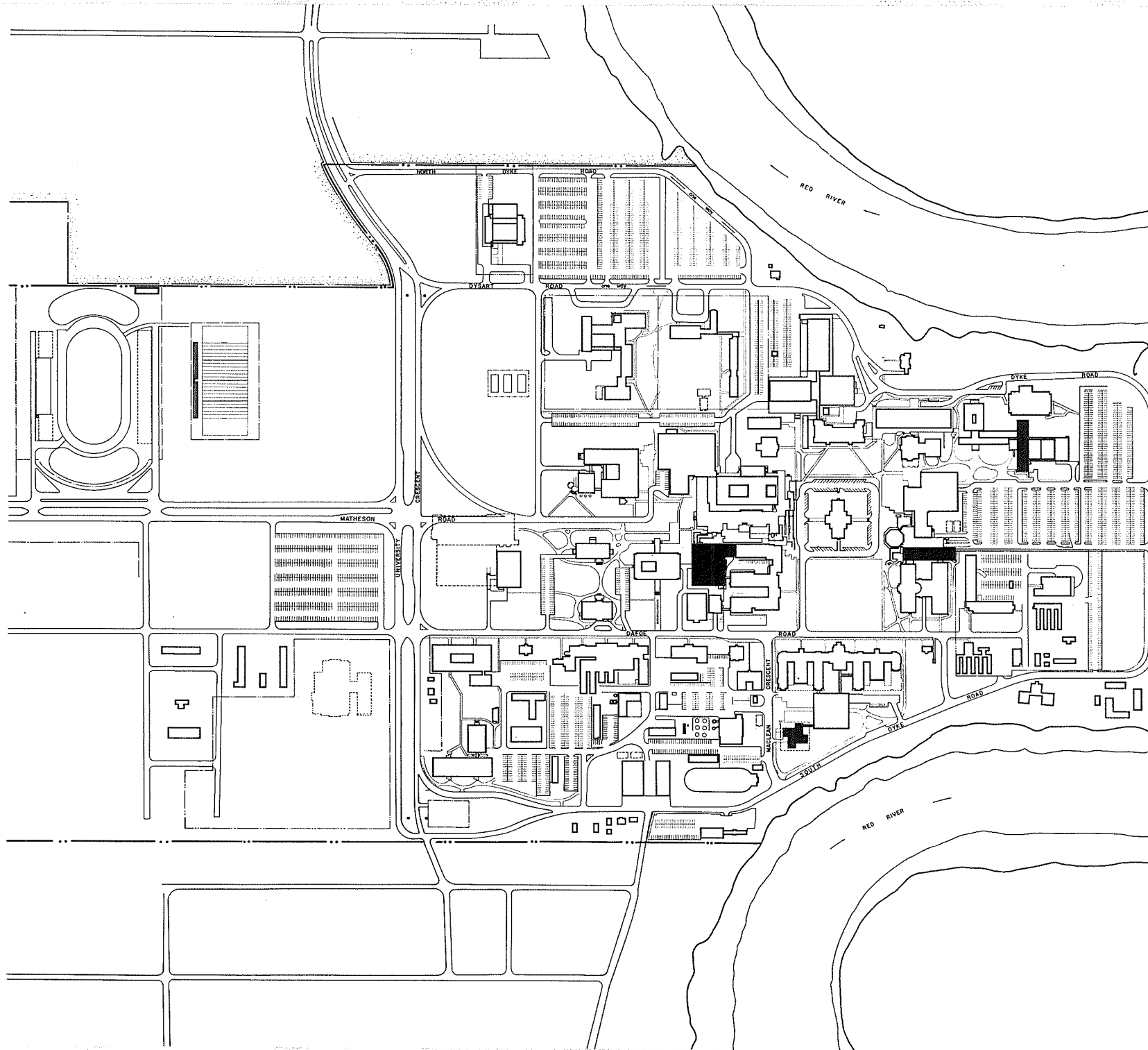
55. Building Programme, North-East Multi-Purpose Building, The University of Manitoba, Planning Secretariat, August, 1970, p. 2.

being built on the campus, then provision should be made for vertical expansion at a later date. A number of universities have found it necessary to expand vertically for various reasons. For example:

Among 9 buildings proposed for construction in the next 10 years at M.I.T., at least 4 will go up to 20 stories. Boston University has a 10-year master plan for a new high-rise campus in which several buildings of 15 or 16 stories will be erected. Even universities with large, sprawling campuses will soon have the vertical look. The University of California at Los Angeles, with a 411-acre campus, is planning buildings that will rise up to 12 stories instead of only 3 or 4 as in the past, so they can retain sizeable landscaped courts and recreation areas. The expansion program at Berkeley is planned so that buildings will be limited to 25 per cent of the 178-acre site, with buildings that will rise vertically in order to maintain open, parklike vistas.⁵⁶

It is interesting to note that on the accompanying Map No. 3 there are only four buildings on the University of Manitoba campus which are five stories or over; the extreme north and south ones are residences, while the ones in the middle east and west portion of the map are the Engineering Building and the Academic Offices of the Fletcher Argue Building, respectively.

56. Weinstock, Ruth, Space and Dollars: An Urban University Expands. Case Studies of Educational Facilities #2. Educational Facilities Laboratories, New York, 1960, p. 14.



BUILDINGS
FIVE STORIES
AND OVER

MAP-3

UNIVERSITY OF MANITOBA
CAMPUS PLANNING OFFICE

However, it is my understanding that a number of the other buildings are capable of vertical expansion. Horizontal expansion is another alternative, but naturally one must have the necessary land and make provision for this type of expansion. The North-East Multi-Purpose Building which is in the programming stages at the University of Manitoba takes into account this meaning of "flexibility", as is realized by this quotation.

The new building should be "open-ended" in the sense that future expansion or connection to later phases of development should be possible without requiring major structural, mechanical or integral planning changes and without destroying the Architectural integrity of the building.⁵⁷

Therefore, it would seem that a thorough examination and weighing of the variables, that is, the availability of centrally located land, the relative costs of further expansion, and so on has been done before the final decision was made.

B) Transforming. "Flexibility" has also been used to convey the idea of transforming, that is, the changing of space designed for the use of one discipline

57. Building Programme, North-East Multi-Purpose Building, Op. Cit., p. 3.

to that of another. For instance, a laboratory that is designed for use in biology could be changed, if the need arose, to a biophysics laboratory without too much trouble or too much expense. Within this context there should also be some consideration given to such problems as "making good a floor when a partition is moved and the type of flooring is no longer on the market."⁵⁸ This is another interpretation which must be realized and accounted for in the programming stage.

C) Servicing provisions. The third interpretation which has been given to "flexibility" is in relation to servicing. This has to do with providing services that are not necessarily needed now but might be needed some time in the future. For example, services such as numerous electrical currents, gases, air withdrawal for fume hoods, and so on could be roughed in at the time of construction, so that they would be available when the need arises. However this could be very costly.

For example, to design and plan a space for initial use as a reading room and service it for possible use as a science laboratory, would be very costly. The investment in servicing might be idle for years and the capital and interest could not be justified.⁵⁹

58. Ibid., p. 6.

59. Ibid., p. 7.

On the other hand, it is postulated that because of the coming impact on the new "electrical" classroom, it is suggested that the necessary cables, outlets and utilities be installed at the initial time of construction rather than after the building has been opened and in operation.

For example, as Walter A. Netsch, Jr., of the Chicago office of Skidmore, Owings and Merrill rationalized as he was designing the University of Illinois campus in Chicago:

All the major instructional areas on the campus, including six low-rise classroom buildings, will be equipped with conduits and cables that will permit the institution to keep up with future electronic developments. Mr. Netsch also hedged his technological bets in planning the audio-visual facilities in the lecture center. He has designed several auditoriums for both front and rear projection..."These buildings," says the architect, "represent the best gamble we could make, considering that educational technology is not a fixed art."⁶⁰

Evidently, it seems that we are caught on the "horns of a dilemma", that is, should we include services that might be of use in the future or not? There is an initial investment of including the services in the

60. Bricks and Mortarboard, Op. Cit., p. 30.

building, plus the loss of interest or there is the increased cost of installing the services at a later date, perhaps at a greater cost. Here, then, are two points of view concerning one interpretation of the word "flexibility", and it is with extreme caution that one must consider the alternatives.

D) Multi-purpose space. The fourth interpretation of "flexibility" is included in the assigning of certain space to a specific function, that is, as a biology laboratory. Usually, a certain amount of preparation and clean-up is required either before or after the class. In many cases, as much as an hour is needed, that is, one-half hour before and one-half hour after the class. This means because of the preparation and clean-up required, usually a laboratory is designated for one particular function, so that the supplies can be close at hand. The result is a room being used by one specific user and losing one hour of room utilization due to preparation and clean-up. The concept of "assignment" of rooms and buildings to specific users has been discussed earlier and will not be considered at this time. However, the preparation and clean-up problem, which is in many ways responsible for room assignment and time loss, will be

considered to this extent.

The multiplying of the use of laboratories can be done by the clever use of the storage space, that is, the adoption of the "lazy susan" principle in the setting up of the laboratory equipment.

On the sample principle, a three-section rotating device is installed in a partition between a bench and storage room. Each section is fitted with adjustable shelves about three feet wide. While a student works with equipment mounted on the shelves that face him, two other sets of shelves are turned toward the storage room where an attendant may simultaneously be setting up equipment for future periods. Between the periods he turns the device, called a Roto Lab, at each bench, either manually or electrically, and lo, an entirely new lab is ready for a new class.⁶¹

It is noted from Chart X that in Pharmacy there is almost an equal number of hours being used for preparation and clean-up as there are scheduled instruction. It might be worthwhile to consider some version of the Roto Lab to alleviate this situation.

CHART X	<u>University of Manitoba: Second Term</u>		
	Total Lab-hrs/wk Available	Total Scheduled Instruction	Total Prep. & Clean-up Time
Pharmacy	270	64	50
Home Ec.	810	175	44

Source: Preliminary Analysis of Space Utilization for Scheduled Instruction on the Fort Garry Campus,
p. 5.

61. Ibid., p. 64.

This interpretation of "flexibility" would increase room utilization as well as make it possible for many types of labs to be held in the one room, thereby reducing the feeling that one must have a biology lab, or a chemistry lab because the equipment room is close at hand. It would become a multi-purpose area, or an area where many different types of labs could be held.

E) Convertibility. The final interpretation of flexibility is convertibility, that is, the dividing of larger spaces into smaller ones and vice versa. This is done in order to gain maximum utility of the floor plan. For example, the idea of operable walls, either sliding, folding or accordian-type, has been used for many years. The difference is that today the acoustical disadvantage has been eliminated. "Noise transmission between class areas has been reduced to the point that activities in one room rarely distract classes on the other side of the partition."⁶² The cost of these partitions is extremely high but in some cases a necessary expense.

62. Ibid., p. 34.

The operable walls at Teachers College cost about \$52,000, or roughly five times the cost of permanent walls. But their installation has made possible an increase in the utilization of classroom space from an estimated 65 per cent to about 85 per cent. "As it works out in practice," Mr. Brotherton said, "the operable walls give Teachers College the equivalent of six additional classrooms." At the going rate of construction in Chicago, that is an unqualified bargain.⁶³

Mr. Obata, of the St. Louis firm of Hellmuth, Obata and Kassabaum, prefers another approach, whereby he places all service elements in towers on the building's periphery. In this way, the entire interior span can be divided and re-divided at will. The whole area can be used as one room or it can be divided into a number of classrooms of various sizes. In a long run, says Mr. Obata, "the flexibility will more than pay for itself."⁶⁴

As should be realized from the foregoing, "flexibility" means different things to different people and almost every interpretation is costly.

Conclusion

The technological changes which will be taking

63. Loc. Cit., (Philip Brotherton is a partner with Perkins and Will, Architects).

64. Ibid., p. 37.

place in the future can leave an institution and those in it in a very perplexed situation. Programming, it seems, is the final and most critical stage through which a prospective building must pass. It is in this stage that such words as "flexibility", with all its interpretations, rear their ugly heads in an effort to thwart the successful completion of the ideal building. The safeguard is to define precisely the meanings of these "catch-all" words in relation to the future needs and growth of the institution. In this way, the project architect can ensure that the final stage before the construction of the building can be an unequivocal success.

Summation and Recommendations

In summation, it is realized from the early history of the University that the addition of physical facilities was achieved in extremely stressful situations, that is, whenever overcrowding or public sentiment provoked it. In contrast to this, a second phase saw the government increase the amounts of the grants allocated to the University and due to this fact the University used this opportunity to construct a number of new buildings. Now it seems that the third phase in the life of the University of Manitoba has come forth in the form of a reduction in the provincial grant. Consequently, it seems that the time is ripe for planning, that is, the coupling of people and their aspirations to the limitations of the fiscal resources. As previously stated in this thesis, one of the many areas that generate space demands is instructional facilities. The analysis of this generator showed that many Faculties and/or Schools were either making good use of the facilities thereby resulting in a need for additional space or they were not using the facilities at their disposal as well as they might.

On the surface it seemed as if they were in need of new facilities, but an in-depth look showed they could get along with the facilities they were now using. At that point, it was felt that it was necessary to find the causes of the poor utilization and reduce it as much as possible. Many causes were found and a number of possible solutions were put forth, some quite controversial, but nevertheless, it was felt they could accomplish the desired goal. Because it was felt that all the previous work could either be brought to a successful conclusion or a dismal failure in the "programming" stage, a discussion of this phase was presented. A well-written building program with precise definitions of the many words which are commonly used, thereby acquiring many meanings, is the secret to success. Through the precise definitions of the schools' requirements it is possible to produce a building program which will satisfy both the current needs of the users and the future possibilities in the field of education, to say nothing of the help which it provides to the Architect whose responsibility it is to draw up the preliminary sketches as well as the

final design. Therefore, clear meanings and precise definitions are an essential pre-requisite to a successful conclusion.

Finally, as a result of this study on the provision and optimal use of the instructional space of the University of Manitoba, the following is a number of recommendations which hopefully will be of some benefit in the future.

1. that a room and station utilization study be developed every year.
2. that central timetabling be instituted at the earliest possible date.
3. that greater use be made of the existing instructional space between the hours of 5:30 p.m. and 10:00 p.m.
4. that all instructional facilities be considered on a regional basis as depicted on Map No. 2, page 56, rather than being thought of as Faculty or Department "owned".
5. that all future construction of buildings be "open-ended" both vertically and horizontally.
6. that consideration be given to building higher buildings in the central portion of the campus.
7. that files such as the W₃ space inventory, registrar's information,³ be automated in a manner which will provide segments of the file rather than the file as a whole.
8. that a detailed study be instituted regarding the

equal credit to contact hours situation as it pertains to the Faculty of Arts and its effects on the Library space.

9. that in-depth studies be initiated on the remainder of the primary space generators.
10. that Operations and Maintenance come directly under the jurisdiction of the planning organization.
11. that the University as a whole be alerted to the planning procedures now in effect and contribute wherever possible to the functioning of this organization.

Thus in conclusion, the implementation of these recommendations will, in essence, enhance the tasks of a campus planning organization and succeed in making campus planning more efficient.

APPENDICES

APPENDIX A

AVERAGE SQUARE FEET NET PER STATION

	<u>Total Instr. Lab & Service Area-Net Sq.Ft.</u>	<u>Total Lab.Stations</u>		<u>Average Area Per Station</u>		
		<u>By Space</u>	<u>By Dept.</u>	<u>By Space</u>	<u>By Dept.</u>	<u>Used For</u>
		<u>Inventory</u>	<u>Info.</u>	<u>Inventory</u>	<u>Info.</u>	<u>Space Projection</u>
Agriculture	25,678	249	272	103	94	100
Architecture	39,066	631 undergrad.students: space/student = 61				
Arts	17,124*	399	399	43	43	25
Commerce	860	23	23	37	37	37
Education	11,954	250	215	48	56	55
Engineering	70,128	896	937	78	75	75
Fine Arts	14,224	174 undergrad.students: space/student = 81				
Home Economics	19,400	195	168	100	116	116
Music	1,915	17	17	112	112	112
Pharmacy	10,606	126	120	84	88	88
Science	98,525	2,408	1,637	41	60	60

* Further details are required on this space. It is estimated that between 2,000 and 4,000 sq. ft. of this space was assigned to the Colleges and to the Dean of Arts and Science, that is probably Science and Commerce space.

Source: Space Requirement Projections to
75/76 for Faculties and Schools,
Fort Garry Campus.

WEEKLY STUDENT CONTACT HOUR PROJECTION

(Proportional to Undergrad. Student Credit Hour Projection)

		<u>69/70</u>	<u>70/71</u>	<u>71/72</u>	<u>72/73</u>	<u>73/74</u>	<u>74/75</u>	<u>75/76</u>
Agric.	Wkly.St.Cls.Hrs.	6156	6960	7640	8012	9214	9846	10440
	Wkly.St.Lab Hrs.	2660	3045	3342	3505	4031	4308	4575
Arch.	Wkly.St.Cls.Hrs.	8770	9123	9492	9873	10265	10606	10654
	Wkly.St.Lab Hrs.	11107	11503	11968	12448	12943	13373	13433
Arts	Wkly.St.Cls.Hrs.	70060	76625	83456	89338	98229	105076	111214
	Wkly.St.Lab Hrs.	2880	3117	3395	3634	3995	4274	4524
Comm.	Wkly.St.Cls.Hrs.	6606	7754	8694	9669	11260	12673	13431
	Wkly.St.Lab Hrs.	904	1016	1140	1268	1477	1662	1761
Educ.	Wkly.St.Cls.Hrs.	15651	17489	19407	21319	23222	23403	24810
	Wkly.St.Lab Hrs.	2097	2363	2623	2881	3138	3163	3353
Engin.	Wkly.St.Cls.Hrs.	11026	12110	13153	14323	15495	16324	17258
	Wkly.St.Lab Hrs.	6437	6920	7516	8185	8854	9328	9862
Fine Arts	Wkly.St.Cls.Hrs.	375	414	455	534	594	633	670
	Wkly.St.Lab Hrs.	3348	3830	4211	4943	5494	5856	6199
H.Econ.	Wkly.St.Cls.Hrs.	2378	2160	3116	3251	3645	3954	4232
	Wkly.St.Lab Hrs.	2990	2699	3895	4063	4556	4942	5291
Law	Wkly.St.Cls.Hrs.	3302	3786	4343	4242	4247	4252	4255
	Wkly.St.Lab Hrs.	--	--	--	--	--	--	--
Music	Wkly.St.Cls.Hrs.	940	1062	1155	1222	1298	1385	1464
	Wkly.St.Lab Hrs.	--	--	--	--	--	--	--
Nurs.	Wkly.St.Cls.Hrs.	2513	2969	3495	4011	4586	5741	5802
	Wkly.St.Lab Hrs.	824	956	1126	1292	1477	1762	1869

WEEKLY STUDENT CONTACT HOUR PROJECTION - continued

	<u>69/70</u>	<u>70/71</u>	<u>71/72</u>	<u>72/73</u>	<u>73/74</u>	<u>74/75</u>	<u>75/76</u>
Pharm. Wkly.St.Cls.Hrs.	1058	1156	1294	1401	1572	1710	1811
Wkly.St.Lab Hrs.	910	995	1113	1206	1353	1472	1558
Phys.Ed.Wkly.St.Cls.Hrs.	1710	2265	2586	2758	2781	2797	2961
Wkly.St.Lab Hrs.	2500	3266	3729	3977	4010	4033	4270
Science Wkly.St.Cls.Hrs.	43009	46967	51092	54912	60668	63909	67752
Wkly.St.Lab Hrs.	28544	31311	34061	36608	40445	42606	45168
Soc.Wk. Wkly.St.Cls.Hrs.	2288	2086	3690	3267	3672	3732	3900
Wkly.St.Lab Hrs.	--	--	--	--	--	--	--

Source:

Space Requirement Projections to 75/76 for Faculties and Schools, Fort Garry Campus.

ROOMS INCLUDED IN INSTRUCTIONAL ROOM COUNT 1969/70

	<u>Classroom or Seminar Room No.</u>	<u>Lab or Studio Room No.</u>
AGRICULTURE BLDGS.		
(011) Agriculture	17, E210, 211, 414	W301, E318
(012) Agric. Engin.	107, 202	108, 203, 210, 211
(013) Agric. Engin. Shed		E
(014) Agric. Lect. Block	101, 102	
(015) Anim. Sc. Bldg.	107, 108, 219, 220	124, 142, 203
(024) Crop Res'h Bldg.	E319	
(027) Dairy Sc. Bldg.	206	100, 106
Total Number of Rooms	14	12
ARCHITECTURE BLDGS.		
(201) Architecture	102, 103, 104, 121, 122	20, 200, 201
(365) Hut J		100
(812) Mobile Bldg.		100
Total Number of Rooms	5	5
ARTS, COMM, SOC. WK. COMPLEX		
(111) Fletcher Argue	100, 200	
(113) Isbister Bldg.	102, 107, 136, 202, 203, 231, 235, 236, 343	101, 103, 137, 201
(115) Tier Bldg.	200, 201, 202, 203, 204, 205, 206, 213, 214, 215, 216, 300, 301, 303, 304, 305, 306, 308, 309, 313, 400, 401, 403, 405, 406, 408, 410, 413, 414, 416, 415, 417, 418, 500, 501, 502, 503, 504, 508	409A
Total Number of Rooms	50	5

ROOMS INCLUDED IN INSTRUCTIONAL ROOM COUNT 1969/70 - continued

	<u>Classroom or Seminar Room No.</u>	<u>Lab or Studio Room No.</u>
COLLEGES		
(131) University College	235, 236, 237, 238, 240, 241, 244, 375, 376, 377, 379, 380, 382, 383, 384, 386, 392, 393, 395, 396	385, 389, 391
(141) St. John's College	C, D, E, F, G, H, J, K	
(145) St. Paul's College	A, B, C, E, I, J, K, L, M	112A, 112B, 201
Total Number of Rooms	37	6
SCIENCE COMPLES		
(151) Allen Physics Bldg.	330	105, 402, 403, 405, 501, 519, 522
(153) Parker Chem. Bldg.	458, 540	201, 207, 213, 219, 220, 225, 226, 234, 303, 309, 331, 405, 413, 419, 425, 431, 433, 522, 525
(152) Armes Lect. Bldg.	111, 113, 200, 201, 204, 205, 208	
(157) Buller Biol. Bldg.	207, 306, 315 527	201, 211, 212, 215, 302, 312, 314, 316, 428, 522, 523, 531
(159) Geology Bldg.	211, 307	303, 310, 406
(167) Duff Roblin Bldg.	Z319, P422, N303, N307, N311, N315	Z201, Z202, Z204, Z205, Z207, Z301, Z302, Z304, H502, H516, P210, P230
Total Number of Rooms	22	52

ROOMS INCLUDED IN INSTRUCTIONAL ROOM COUNT 1969/70 - continued

	<u>Classroom or Seminar Room No.</u>	<u>Lab or Studio Room No.</u>
EDUCATION BUILDINGS		
(211) Education Bldg.	127, 128, 134, 136, 138, 224, 309, 310, 311, 312, 313, 314, 318, 319, 321, 325, 326, 330, 333, 334, 336, 338, 345, 346	140, 225, 328, 342, 343, 327
(213) Education Addition	270A, 361, 362, 363, 365, 366	
Total Number of Rooms	30	6
ENGINEERING BUILDINGS		
(231) Engin. Bldg.	108, 223, 224, 227, 328, 331, 335, 337, 339, 406A, B, C, 408, 427, 428, 429, 437, 438, 439, 442, 444, 445, 446, 447, 448, 449	211, 212, 229, 312, 346, 347, 414, 426, 430
(235) Engin. Addition	234, 450, 451, 461, 462, 504, 506, 516, 517	119, 363, 366, 452, 463, 465, 466, 469, 508, 518, 519, 521, 423, 527, 529
Total Number of Rooms	33	24
(261) FINE ARTS BLDG.	27	12, 18, 110A, 110B, 112, 203, 304, 305, 306, 308
Total Number of Rooms	1	9

ROOMS INCLUDED IN INSTRUCTIONAL ROOM COUNT 1969/70 - continued

	<u>Classroom or Seminar Room No.</u>	<u>Lab or Studio Room No.</u>
(081) HOME ECON. BLDG.	108, 206, 216, 402, 417	104, 109, 202, 212, 302, 304, 318, 401, 404, 410, 417A, 200, 200A, 300, 322
Total Number of Rooms	5	15
(251) LAW BUILDING	200A, 200B, 204, 205, 206, 207, 306, 308, 309, 311	
Total Number of Rooms	10	
(271) MUSIC BUILDING	203, 222, 308	208, 211, 212, 301, 302, 303, 305, 307, 311, 312, 315, 323, 326, 327, 328, 329, 332
Total Number of Rooms	3	17
(191) PHARMACY BUILDING	301, 401	108, 201, 203, 303, 307, 405
Total Number of Rooms	2	6
(331) ADMIN. BUILDING	408, 409, 411	
Total Number of Rooms	3	
PHYSICAL ED. FACILITIES		
(811) Mobile Bldg.	1	
(301) U.M.S.U.		100E, 100W (gyms)
(341) Tache Hall		200W (gym)
Total Number of Rooms	1	3
Grand Total	216	161

THE UNIVERSITY OF MANITOBAFORT GARRY CAMPUS

<u>Building Number</u>	<u>Building Description</u>
011	Agriculture Building
012	Agriculture Engineering Building
013	Agriculture Engineering Shed
014	Agriculture Lecture Block
015	Animal Science Building
016	Animal Science Equipment Shed
017	Animal Feed Mill
021	Cattle Barn
023	Agricultural Economics Annex Building
025	Crop Research Building
027	Dairy Science Building
028	Dairy Barns
031	Entomology Shed
037	Food Science Building
041	Plant Science Garages and Stores
043	Poultry Confinement Building
044	Poultry Feed Shed
045	Poultry Nutrition Building
046	Processing and Chick Battery Building
047	Research Annex Building
048	Sheep Barn
051	Swine Barns
053	Soil Science Equipment Shed
081	Home Economics Building
111	Fletcher Argue Building and Theatre
113	Isbister Building
115	Tier Building
131	University College
133	University College Residence
141	St. John's College
145	St. Paul's College
151	Allen Physics Building
152	Armes Lecture Building
153	Parker Chemistry Building
157	Buller Biological Building
159	Geology Building
161	Cyclotron
167	Roblin Building
171	Botany Greenhouse
191	Pharmacy Building
201	Architecture Building
211	Education Building

THE UNIVERSITY OF MANITOBAFORT GARRY CAMPUS - continued

<u>Building Number</u>	<u>Building Description</u>
213	New Education Addition
231	Engineering Building
235	New Engineering Building
237	Fetherstonhaugh High Voltage Laboratory
251	Law Building
261	School of Art
271	School of Music
301	Student Union Building
303*	University Centre
311	Swimming Pool
313	Rifle Range
315	Skating Rink
317	Stadium
318	Field House
321	Dafoe Library
331	Administration Building
337*	Temporary Book Store
341	Tache Hall
345	Pembina Hall
347	Mary Speechly Hall
351*	Constable's Residence
353	President's Residence
355	Vice-President's Residence
361	Farm House
362	Employee Dwellings
363	
364	
365	Hut "J"
367	Surplus Products Store

OPERATIONS AND MAINTENANCE BUILDINGS

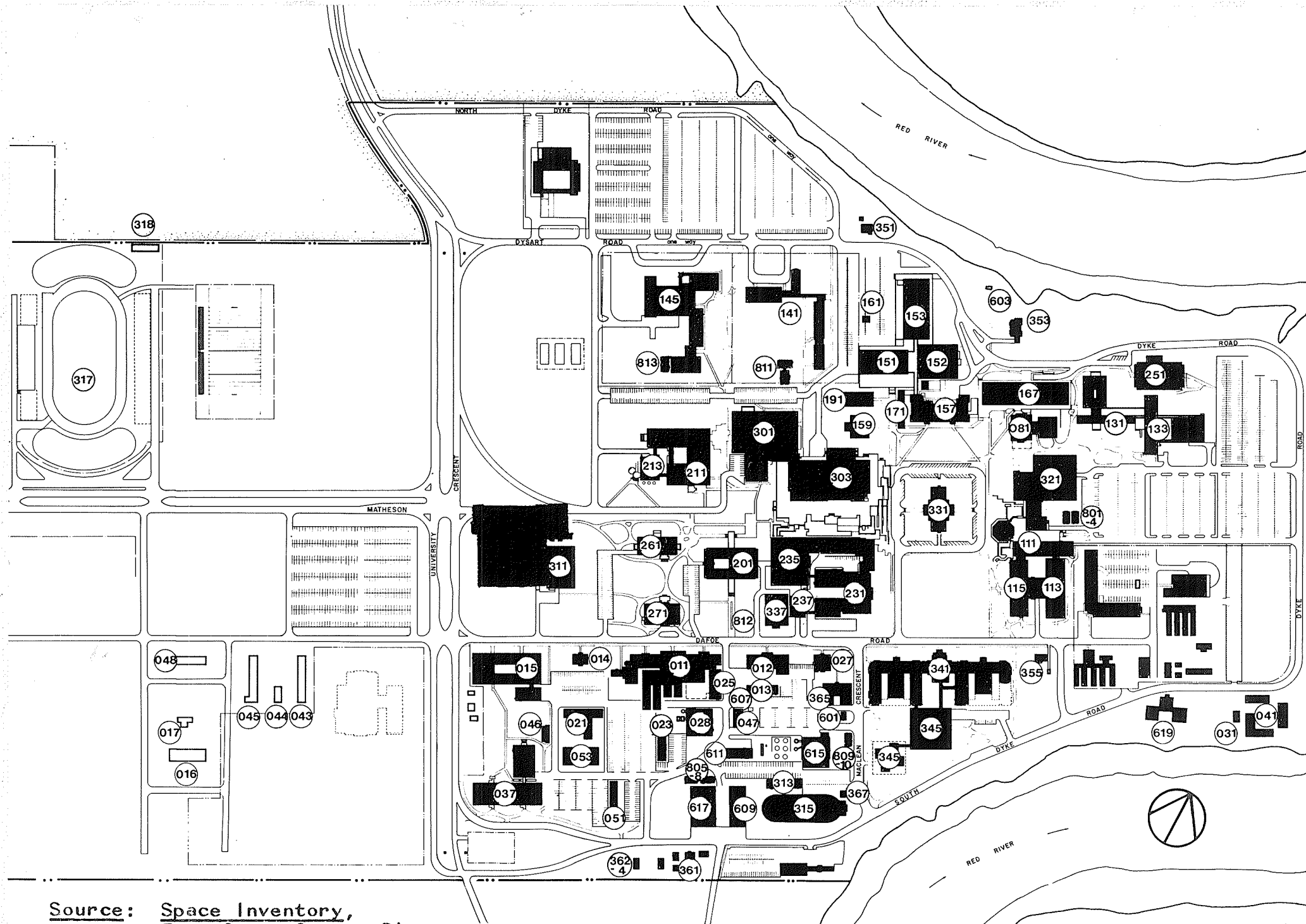
601	Fire Hall
603	Flood Pump House
607	Gas and Oil Area
609	Maintenance Building
611	Agriculture Implement Shed
615	Power House and Laundry
617	Stores
619	Water Works Building
709	Pedestrian Tunnels

THE UNIVERSITY OF MANITOBAFORT GARRY CAMPUS - continuedBuilding NumberBuilding Description

MOBILE BUILDINGS

801	Unit A, (Fletcher Argue Area 70/71)
802	Unit B, (Fletcher Argue Area 70/71)
803	Unit C, (Fletcher Argue Area 70/71)
804	Unit D, (Fletcher Argue Area 70/71)
805	Unit E, (Maintenance Area 70/71)
806	Unit F, (Maintenance Area 70/71)
807	Unit G, (Maintenance Area 70/71)
808	Unit H, (Maintenance Area 70/71)
809	Unit J, (Power House Area 70/71)
810	Unit K, (Power House Area 70/71)
811	Unit L, (Student Union Area 70/71)
812	Unit M, (Architecture Area 70/71)
813	Unit N, (St. Paul's College Area 70/71)

*Buildings not completed as of 1970 Survey



Source: Space Inventory,
Fort Garry Campus Plans
University of Manitoba. Office of the Vice-President Planning.

LABORATORY AND STUDIO SPACE

<u>Actual Rates</u>	<u>Optimum Rates</u>	<u>Difference</u>
46,816	15,827	30,989
29,433	40,318	-10,885
6,319	5,600	719
10,820	6,857	3,963
83,037	28,709	54,328
14,262	16,317	-2,055
40,365	20,631	19,734
10,101	4,732	5,369
24,275	37,000	-12,725
260,035	101,902	158,133
<hr/>	<hr/>	<hr/>
525,463	277,893	247,570

Difference is: $525,463 - 277,893 = 247,570$ sq. ft. net

COST OF EXCESS IS: $247,570 \times \$55. = \underline{\$13,616,350.00}$

CLASSROOMS AND SEMINAR SPACE

<u>Actual Rates</u>	<u>Optimum Rates</u>	<u>Difference</u>
12,065	5,109	6,956
9,910	7,279	2,631
64,742	65,531	-789
26,606	12,990	13,616
24,587	9,151	15,436
1,316	311	1,005
7,585	1,973	5,612
7,528	2,740	4,788
2,857	780	2,077
9,800	2,085	7,715
1,819	878	941
6,019	1,419	4,600
58,062	35,697	22,365
<hr/>	<hr/>	<hr/>
232,896	145,943	86,953

Difference is: $232,896 - 145,943 = 86,953$ sq. ft. net

COST OF EXCESS is: $\$45. \times 86,953 = \underline{\$3,912,885.00}$

APPENDIX B

THE UNIVERSITY OF MANITOBA

Faculty of Arts and Science

1969-70 Winter Day Session Lecture and Laboratory Timetable

The 45 hours available in a week (Monday through Friday) have been subdivided for lecture purposes into 15 three-hour groups, each one of which is referred to as a "slot". Each lecture course will occupy one slot. The five courses of a typical registration will therefore require five different slots, to avoid conflicts. The slots, which have been numbered 1 to 15, are shown for each section of every course in the Lecture Timetable. The three hours allotted to each of the 15 slots are shown on a typical weekly timetable form as follows:

Lecture Slot Timetable

	Mon.	Tues.	Wed.	Thurs.	Fri.
8:30	1	4	2	5	3
9:40	2	5	3	1	4
10:40	3	1	4	2	5
11:40	6	9	7	10	8
12:40	7	10	8	6	9
1:40	8	6	9	7	10
2:40	11	14	12	15	13
3:40	12	15	13	11	14
4:40	13	11	14	12	15

For example, students choosing to elect First Year courses will find Geology 7.123 lectures in slot 9; slot 9 indicated classes at 11:40 Tuesdays, 1:40 Wednesdays, 12:40 Fridays. Other courses given at the same hours will also appear in slot 9 and may not be taken concurrently.

A laboratory number must be entered in each case on the registration form. Arts and Science students in Lecture Shift A will normally choose laboratory periods in the afternoon; those in Lecture Shift B will normally choose laboratory periods in the morning. Location of laboratories will be announced in lectures or posted. Most laboratories are of 3 hours duration. These are to be shown on the student's timetable. Observe that all laboratory sections have been designated by a number:

Monday	A.M. - Lab. No. 20	Monday	P.M. - Lab. No. 21
Tuesday	A.M. - Lab. No. 22	Tuesday	P.M. - Lab. No. 23
Wednesday	A.M. - Lab. No. 24	Wednesday	P.M. - Lab. No. 25
Thursday	A.M. - Lab. No. 26	Thursday	P.M. - Lab. No. 27
Friday	A.M. - Lab. No. 28	Friday	P.M. - Lab. No. 29

Monday	Mid-day - Lab. No. M1
Tuesday	Mid-day - Lab. No. M2
Wednesday	Mid-day - Lab. No. M3
Thursday	Mid-day - Lab. No. M4
Friday	Mid-day - Lab. No. M5

A.M. LABS - 8:30 to 11:30
 Mid-Day - 11:40 to 2:30
 P.M. LABS - 2:40 to 5:30

LECTURE SECTIONS IN THE FACULTY OF ARTS

Anthro:

76:120 - 4 sections
 76:220 - 1
 76:221 - 1
 76:330 - 1
 76:331 - 3 Total 10

Classics:

3:234 - 1 section
 3:240 - 1
 3:243 - 1
 3:343 - 1
 3:093 - 1
 3:123 - 1
 3:222 - 1
 3:092 - 2
 3:122 - 1
 3:221 - 1
 3:224 - 1
 3:336 - 1
 3:337 - 1 Total 14

Economics:

18:120 - 24 sections
 18:221 - 4
 18:223 - 1
 18:226 - 5
 18:227 - 1
 18:228 - 1
 18:330 - 1
 18:332 - 1
 18:336 - 1
 18:337 - 2
 18:338 - 1
 18:339 - 1
 18:342 - 1
 18:344 - 1 Total 45

English:

4:120 - 38 sections
 4:221 - 2
 4:222 - 3
 4:223 - 6
 4:234 - 3
 4:235 - 2
 4:237 - 1
 4:238 - 1
 4:332 - 5
 4:333 - 1
 4:334 - 4
 4:336 - 1
 4:337 - 1
 4:338 - 1
 4:346 - 1
 4:347 - 1
 4:350 - 3
 4:359 - 1
 4:369 - 1
 4:370 - 1 Total 74

French:

6:120 - 14 sections
 6:121 - 2
 6:224 - 2
 6:226 - 1
 6:227 - 3
 6:334 - 1
 6:336 - 1
 6:337 - 2 Total 26

Geography:

53:120 - 3 sections
 53:221 - 1
 53:228 - 1
 53:234 - 1
 53:235 - 1
 53:236 - 1
 53:330 - 1
 53:331 - 1
 53:340 - 1
 53:341 - 1 Total 12

German:

8:090 - 3 sections
 8:120 - 3
 8:221 - 1
 8:222 - 1
 8:331 - 1
 8:332 - 1 Total 10

History:

11:120 - 5 sections
 11:121 - 4
 11:122 - 1
 11:220 - 2
 11:221 - 2
 11:222 - 1
 11:223 - 3
 11:233 - 1
 11:235 - 1
 11:236 - 3
 11:237 - 1
 11:238 - 2
 11:239 - 1
 11:245 - 1
 11:247 - 1
 11:334 - 1
 11:337 - 1
 11:338 - 2
 11:339 - 1
 11:341 - 1
 11:342 - 1
 11:343 - 1
 11:344 - 1
 11:346 - 1
 11:347 - 1
 11:362 - 1
 3:234 - 1 Total 42

Icelandic:

12:090 - 1
 12:120 - 1
 12:220 - 1
 12:330 - 1 Total 4

Italian:

98:090 - 1 Total 1

Judaic Studies:

55:090 - 1
 55:120 - 1
 55:220 - 1
 55:331 - 1
 55:123 - 1
 55:223 - 1
 55:332 - 1
 55:122 - 1
 55:222 - 1 Total 9

Eastern Lang.:

67:331 - 1 Total 1

Philosophy:

15:120 - 10 sections
 15:123 - 1
 15:124 - $\frac{1}{2}$
 15:125 - $\frac{1}{2}$
 15:151 - 2
 15:223 - 1
 15:225 - 1
 15:226 - 1
 15:228 - 1
 15:229 - 2
 15:230 - 1
 15:231 - 1
 15:232 - 1
 15:253 - 1
 15:332 - 1
 15:335 - 1
 15:337 - 1
 15:338 - 1
 15:353 - 1 Total 29

Political Science:

19:122 - 6 sections
 19:221 - 1
 19:223 - 3
 19:224 - 2
 19:226 - 2
 19:228 - 1
 19:333 - 1
 19:337 - 1
 19:336 - 1
 19:338 - 1 Total 19

Psychology:

17:120 - 36 sections
 17:220 - 3
 17:221 - 4
 17:222 - 4
 17:224 - $\frac{1}{2}$
 17:330 - 4
 17:332 - 1
 17:334 - 1
 17:335 - 2
 17:336 - $\frac{1}{2}$ Total 55

Religious Studies:

20:124 - 1
 20:127 - 1
 20:225 - 1
 20:230 - 1
 20:231 - 1
 20:221 - 1
 20:223 - 1
 20:338 - 1
 20:340 - 1
 20:341 - 1 Total 10

Science Studies:

52:090 - 1
 52:124 - 1
 52:221 - 1
 52:231 - 1
 52:330 - 1
 52:091 - 1
 52:125 - 1
 52:228 - 1
 52:229 - 1
 52:336 - 1
 52:337 - 1 Total 11

Sociology:

77:120 - 12 sections
 77:220 - 2
 77:221 - 2
 77:223 - 3
 77:226 - $\frac{1}{2}$
 77:227 - $\frac{1}{2}$
 77:228 - 2
 77:229 - 4
 77:330 - 1
 77:331 - 2
 77:332 - 2
 77:333 - 1
 77:334 - $\frac{1}{2}$
 77:336 - 1
 77:338 - $\frac{1}{2}$
 77:337 - $\frac{1}{2}$
 77:340 - 1
 77:341 - 1
 77:342 - $\frac{1}{2}$ Total 37

Spanish:

75:090 - 3
 75:120 - 2
 75:222 - 1
 75:223 - 1
 75:330 - 1
 75:331 - 1 Total 9

GRAND TOTAL NO. OF ARTS SECTIONS: 418

UNDERGRAD: 5 - 15 Students

Course	Number	Building	Lab. Or Room No.	Capacity	Enrollment
34	305	014	102	46	13
34	309	012	202	50	6
34	417	012	202	50	6
34	421	011	211	40	5
35	415	015	219	120	8
35	416	015	219	120	11
35	420	015	220	35	8
35	424	015	220	35	11
35	425	015	220	35	12
38	312	015	220	35	8
38	313	015	219	120	11
38	410	015	220	35	11
38	419	015	211	10	5
39	413	011	E318	50	11
39	423	011	E318	50	14
39	425	011	211	40	14
40	405	011	211	40	13
40	406	011	E318	50	12
40	408	012	202	50	7
40	409	011	W301	33	10
41	252	014	101	75	11
41	256	011	E210	150	11
41	259	015	220	50	8
41	260	014	102	46	7
41	264	012	202	50	11
61	303	011	211	40	7
61	306	014	102	46	12
61	410	011	E318	50	14
61	412	011	211	40	13
61	413	014	101	75	11
61	416	011	211	40	7
61	417	011	211	40	14

Course	Number	Building	Lab. Or Room No.	Capacity	Enrollment
78	314	027	206	35	13
78	315	027	206	35	10
78	412	027	206	35	11
78	415	027	206	35	14
78	416	027	206	35	10
78	420	027	206	35	9
78	421	027	206	35	7
78	422	027	206	35	11
3	122	131	384	40	6
3	240	131	384	40	10
3	343	131	376	18	8
4	273	141	B	36	6
4	274	131	375	20	8
4	336	115	304	24	12
4	347	131	375	20	12
4	359	115	309	24	13
4	371	131	384	40	12
4	373	131	376	20	7
4	374	131	375	20	9
4	376	115	300	24	8
4	471	131	375	20	7
4	472	131	375	20	14
6	224	145	201	12	12
6	233	115	300	24	12
6	234	115	417	24	12
6	340	115	201	64	10
6	341	131	392	14	7
6	343	131	395	20	7
6	344	115	300	24	7
6	345	131	395	20	12
6	440	131	383	20	13
6	441	131	383	20	11
6	442	115	300	24	12
6	443	131	395	20	7
6	444	131	395	20	14
8	090	145	E	40	11
8	222	131	377	18	12
8	331	131	377	18	10
8	332	131	377	18	5

Course	Number	Building	Lab. Or Room No.	Capacity	Enrollment
42	428	211	345	14	5
42	429	211	346	5	5
42	431	211	225	40	7
42	458	211	346	5	10
23	446	231	406	24	13
25	441	231	427	12	9
25	443	231	428	16	6
25	444	231	337	72	10
25	447	231	427	12	6
54	337	261	18	5	7
54	346	261	12	5	6
54	363	261	306	3	5
54	365	261	12	5	5
26	203	081	104	16	12
26	317	201	121	145	10
28	306	081	216	24	11
62	311	081	109	30	13
62	312	081	216	24	11
62	315	081	216	24	14
62	405	081	216	24	12
64	211	081	206	180	6
64	318	081	216	24	10
64	319	081	304	24	9
64	320	081	300	16	13
64	413	081	304	24	13
45	220	251	308	20	11
45	316	251	207	52	8
45	322	251	308	20	7

Course	Number	Building	Lab. Or Room No.	Capacity	Enrollment
20	223	141	D	40	9
20	225	145	E	18	11
20	230	115	200	24	8
20	338	131	386	42	6
20	340	131	375	42	6
52	122	115	415	24	13
52	124	115	205	24	14
52	228	115	204	30	5
52	229	115	216	20	6
52	231	115	204	30	8
52	330	115	205	24	7
52	336	115	205	24	12
52	337	115	408	24	5
52	440	115	205	24	7
52	441	115	418	24	8
53	229	115	306	186	7
55	120	115	409A	50	13
55	122	115	409A	50	11
55	220	113	407	5	6
75	223	115	300	24	5
75	330	115	300	24	6
75	331	115	300	24	6
77	221	141	C	36	5
77	330	141	J	79	9
77	338	115	400	11	12
9	401	113	203	72	13
9	420	113	204	30	13
10	232	113	236	30	9
10	340	115	204	30	8
10	342	115	204	30	9
27	462	113	136	40	5
29	404	113	136	40	10
29	406	113	136	40	7
29	407	113	202	48	6
29	409	113	102	94	5
29	410	113	235	96	13
29	411	115	204	30	8

Course	Number	Building	Lab. Or Room No.	Capacity	Enrollment
11	339	115	301	65	10
11	344	115	417	20	5
11	346	115	417	20	7
11	442	131	396	17	8
11	443	131	396	17	5
11	445	131	396	17	8
11	446	131	396	17	6
11	448	131	396	17	7
11	449	131	396	17	10
11	453	115	417	20	8
11	458	131	396	17	8
11	461	131	396	17	11
11	462	131	396	17	14
11	463	131	396	17	14
11	464	145	1	8	7
11	472	145	1	8	14
11	473	115	417	20	8
15	231	141	D	40	8
15	332	131	382	20	14
15	338	131	241	53	7
15	341	131	382	20	10
15	343	131	392	14	14
15	448	131	382	20	5
15	449	131	382	20	7
15	450	131	382	20	10
18	343	115	415	24	8
18	440	115	415	24	12
18	444	115	414	24	9
18	445	115	417	24	12
19	233	145	C	50	13
19	338	145	C	50	13
19	348	131	379	20	9
19	349	131	379	20	9
19	440	131	379	20	11
19	446	131	379	20	10
19	450	131	379	20	5
19	452	131	379	20	9

Course	Number	Building	Lab. Or Room No.	Capacity	Enrollment
14	126	271	222	50	12
14	260	271	308	30	14
14	330	271	222	50	13
14	340	271	222	50	7
14	344	271	308	30	9
14	346	271	308	30	10
14	363	271	308	30	12
14	366	271	203	226	10
14	367	271	222	50	9
46	425	191	401	56	5
46	426	191	307	18	5
46	225	157	527	93	14
46	334	157	527	93	9
46	335	157	527	93	6
46	440	157	527	93	6
46	453	157	315	130	5
46	454	157	319	9	8
5	222	113	231	250	11
5	343	115	413	80	14
5	452	115	405	35	13
5	453	115	413	80	9
5	456	115	413	80	9
5	457	115	413	80	11
5	458	115	413	80	9
5	459	115	308	80	7
7	222	152	200	223	8
7	224	159	211	116	8
7	345	159	406	48	12
13	342	115	401	50	11
13	347	115	405	45	12
13	349	115	405	45	12
13	451	115	214	65	14
13	452	115	414	12	13
13	455	115	418	20	5
16	335	152	113	50	12
16	449	152	113	50	6

<u>Course</u>	<u>Number</u>	<u>Building</u>	<u>Lab Or Room No.</u>	<u>Capacity</u>	<u>Enrollment</u>
22	440	167	204	30	11
22	441	167	319	30	10
22	445	167	319	30	12
22	451	167	319	30	10
22	455	167	207	30	9
74	307	152	111	90	13
74	403	231	108	70	7
74	404	235	504	24	12
74	405	231	108	70	11
74	406	231	108	70	7
74	407	231	108	70	6
47	127	115	503	12	14
TOTAL:					<u>222</u>

Source: Computer Print Out:
February 3, 1971.

BIBLIOGRAPHY

A. BOOKS

Bareither, Harlan D. and Schillinger, Jerry L., University Space Planning, Translating the Educational Program of a University into Physical Facility Requirements, University of Illinois Press, Urbana-Chicago-London, 1968.

Knowles, Asa S., editor-in-chief, Handbook of College and University Administration: General, McGraw-Hill Book Company, New York, 1970, Volumes 1 and 2.

Lodge, R. C., editor, Manitoba Essays Written in Commemoration of the Sixtieth Anniversary of the University of Manitoba, The MacMillan Company of Canada Limited, Toronto, 1937.

Morton, W. L., Manitoba: A History, University of Toronto Press, Second Edition, 1967.

One University: A History of the University of Manitoba, 1877-1952, McClelland and Stewart Limited, 1957.

Tilton, Leon Deming and O'Donnell, Thomas Edward, History of the Growth and Development of the Campus of the University of Illinois, The University of Illinois Press, Illinois, 1930.

B. REPORTS

An Outline of the Physical Planning Proposals for the Growth of the Fort Garry Campus, DRAFT, University of Manitoba, Campus Planning Office, September, 1970.

Bricks and Mortarboards: A Report on College Planning and Building, New York: Educational Facilities Laboratories Inc., 1964.

Building Programme, North-East Multi-Purpose Building, The University of Manitoba-Planning Secretariat, August, 1970.

Buildings For Research (An Architectural Record Book), Published by F. W. Dodge Corporation, 1958.

Dental School Planning, prepared by Public Health Service, Publication No. 940, United States Government Printing Office, Washington, 1962.

Housing: University of Manitoba, Nolan Consultants Limited, 240 Adelaide Street, West, Toronto 1, Ontario.

Jamrich, John X., To Build or Not to Build, A Report on the Utilization and Planning of Instructional Facilities in Small Colleges, The Georgian Lithographers, Inc: A Report from Educational Facilities Laboratories, 1969.

Methodology For Projecting Space Requirements For Faculties and Schools, Fort Garry Campus, The University of Manitoba, Planning Secretariat, October, 1970.

Planning Community Junior College Facilities, A Look into the Twenty-first Century, edited by Floyd G. Parker and Max S. Smith, Proceedings of a Conference Sponsored by College of Education and Continuing Education Service and the Council of Educational Facility Planners, Michigan State University, East Lansing, Michigan, 1968.

Preliminary Analysis of Space Utilization for Scheduled Instruction on the Fort Garry Campus, #3, The University of Manitoba-Planning Secretariat, 1970.

School Building Research, Publication No. 1008, Report of a Program held as part of the Building Research Institute 1962 Fall Conferences, 1963.

Space Inventory By Building, May 12, 1970, The University of Manitoba, Winnipeg, Manitoba.

Space Inventory Methodology, Definitions, Classifications, No. 4, University of Manitoba-Office of Vice-President Planning.

Space Requirement Projections to 1975/76 For Faculties and Schools, Fort Garry Campus.

The University of Manitoba Capital Projects: A File on Building Development and Capital Expenditure, 1877-1970, Vice-President - Administration, The University of Manitoba, October, 1970.

University of Manitoba, 1877-1937 - Sixty Years in Pioneering Organization Achievement, Programme of the Celebration Diamond Jubilee, The University of Manitoba, May 16-19, 1937.

University Planning and Design a Symposium, edited by Michael Brawne, Architectural Association, Paper Number 3, published by Lund Humphries for the Architectural Association, London, 1967.

Weinstock, Ruth, Space and Dollars: An Urban University Expands, Case Studies of Educational Facilities #2, Educational Facilities Laboratories, New York, 1960.

Wolfgang M. Illing and Zoltan E. Zigmond, Enrolment in Schools and Universities 1951-52 to 1975-76. Ottawa: Staff Study No. 20, Economic Council of Canada, October, 1967.

Zsigmond, Z. E. and Wenaas, Enrolment In Educational Institutions By Province 1951-52 to 1980-81, Ottawa: Staff Study No. 25, Economic Council of Canada, January, 1970.

C. CALENDARS, YEARBOOKS AND SPECIAL PUBLICATIONS

Computer Printouts, University of Manitoba, February, 1970, "W-3" Printout, "Timetable" Printout, "Classes 15 and Less" Printout.

Original Departmental Data Sheets collected during the winter and summer session of 1969-70, Planning Secretariat, University of Manitoba.

The American School and University, a yearbook devoted to the Design, Construction, Equipment, Utilization, and Maintenance of Educational Buildings and Grounds, American School Publishing Corporation, New York 16, New York, 1948-49, Twentieth Annual Edition, 1951-52, Twenty-third Annual Edition.

The University of Manitoba Evening Session Courses for Credit Towards Degrees, 1969-70, Winnipeg, Manitoba.

The University of Manitoba Faculty of Arts and Science
1969-70 Winter Day Session Lecture and Laboratory
Timetable, Winnipeg, Manitoba.

The University of Manitoba General Calendar, 1969-70,
Winnipeg, Manitoba.

The University of Manitoba Summer Session, 1969, Winnipeg,
Manitoba.