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ABSTRACT

The Ontario Council of University Librarians (OCUL) was requested to undertake an assessment of the library facilities that would be required by each university to serve the enrollment projected for 1975-76. After submission of the report a research staff refined the data and analysis, and placed the figures for all universities on a comparable basis. The analysis is presented in two major sections: the first deals with the projected facilities requirements, and the associated capital commitment; and the second deals with the implications of this planning on future operating budgets. The prime objective of this report is to estimate the total capital dollar commitment that the Government of Ontario will be required to undertake to provide minimum library facilities for the 1976 projected enrollment levels determined from a range of current planning factors. The conclusions and data of the report are not intended for use in the allocation of resources at either the system or university level, but only as guidelines to the financial implications of future decision-making. (Author/SJ)

A TECHNICAL ANALYSIS OF ONTARIO UNIVERSITIES' REQUIREMENTS FOR LIBRARY FACILITIES 1970 - 76

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and
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This report is not a public document. It was prepared for the Committee of Presidents of Universities of Ontario and the Ontario Council of University Librarians. The authors would appreciate notification of any errors or recommendations.

Research Division,
Committee of Presidents
of Universities of Ontario,
June 12, 1970.

Contents

1. INTRODUCTION

At the 39th meeting of the Committee of Presidents of Universities of Ontario in June 1968 the Ontario Council of University Librarians (OCUL) was requested to undertake an assessment of the library facilities that will be required by each university to serve the enrolment projected for 1975-76. Following submission of the OCUL report to CPUO on April 10, 1969, this CPUO research staff was asked to refine the data and analysis, to place the figures for all universities on a comparable basis and to report back.

The analysis is presented in two major sections; the first deals with the projected facilities requirements and the associated capital commitment and the second with the implications of this planning on future operating budgets.

In this report library needs are analyzed using derived system parameters so it is not feasible to treat specific problems associated with a single library except perhaps to acknowledge that university libraries will differ in certain aspects such as quality and size. If the total capital resources were unlimited there would be justification for analyzing the requirements of each university separately within the constraints of the master plan of that university. Capital resources are limited however and with this it would be difficult, for example, to justify a factor of 25 square feet per undergraduate reader seat as a maximum in one university while providing 35 square feet in another.

The report does attempt to compensate for significant differences among universities, however. The staff-student ratios at the individual universities are used rather than the

provincial average. The mix of students is also taken into account.

We would have liked to consider the libraries as a system resource in this analysis but the state of the art of this development would not allow it at this time. If the report were to deal with the libraries as a complete system then it would be necessary to consider the effects of the inter-library loan system, the new bibliographic centre and the possible central storage of certain materials. All of these considerations are currently beyond the scope of this report. However, they are fruitful avenues for future discussion and any long range planning of library requirements should take such system characteristics into account.

The prime objective of this paper is to estimate the total capital dollar commitment that the Government of Ontario will be required to undertake to provide minimum library facilities for the 1976 projected enrolment levels, determined from a range of current planning factors. The analyses and results presented for individual universities are intended only to show how each university would be affected by the application of these planning standards. The conclusions and data of the report are not intended for use in the allocation of resources at either the system or university level but only as guidelines to the financial implications of future decision-making.

Before proceeding with the analyses it will be useful to discuss briefly the methodology introduced in the report. One possible method would have involved collating various

planning factors from several jurisdictions, averaging appropriate categories and applying these averages as planning factors. Problems would have immediately risen with respect to both definition and categorization. One system may have specified one reading seat space factor for graduate students and another factor for faculty while a comparable system specified one factor for graduate students and inflated this value artificially to provide space for faculty.

To correct for these problems the analysis consists of the application of planning factors selected from four different jurisdictions. The space totals generated by the four systems are used to derive a range for the estimation of capital funds required for library facilities in 1975-76. The systems employed are:

(1) University of Illinois

(2) Indiana University

(3) Taylor, Lieberfeld and Heldman

(4) Ontario system 1/

An estimate is then made of the formula income for 1975-76 and the expenditures required to maintain the projected

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1/ These are planning factors developed during the compilation of this report. The derivation is presented in detail later in the report.

library operations. A comparison of the ratio of projected library expenditures and formula income to current budgetary policies provides an indicator of the viability of planned operating levels.

1.1 Summary of Results and Conclusions

In our view the Taylor, Lieberfeld and Heldman planning criteria are too conservative and the Indiana criteria are too liberal. The Illinois and Ontario systems, which we consider appropriate, indicate a requirement of an additional 1.0 to 1.4 million gross feet of library space by 1975-76. At an estimated average cost of $33 per gross square foot the total additional capital requirement for the period would be in the order of $40 million.

The proposed Ontario planning factors are also used to estimate the library facilities that universities ought to have had for 1968-69 enrolment. This estimate, considered together with the appraisal of facilities required by 1975-76 and in conjunction with the present facilities and approved building programmes, provides approximate indications of when the libraries will experience shortages of space.

By these criteria, many of the libraries now have space shortages and will continue to have them even considering current and approved construction. Other university libraries will face the same situation in the future as demand begins to exceed the supply of library space.

With regard to operating expenditures, library operating budgets currently consume an average of 7% to 8% of the total university general operating income.[2/] In contrast, in their submission to the Bladen Commission on the financing of higher education in Canada, the Canadian Association of College and University Libraries (CACUL) recommended that "libraries in established institutions should receive a minimum of 10% of the operational budget and that new institutions should raise library expenditures considerably beyond this".[3/]

An estimate of formula income for 1975-76 (in 1968-69 dollars) is derived by applying the 1968-69 value of the basic income unit ($1450) to the projected number of income units. Using this estimate of total formula income the implied library operating expenditures in 1975-76 generally conform to the present budgetary policies of the universities. The projections for the library budgets range from 6% to 15% of projected formula income. Since formula income constitutes only a portion of the total general operating income the projected library budgets will be lower, as a percentage of total income, than the 6% to 15% indicated. Therefore the projected budgets do approximate the current situation. The imputed operating levels of the libraries should then be possible if present budgetary policy is maintained.

2/ "Brief to the Committee on University Affairs - Estimates of Operating Grant Requirements for 1970-71 "Committee of Presidents of Universities of Ontario, December 1969.

3/ "Financing Higher Education in Canada", V. W. Bladen et al, Toronto, 1965.

In this study it was possible to look only at the financial implications of one set of data on staff, enrolments and acquisitions. Further study into the effects of changes in these parameters would be an aid to decision-making in future library planning. For example, we might ask what the capital implications of the provision for five years space growth in the stack area instead of three would be. Also, what would be the effect of exponential growth in acquisitions where the parameters are based on the exponential growth in publications? Moreover, how would the libraries react to changes in methods of disseminating university education.

Techniques for estimating numbers of volumes required for projected levels of enrolment are required if we are to improve the accuracy and sophistication of future studies. Preferably such techniques would take into account the programme enrolments and level of study, and whether graduate or undergraduate. Also, more information is required on reader area utilization. For example, how many reader seats per 100 undergraduate students should be provided? What are the costs of not providing reader seats to meet peak demand? What effect would the implementation of a policy of fewer formal class contact-hours have on the requirements for reader areas? Indeed, this may be the pattern of the future!

This study is essentially an extrapolation of current library policy to estimations of future demand. Beyond 1976 however, drastic changes will likely be required in the operation of university libraries.

> "The cost of building, of purchasing volumes, of cataloguing, and of servicing these gigantic libraries could eventually ruin our richest universities. This says nothing of the difficulties that lie in wait for the user as he approaches the card catalogues of awesome dimension, ---"4/

Clearly, advancements in the general field of information retrieval will have profound effects on future capital expenditures. In the more immediate future, effects of implementing a policy of central storage of volumes with low usage rates should be examined. Statistical techniques could be applied to the determination of the number of multiple copies required at various locations.

Finally, it must be emphasized that space factors taken from other jurisdictions give no indication of their derivation. Whether they are the extrapolation of past practice or based on a user requirement form of study remains unknown.

4/ "The Impact of Technology on the Library Building", Educational Facilities Laboratories, New York, N.Y., June 1967.

With the level of expenditures anticipated it is not enough to rely on past practice. While this may be necessary for planning at this time, study must begin now on the establishment of space factors based on measurements of need and future configurations of the learning situation.

2. PRESENTATION OF DATA

The collection of reliable data and the selection of a common base are essential for this analysis. The enrolment levels of the 1968-69 session were selected as the base and the necessary data were taken from the UA3 submission forms of the Department of University Affairs (December 15, 1968-69). These data, together with projected 1975-76 enrolments, are presented in Table 1. For the projection of enrolment levels through 1974-75 we used data provided by Department of University Affairs.[5/]

When these year by year projections were plotted the trends followed one of two patterns - either a continuing linear rate of growth or a gradual levelling off. Depending on the pattern shown by the projections through 1974-75, the trends were extrapolated for another year to derive the projections for 1975-76. The graphs for this analysis are contained in Appendix A to this report. In several cases universities have forwarded additional data on enrolment projections where review has indicated marked differences from earlier statistics reported to the Department of University Affairs. Where this is the case the updated figures have been inserted in place of the general projections. These corrections are noted in Table 1.

5/ "Documents Describing the Development of an Interim Capital Formula for Provincially-Assisted Universities in Ontario", Department of University Affairs, February, 1969.

FULL-TIME EQUIVALENT ENROLMENT

UNIVERSITY	Actual 1968-1969			Projected 1975-1976		
	Undergraduate	Graduate[1]	Total	Undergraduate	Graduate	Total
Brock	1,249.5	7.0	1,256.5	4,700	150	4,850
Carleton	6,732.3	694.9	7,427.2	12,988	1,455	14,443*
Guelph	5,286.7	470.2	5,756.9	9,500	1,300	10,800
Lakehead	2,437.0	34.2	2,471.2	4,497[4]	133	4,630*
Laurentian[2]	2,018.8	-	2,018.8	5,100	150	5,250
McMaster	6,140.7	1,257.2	7,397.9	11,000	2,300	13,300
Ottawa	6,392.7	1,465.3	7,858.0	10,174	3,083	13,257*[5]
Queen's	6,734.0	956.6	7,690.6	8,600	1,800	10,400
Toronto[3]	18,933.5	4,084.2	23,017.7	28,546	5,310	33,856*
Trent	1,159.2	2.0	1,161.2	3,200	60	3,260
Waterloo	6,674.9	1,230.2	7,905.1	12,324	1,597	13,921*
Western	8,944.7	1,202.0	10,146.7	11,200	2,100	13,300
Windsor	4,871.7	484.7	5,356.4	11,000	700	11,700
York	7,120.0	456.5	7,576.5	18,000	1,800	19,800*
TOTAL	84,695.7	12,345.0	97,040.7	150,829	21,938	172,767

(1) Fall or Winter, whichever is greater.
(2) Includes Algoma and Nipissing.
(3) Includes Scarborough and Erindale.
(4) Includes FTE of part-time graduate.
* Denotes update by the university.
(5) FTE of part-time divided between graduate and undergraduate on the basis of the 1968-69 ratio.

Table 1

Student enrolment statistics are commonly shown in three ways: full-time students only, total headcount (sum of full-time and part-time) and full-time equivalence (sum of full-time and a proportion of part-time where the proportion is related to a percentage of teaching load).

The most common measure of student load is full-time equivalence(full-time plus a proportion of part-time). The present formula for capital funding to provincially-assisted universities (interim capital formula) does not recognize the space requirements of part-time students. (We have learned recently that CUA is favourably disposed to include part-time students although what the conversion factor to full-time equivalent will be has not been stated.) The full-time equivalent student base is used in this report to enable us to make comparisons to other jurisdictions. Equivalence is measured as a percentage of teaching load and the conversion factors used are those of the current operating grants formula.

Table 2 contains a compilation of the four categories of library space available to each university in 1968-69 - stack area, reader area, staff area and service space.

The total amount of library space expected to be available in 1976 is calculated as the sum of the main library buildings now in existence, the branch libraries, recoverable area and space that will become available with the completion of projects having final approval status from the Department of University Affairs. Commitments are not included in the determination

TABLE 2

AVAILABLE LIBRARY SPACE (1) BY CATEGORY (1968)

University	Stack Area	Reader Area	Staff Area	Service And/Or Storage Area (2)	Total Area
Brock	20,967	13,060	7,265	—	41,292
Carleton	27,820	62,176	19,352	—	109,348
Guelph	65,000	94,860	22,750	20,000	212,610 (3)
Lakehead	10,200	11,100	3,300	7,000	31,600
Laurentian	23,000	9,000	5,000	1,500	38,500
McMaster	34,500	21,000	16,000	9,882	80,382
Ottawa	28,502	30,650	3,625	5,380	68,157
Queen's	67,270	27,490	17,426	14,933	127,119
Toronto	135,279	108,090	53,337	30,158	326,864
Trent	8,208	9,976	4,300	—	22,484
Waterloo	24,750	18,660	17,450	4,540	65,400
Western	62,664	43,682	45,896	3,000	155,242
Windsor	26,000	11,300	7,352	235	44,887
York	30,500	24,400	N.A.	N.A.	77,900

(1) Net assignable square feet

(2) For some universities this space has been distributed among the other three categories

(3) Includes 10,000 sq. ft. of branch library space not broken down into specific categories

N.A. - not available

of required library space, though many are not yet completed, since the purpose of this analysis is to estimate the minimum additional capital funds exclusive of commitments that will be required to meet the future demand on library space.

Space to be relinquished by the libraries is subtracted from the total available space. Totals for the University of Toronto do not include the Federated Colleges but do include the Constituent Colleges (Scarborough and Erindale). The totals for each university are presented in Table 3. Space available at each university in each intervening year up to 1976 is tabulated in Table 4.

Table 5 contains statistics on the number of library staff, reader seats and volumes in 1968-69 and projected volume holdings for each library in 1976.

The available library space in 1976 shown in Table 4 can now be compared to objective measures of need in order to determine the shortage, or excess of library space. Measurement of need is considered in the next section.

TOTAL AVAILABLE LIBRARY SPACE (1976)

University	Main Buildings	Branch Libraries	Recoverable Area	"A" Type Projects	Space to be Relinquished	Total
Brock	41,292		16,414			57,706
Carleton	118,103	5,062				123,165
Guelph	182,610	30,000 (1)				212,610
Lakehead	31,600		26,000	19,000		76,600
Laurentian	37,000			10,250		47,250
McMaster	67,082	13,300		75,400	9,430	146,352
Ottawa	33,609 (3)	34,548				68,157
Queen's	80,997	46,122	4,250	46,680	8,280	169,769
Toronto	180,044 (4)	146,820		454,957	58,525	723,296
Trent		9,050	10,566	61,222	10,020	70,818
Waterloo	65,400		39,345	27,000		131,745
Western	51,000 (5)	104,242		170,888	51,000	275,130
Windsor	40,400			130,800		171,200
York	77,900			167,200		245,100

(1) includes storage area (10,000 sq. ft.)
(3) includes 6,500 sq. ft. of temporary space. (4) includes 47,260 sq. ft. of temporary space.
(5) includes 3,000 sq. ft. of temporary space.

TABLE 3

TABLE 4

AVAILABLE LIBRARY SPACE BY YEAR (1968-69 TO 1975-76)

UNIVERSITY	1968-69	1969-70	1970-71	1971-72	1972-73	1975-76
Brock	41,292			57,706		57,706
Carleton	123,165					123,165
Guelph	212,610					212,610
Lakehead	31,600	32,600	32,600	51,600	58,500	76,600
Laurentian	38,500		47,250			47,250
McMaster	80,382	110,962	131,352		146,352	146,352
Ottawa	68,157					68,157
Queen's	127,119	138,269			169,769	169,769
Toronto	326,864	331,703	388,192		723,296	723,296
Trent	22,484	70,818				70,818
Waterloo	65,400	69,275	87,275	131,745		131,745
Western	155,242		275,130			275,130
Windsor	44,487				171,200	171,200
York	77,900	245,100				245,100

ACTUAL (1968) AND PROJECTED (1976) LEVEL OF LIBRARY OPERATIONS

University	Volume Holdings (1968)	Reader Seats (1968)	Staff (1968)	Volume Holdings (1976)	Volume Capacity (1976)
Brock	111,500	520	38	315,000	321,030
Carleton	425,509	2,011	154	1,306,000	1,306,000
Guelph	300,000	2,087	130	700,000	1,000,000
Lakehead	85,000	444	33	375,000	415,000
Laurentian	125,000	350	44	365,000	750,000
McMaster	576,000	900	150	1,000,000	1,000,000
Ottawa	305,000	835	113	1,059,000	1,059,000
Queen's	600,000	1,600	175	1,150,000	1,900,750
Toronto	2,244,498	3,603	757	4,300,000	5,494,850
Trent	102,000	355	40	294,000	475,485
Waterloo	280,000	938	118	826,000	826,000
Western	601,207	2,461	300	1,246,600	2,043,600
Windsor	370,000	540	100	838,000	1,098,712
York	770,068	1,045	157	1,500,000	2,392,000

TABLE 5

3. ANALYSIS OF REQUIRED CAPITAL FOR LIBRARIES BY 1975-76

3.1 Analysis of Required Library Space (1975-76)

As indicated in the introduction, the method of analysis used in this report involves the application of selected planning criteria to the Ontario library system. In the first draft of this report only one set of factors was applied to determine the library space requirements. This set of factors was derived by averaging current statistics on library space consumption. Many of the librarians pointed out that the limitations imposed by extrapolating the present were too stringent in comparison to other jurisdictions and in fact would represent the continuation of a space situation already deemed unacceptable.

Heeding their advice we have introduced several comparative measures from other jurisdictions along with the amended analysis of the first draft of this report.

The statistic with the greatest impact is the number of projected volumes for 1975-76. A logical starting point for this study would be to question the total volumes estimated as required for 1976. This would imply the application of formulae such as the Clapp-Jordan or Washington formula to the projected 1976 enrolment levels. One criticism of the Clapp-Jordan formula for assessing library needs is that it does not take the programme mix of the student population properly into account.

The Washington formula rectifies this deficiency somewhat. Unfortunately, projections by programme of study in 1976 are not available from all universities at this time. An alternative check is to group the universities in size ranges and compare the estimated required volume holdings of a university with other universities in the group. University estimates of required volumes for 1976 are shown in Table 6. Since so many factors are involved in the determination of required volumes changes were made only when the figures seemed to be far out of line with institutions of a similar size.

REQUIRED VOLUMES (1976)
(Universities ranked by Size)

University	Projected Total Enrolment (FTE)	Projected Graduate Enrolment (FTE)	Projected Volumes Required (1976)
Trent	3,260	60	294,000
Lakehead	4,630	133	375,000
Brock	4,850	150	315,000
Laurentian	5,250	150	365,000
Queen's	10,400	1,800	1,150,000
Guelph	10,800	1,300	700,000
Windsor	11,700	700	838,000
Ottawa	13,257	3,083	1,059,000
McMaster	13,300	2,300	1,000,000
Western	13,309	2,100	1,246,600
Carleton	14,443	1,455	1,306,000
Waterloo	13,921	1,597	826,000
York	19,800	1,800	1,500,000
Toronto	33,856	5,310	4,300,000

TABLE 6

The rationale of this approach is that it would be difficult to justify a much larger collection at one university than at another university of similar size and programme mix. A figure of equal importance is the "planned capacity" of each library. This planned capacity represents the total number of volumes that could be contained in the library if all available stack space were filled. The difference between this planned capacity and the projected volumes represents the area for growth beyond 1976 and also additional space for unexpected growth in the libraries.

How great should this slack be? To estimate this we must ascertain the number of volumes added per year by a library. A simple method of accomplishing this would be to compare the volumes currently held to the volumes projected for 1976 and assume that annual growth in volumes to be added will be constant between the two periods. This would provide a measure of "volumes added per year". Then, assuming the same acquisition policy beyond 1976 and knowing the "planned capacity" we could calculate the years of growth provided for in the planned capacity.

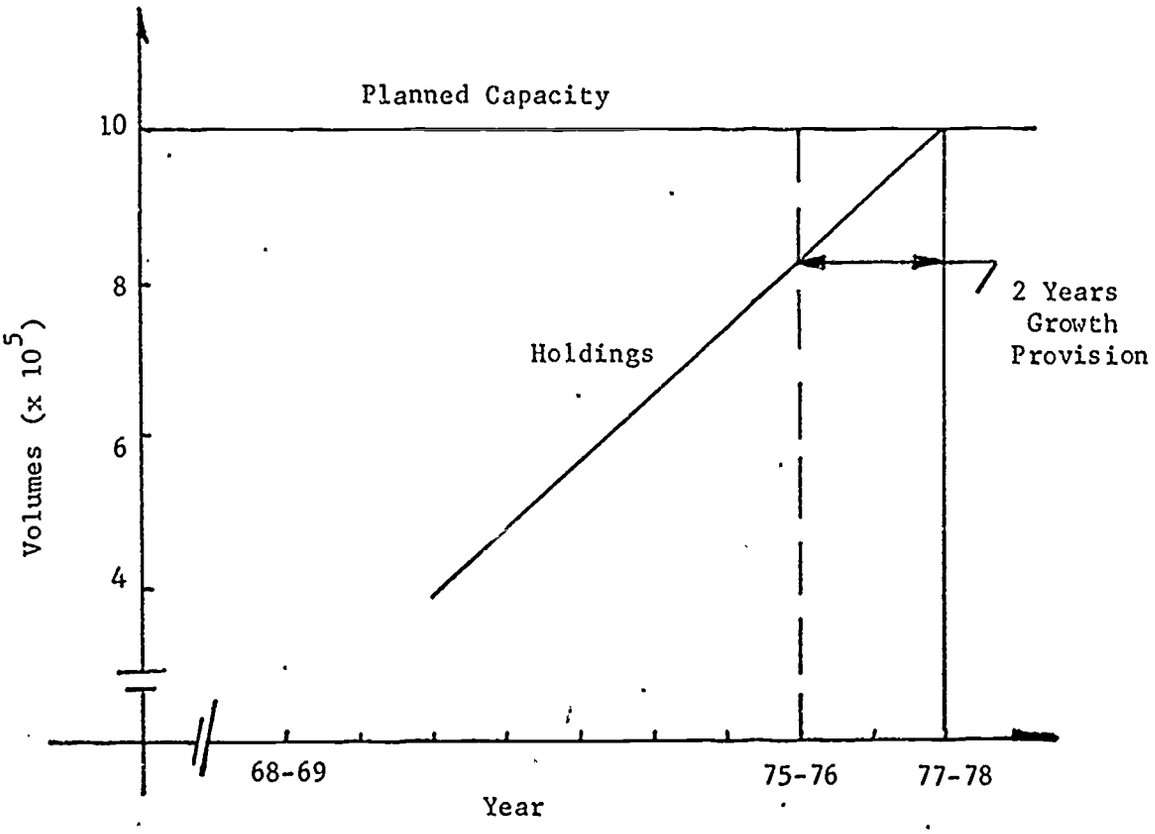
Following is an example of the calculations involved.

Example: 1968-69 to 1975-76 (7 year planning period)

Line	Description	Calculation	Result
1.	Projected volumes required (1975-76)	-	800,000
2.	Volumes currently held (1968-69)	-	100,000
3.	Total additional volumes required.	Line 1 - Line 2	700,000

Line	Description	Calculation	Result
4.	Additional volumes per year	Line 3 ÷ 7 years	100,000
5.	Planned capacity (volumes)	-	1,000,000
6.	Excess over 1976 projected	Line 5 - Line 1	200,000
7.	Years of growth provided for in the planned capacity	Line 6 ÷ Line 4	2

GRAPHICAL ANALYSIS



The assumption of linearity is unwarranted, however. Libraries do not add equal numbers of volumes per year but more likely increasing numbers. For example, a library may add

100,000 volumes one year, 105,000 the next and so on. The percentage increase over the previous year may remain constant but not the absolute increase. This is certainly true when the increase in the rate of publication is noted.

> "There are 400,000 books published annually worldwide, roughly twice that of a decade ago. ---The journals themselves are estimated to be growing in number at the rate of 5 to 10 percent a year; the literature in them doubling every 10 to 15 years."6/

Figure 1 is a comparison between constant percentage growth and constant growth in numbers. The assumption of linear growth is represented by the solid line L-L; the assumption of constant percentage growth by the curve C-C. The two lines have two points in common; at the 1968-69 session (A) and the 1975-76 session (B). Point "A" represents the present number of volumes held and "B" the projected requirement for 1975-76. The difference in the two assumptions rests in the method of moving from "A" to "B" (rate of acquisition). Rate of acquisition in this context means volumes added per year.

Rate of acquisition may be calculated from a graph, such as in Figure 1, by determining the slope of the line. In this example the slope is the change in volumes held from one period to the next. Line L-L in Figure 1 has a constant slope, or rate

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6/ "The Impact of Technology on the Library Building" Educational Facilities Laboratories, New York, New York, July 1967.

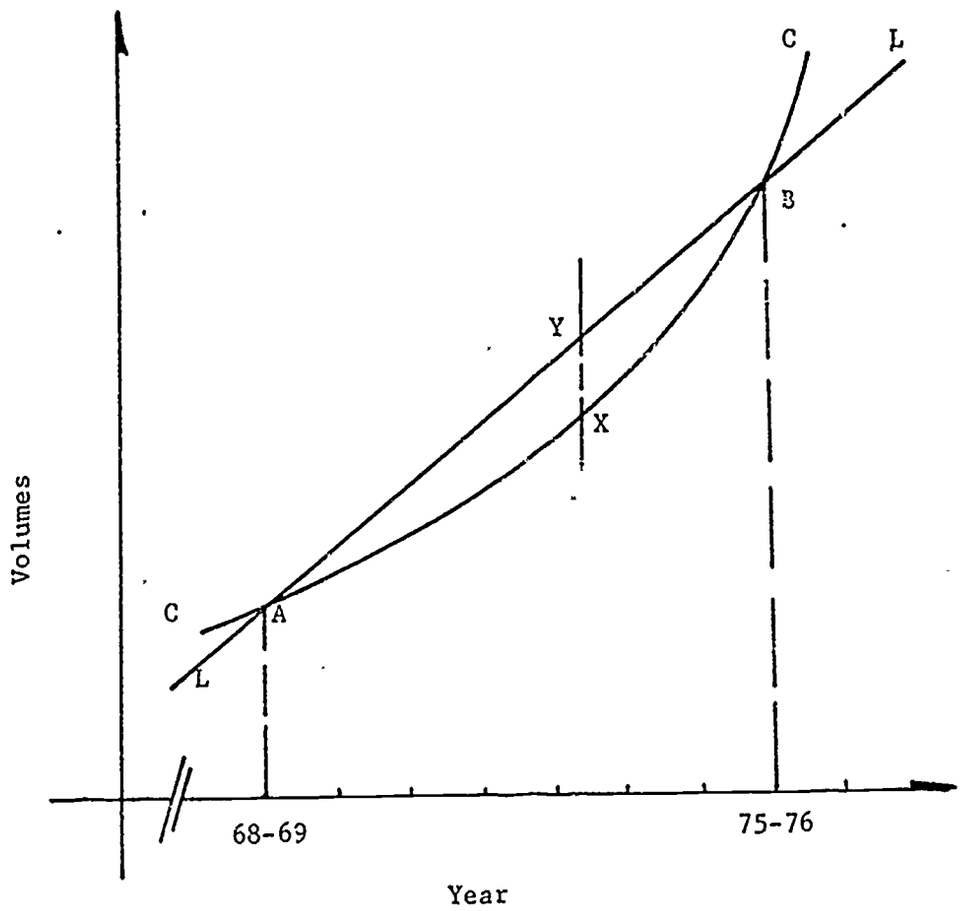


Figure 1.

of acquisition (fixed number of volumes added per year) compared to Line C-C which has a varying slope. From points "A" to "X" on Line C-C the slope is less than in the corresponding section of Line L-L (point "A" to "Y") and greater from "X" to "B".

The next step is to calculate for each university library the percentage growth that would have to be maintained to move from the present level of acquisitions to the projected level.

The present value concept is important in this analysis. If the rate of interest is 10% per year then one dollar ($1.00) invested today will be worth $1.10 next year ($1.00+(10% of $1.00) and $1.21 the year after ($1.10+10% of $1.10).

This principle can be applied to library acquisitions. However, the "rate of interest" is unknown and we know only the beginning and final "values of the account". Thus, the question is "At what constant annual percentage increase must a library acquire volumes (or at what rate of interest must a dollar be invested) to reach the 1976 projected level of holdings?".

Let this percentage be represented by "i". If the number of volumes held in the initial period (1968-69) is represented by Y_o and the projected number in period n (1975-76) by Y_n, then Y_n can be expressed in terms of Y_o, i and n by the following equation:

$$Y_n = Y_o (1 + i)^n$$

The only unknown is "i" so the equation may be solved using present value tables. The results of this analysis are presented in Table 7.

A graphic example of the application of this assumption of a constant percentage increase for Queen's and Carleton universities is contained in Figure 2.

DETERMINATION OF IMPLIED RATE OF GROWTH
(Assume: Constant Percentage Increase)

University	Volumes (1968)	Planned Volumes (1976)	Implied Percentage Increase Per Year
Brock	111,500	315,000	16.0
Carleton	425,509	1,306,000	17.4
Guelph	300,000	700,000	12.9
Lakehead	85,000	375,000	23.6
Laurentian	125,000	365,000	16.6
McMaster	576,000	1,000,000	8.2
Ottawa	305,000	1,059,000	19.4
Queen's	600,000	1,150,000	9.7
Toronto	2,244,498	4,300,000	9.4
Trent	102,000	294,000	16.3
Waterloo	280,000	826,000	16.6
Western	601,207	1,246,600	11.0
Windsor	370,000	838,000	12.4
York	770,068	1,500,000	10.0
TOTALS	6,895,782	15,274,600	-

TABLE 7

Using these percentage increases and an analysis similar to that used with the assumption of linear growth the number of years of growth provided beyond 1976 in the planned capacity can be determined. The formula is similar to the one above except that now "i" is known along with Y_o and Y_n and n is unknown.

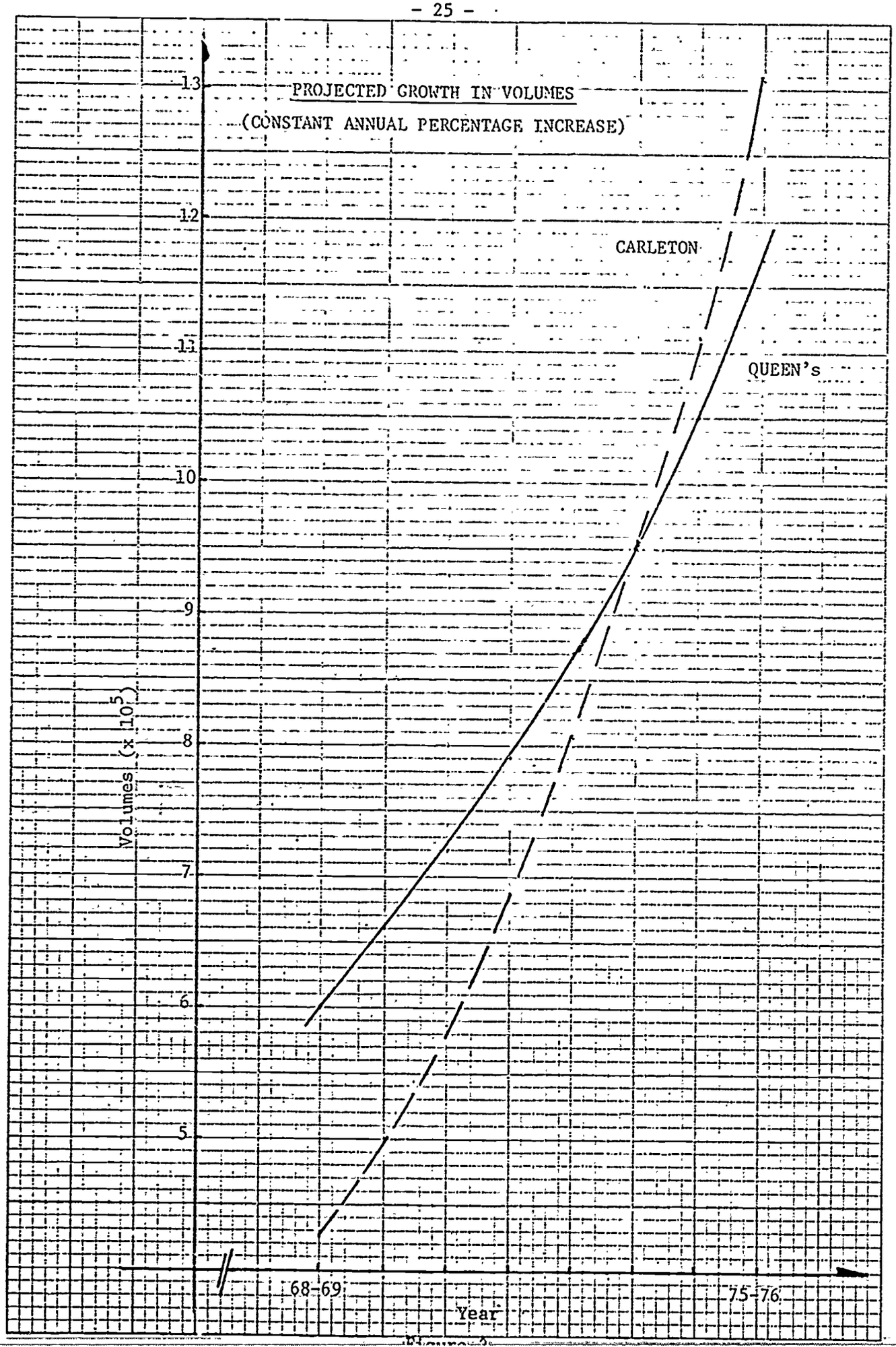

PROJECTED GROWTH IN VOLUMES
(CONSTANT ANNUAL PERCENTAGE INCREASE)
CARLETON
QUEEN's
13
12
11
10
9
8
7
6
5
Volumes (x 10^5)
68-69
75-76
Year

FIGURE 2

Now Y_o represents the projected level of holdings for 1976, Y_n the planned capacity level and "n" the number of years through which the library must grow at "i" percent per year to reach the planned capacity. The results of this analysis are presented in Table 8.

The values are much lower than those that would have been derived from the assumption of linear growth. Figure 3 illustrates why this is so.

IMPLICATION OF CONSTANT ANNUAL PERCENTAGE INCREASES IN TERMS OF THE PLANNED CAPACITY

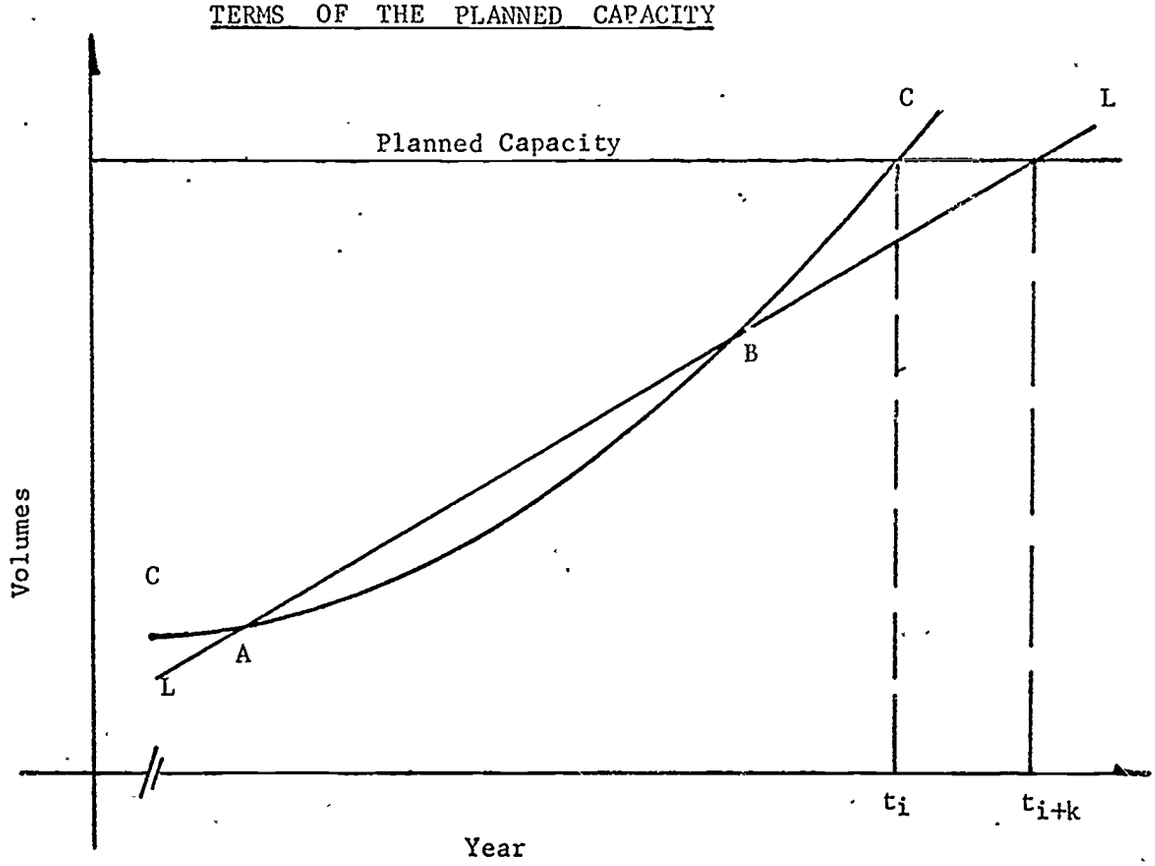


Figure 3.

YEARS OF GROWTH ALLOWED IN PLANNED CAPACITY
(Assume constant percentage increase per year)

University	Planned Volumes (1976 Y_o	Planned Capacity 1976 Y_n	Percentage Increase Per Year(1) i	Years of Growth(2) $\frac{(n)}{Y_o=Y_n(1+i)^n}$
Brock	315,000	321,030	16	1
Carleton	1,306,000	1,306,000	17	0
Guelph	700,000	1,000,000	13	3
Lakehead	375,000	415,000	14(3)	1
Laurentian	365,000	750,000	17	5
McMaster	1,000,000	1,000,000	8	0
Ottawa	1,059,000	1,059,000	19	0
Queen's	1,150,000	1,900,750	10	5
Toronto	4,300,000	5,494,850	9	3
Trent	294,000	475,485	16	3
Waterloo	826,000	826,000	17	0
Western	1,246,000	2,043,600	11	5
Windsor	838,000	1,098,712	12	2
York	1,500,000	2,392,000	10	5

(1) Rounded to the nearest percentage point

(2) Rounded to the nearest year

(3) The projected increase of 24% per year would be unrealistic (Table 7). Instead there is an anticipated growth rate of 33% in the early years, levelling off to a constant 13% to 14% increase per year beyond 1976.

TABLE 8

Figure 3 illustrates that if a library continues to acquire volumes at the same percentage increase then it will reach the planned capacity before the time estimated using the assumption of linear growth (t_i as compared to t_{i+k}).

What constitutes a proper planning period? Table 8 shows a range from zero to five years. We are suggesting limiting growth space to three years beyond the projected 1975-76 holdings. This provision for growth in the stack area would extend the planning period to almost 10 years (1979). Assuming that the time from the first stage of approval from the Department of University Affairs to occupation is normally four to five years this ten-year period would allow until 1974 or 1975 to re-assess library space needs.

At least three year's growth would seem to be required as safety space. If the universities are able to acquire volumes at a rate greater than that projected by the constant percentage increase, or in other words to follow the "publication explosion" more closely, growth space must be provided. Of course, the cost implications of slack capacity beyond the three years are very great.

Assuming slack space is to be provided for three years expansion beyond the 1975-76 session, it is possible to calculate the number of volumes to be housed by applying the annual percentage increases for three years beyond the projected holdings for 1975-76. The results of these calculations are tabulated in Table 9. However, if the libraries do in fact outstrip the projected growth pattern, the three year's growth provision will be significantly reduced.

This concludes the introduction and testing of the raw data that will serve as input to the various systems introduced in the next section. In that section we calculate alternative estimates of required library space by applying different sets of planning factors. The results are then compared to those generated from factors derived for the Ontario system.

3.1.1. University of Illinois

Library space standards for the University of Illinois may be summarized in the following form:

Stack Space	
First 150,000 volumes	.1 NASF per bound volume
Second 150,000 volumes	.09 NASF per bound volume
Next 300,000 volumes	.08 NASF per bound volume
All volumes in excess of 600,000 volumes	.07 NASF per bound volume

CALCULATION OF VOLUMES TO BE HOUSED BY 1979 .

University	Planned Volumes 1976	Percentage Increase Per Year	Expected Volume Holdings 1979
Brock	315,000	16	492,000
Carleton	1,306,000	17	2,092,000
Guelph	700,000	13	1,010,000
Lakehead	375,000	14	555,000
Laurentian	365,000	17	585,000
McMaster	1,000,000	8	1,260,000
Ottawa	1,059,000	19	1,785,000
Queen's	1,150,000	10	1,531,000
Toronto	4,300,000	9	5,569,000
Trent	294,000	16	459,000
Waterloo	826,000	17	1,323,000
Western	1,246,000	11	1,704,000
Windsor	838,000	12	1,177,000
York	1,500,000	10	2,000,000
TOTALS	14,980,000		21,542,000

TABLE 9

Reading Room Space

1. 7.5 square feet per FTE undergraduate student

2. 7.5 square feet per headcount beginning graduate student

3. 7.5 square feet per headcount advanced graduate student in those fields of study with high research requirement (those fields of study that have a research demand factor greater than one).

4. 15 square feet per headcount advanced graduate student in those fields of study with low research requirements (those fields of study that have a research demand factor of one or less).

5. 15 square feet per FTE teaching and research faculty (with the rank of instructor or above) in those departments that have low research requirements (those departments with a research demand factor of one or less).

6. 3 square feet per FTE teaching and research faculty (with the rank of instructor or above) in those departments that have high research requirements (those departments with a research demand factor of greater than one).

Service Space

...(It is) recommended that the determination of this type of space be based on a percentage of reader space with 25% being used. Where branch libraries are to be constructed, only 20% of the reader space should be allowed for service space within the branch library, the remaining five percent to be allowed in the main library. The 5% maintained in the main library is to accommodate the activities connected with centralized acquisition and cataloguing. 8/

The term "research demand factor" refers to an index, varying from 0.0 to 45.0, which reflects "variations in the space requirement of a given field of study".9/ This research demand factor provides differing amounts of research space depending on the programme or major area of study. Therefore Aeronautical Engineering with a factor of 30.0 is assumed to have a demand for more research space than Classics with a factor of 0.5. For assessing reading room space the reverse applies. Those programmes with low research demand factors are provided more library space than those with higher factors recognizing that the library is often the laboratory of the humanist.

8/ "University Space Planning", H. D. Bareither and J. L. Schillinger, University of Illinois Press, Urbana, Chicago, 1968.

9/ Ibid, p. 59.

In order to apply the above space factors two additional sets of data are required. These include the number of FTE faculty in each department and the graduate enrolment detailed by department or major programme of study. Since neither of these data sets are available for the 1975-76 session, estimates of 1975-76 data must be made by projecting 1968-69 ratios.

PERCENTAGE OF 1968-69 GRADUATE ENROLMENT WITH RESEARCH DEMAND FACTOR LESS THAN OR EQUAL TO ONE

University	Full-Time Graduate Enrolment (1968-69)	Enrolment with Research Demand Factor Equal To or Less Than One	Percentage With Research Demand Factor Less Than or Equal to One
Brock	7	0	0
Carleton	508	85	16:7
Guelph	402	46	11.4
Lakehead	27	1	3.7
Laurentian	0	0	-
McMaster	1,050	216	20.6
Ottawa	976	556	57.0
Queen's	838	212	25.3
Toronto	3,514	1,118	31.8
Trent	2	0	0
Waterloo	1,109	351	31.7
Western	1,061	204	19.2
Windsor	270	47	17.4
York	349	75	21.5
Total	10,113	2,911	28.8

TABLE 11

Table 11 documents the percentage of the 1968-69 full-time graduate enrolment from programmes with a research demand factor of one or less. The overall percentage is presented along with the percentages for each university. These percentages are then applied to the projected (1975-76) graduate enrolment (Table 12). In the 1968-69 session many of the graduate schools were in their infancy so it would be improper to apply percentages existing in 1968-69 to 1975-76. If the graduate enrolment in 1968-69 was less than 100 the overall average for 1968-69 was employed instead of the 1968-69 percentage for that particular university.

Number of FTE staff in 1975-76 are estimated by applying 1968-69 staff-student ratios (listed in Table 13) to the 1975-76 projected enrolment levels. These projected staff levels are distributed into the two research demand factor categories (defined as greater than one and less than or equal to one) on the basis of the 1968-69 distribution of graduate enrolment (Table 11). The results are shown in Table 13.

This completes the derivation of the data elements required for the application of the space factors introduced previously. The calculations are summarized in Tables 14, 15 and 16. It should be noted that the factors for stack space in Table 16 are applied to the projected 1975-76 actual holdings and not to the planned capacity of the library. The planned capacity represents a minimum limit on the number of volumes for which

TABLE 12

DETERMINATION OF 1975-76 GRADUATE ENROLMENT
WITH RESEARCH DEMAND FACTOR LESS THAN OR EQUAL TO ONE

University	Percentage with Research Demand Factor Less Than or Equal to One (1968-69)	FTE Graduate Enrolment (1975-76)	FTE Graduate Enrolment with Research Demand Factor Less Than or Equal to One
Brock	28.8*	150	43
Carleton	16.7	1,455	243
Guelph	11.4	1,300	148
Lakehead	28.8*	133	38
Laurentian	28.8*	150	43
McMaster	20.6	2,300	474
Ottawa	57.0	3,083	1,757
Queen's	25.3	1,800	455
Toronto	31.8	5,310	1.689
Trent	28.8*	60	17
Waterloo	31.7	1,597	506
Western	19.2	2,100	403
Windsor	17.4	700	122
York	21.5	1,800	387

*Overall Average replaced university average

TABLE 13

PROJECTION OF FTE FACULTY (1975-76)

	Staff-Student Ratio (1) (1968-69)	FTE Enrolment (1975-76)	Projected FTE Staff (1975-76)	Percentage Graduate Students with RDF* Less Than or Equal To One (1968-69)	Faculty with RDF Less Than or Equal To One
	1	2	3 =(1x2)	4	Col 4x3/100
Brock	11.0	4,850	440.9	28.8	127.0
Carleton	16.7	14,443	864.9	16.7	144.4
Guelph	11.6	10,800	931.0	11.4	106.1
Lakehead	14.5	4,630	265.0 (2)	28.8	76.3
Laurentian	15.8	5,250	332.3	28.8	95.7
McMaster	14.9	13,300	892.6	20.6	183.9
Ottawa	12.7	13,257	1,043.9	57.0	595.0
Queen's	14.1	10,400	737.6	25.3	186.6
Toronto	11.8	33,856	2,869.2	31.8	912.4
Trent	11.4	3,260	286.0	28.8	82.4
Waterloo	15.5	13,921	898.1	31.7	284.7
Western	13.9	13,300	956.8	19.2	183.7
Windsor	15.8	11,700	740.5	17.4	128.8
York	14.8	19,800	1,337.8	21.5	287.6

* RDF - research demand factor
(1) approximation based upon total salaries paid and average faculty salary.
(2) The student-staff ratio will be significantly increased by 1976.

CALCULATION OF REQUIRED STUDENT READER SPACE (1975-76)

University	Projected FTE Undergraduate Enrolment	Undergraduate Reading Space	Projected FTE Graduate Enrolment with RDF ≤ 1	Projected FTE Graduate Enrolment with RDF > 1	Graduate Reading Space	Total Student Reader Space
	1	2=Col. 1x7.5	3	4	5=(Col 3x15) +(Col 4x7.5)	2 + 5
Brock	4,700	35,250	43	107	1,448	36,698
Carleton	12,988	97,410	243	1,212	12,735	110,145
Guelph	9,500	71,250	148	1,152	10,860	82,110
Lakehead	4,497	33,728	38	95	1,283	35,011
Laurentian	5,100	38,250	43	107	1,448	39,698
McMaster	11,000	82,500	474	1,826	20,805	103,305
Ottawa	10,174	76,305	1,757	1,326	36,300	112,605
Queen's	8,600	64,500	455	1,345	16,913	81,413
Toronto	28,546	214,095	1,689	3,621	52,493	266,588
Trent	3,200	24,000	17	43	578	24,578
Waterloo	12,324	92,430	506	1,091	15,773	108,203
Western	11,200	84,000	403	1,697	18,773	102,773
Windsor	11,000	82,500	122	578	6,165	88,665
York	18,000	135,000	387	1,413	16,403	151,403

TABLE 14

CALCULATION OF TOTAL READER AND SERVICE SPACE REQUIRED

University	Projected Faculty with RDF ⩽ 1	Projected Faculty with RDF > 1	Faculty Reader Space	Student Reader Space (Table 15)	Total Reader Space Required	Total Library Service Space Required
	1	2	3=(Col 1x15) +(Col 2x3)	4	5 =3 +4	Col 5x.25
Brock	127.0	313.9	2,847	36,698	39,545	9,886
Carleton	144.4	720.5	4,328	110,145	114,473	28,618
Guelph	106.1	824.9	4,066	82,110	86,176	21,544
Lakehead	76.3	188.7	1,711	35,011	36,722	9,181
Laurentian	95.7	236.6	2,145	39,698	41,843	10,461
McMaster	183.9	708.7	4,885	103,305	108,190	27,048
Ottawa	595.0	448.9	10,272	112,605	122,877	30,719
Queen's	186.6	551.0	4,452	81,413	85,865	21,466
Toronto	912.4	1,956.8	19,556	266,588	286,144	71,536
Trent	82.4	203.6	1,847	24,578	26,425	6,606
Waterloo	284.7	613.4	6,111	108,203	114,314	28,579
Western	183.7	773.1	5,075	102,773	107,848	26,962
Windsor	128.9	611.6	3,768	88,665	92,433	23,108
York	287.6	1,050.2	7,465	151,403	158,868	39,717

Table 15

TOTAL LIBRARY SPACE REQUIRED (1975-76)
(Method: University of Illinois)

University	Volumes (1975-76)	Stack Space	Reader Space	Service Space	Total Space Required
	1	2	3	4	Col. 2+3+4
Brock	315,000	29,700	39,545	9,886	79,131
Carleton	1,306,000	101,920	114,473	28,618	45,011
Guelph	700,000	59,500	86,176	21,544	167,220
Lakehead	375,000	34,500	36,722	9,181	80,403
Laurentian	365,000	33,700	41,843	10,461	86,004
McMaster	1,000,000	80,500	108,190	27,048	215,738
Ottawa	1,059,000	84,630	122,877	30,719	238,226
Queen's	1,150,000	91,000	85,865	21,466	198,331
Toronto	4,300,000	311,500	286,144	71,536	669,180
Trent	294,000	27,960	26,425	6,606	60,991
Waterloo	826,000	68,320	114,314	28,579	211,213
Western	1,246,000	97,720	107,848	26,962	232,530
Windsor	838,000	69,160	92,433	23,108	184,701
York	1,500,000	115,500	158,868	39,717	314,085

TABLE 16

space should be provided by 1975-76. The space factors for the University of Illinois however have a built-in provision of 25% slack space; "the space required is usually planned so that each shelf is filled to about 75% of capacity".10/ Therefore, the application of the space factors to the planned capacity would involve a double counting. This figure for total required library space can then be compared to the total available library space in 1975-76 to determine the excess or surplus at each university. However, this comparison will be deferred until the application of all the systems is completed.

3.1.2. Indiana University

The library space standards for Indiana University are outlined in the following statements.11/

1.	Study Hall	10 ASF/student	25 SF/station, 40% of FTE student body using facility at any one time
2.	Library Service	32% of Study Hall space	
3.	Stack	.1 SF/volume (10 volumes/SF)	

These factors are applied to the 1975-76 projected data and presented in Table 17. As with the application of the University of Illinois factors, the factor for stack space is applied to projected 1976 volume holdings and not to planned

---

10/ Ibid, p. 64

11/ "Factors to be Employed in Space Planning and Analysis", Indiana University, April, 1967.

TOTAL LIBRARY SPACE REQUIRED (1975-76)
(Method: Indiana University)

University	Projected FTE Enrolment (1975-76)	Study Space	Service Space	Projected Volumes (1976)	Stack Space	Total Library Space
	1	2	3	4	5	Col 2+3+5
Brock	4,850	48,500	15,520	315,000	31,500	95,520
Carleton	14,443	144,430	46,218	1,306,000	130,600	321,248
Guelph	10,800	108,000	34,560	700,000	70,000	212,560
Lakehead	4,630	46,300	14,816	375,000	37,500	98,616
Laurentian	5,250	52,500	16,800	365,000	36,500	105,800
McMaster	13,300	133,000	42,560	1,000,000	100,000	275,560
Ottawa	13,257	132,570	42,422	1,059,000	105,900	280,892
Queen's	10,400	104,000	33,280	1,150,000	115,000	252,280
Toronto	33,856	338,560	108,339	4,300,000	430,000	876,899
Trent	3,260	32,600	10,432	294,000	29,400	72,432
Waterloo	13,921	139,210	44,547	826,000	82,600	266,357
Western	13,300	133,000	42,560	1,246,600	124,660	300,220
Windsor	11,700	117,000	37,440	838,000	83,800	238,240
York	19,800	198,000	63,360	1,500,000	150,000	411,360

TABLE 17

capacity. Comparison of total required space to available library space in 1975-76 is once again deferred until the introduction of all systems.

3.1.3. Taylor, Lieberfeld and Heldman (TLH)

TLH have been engaged as consultants to the Joint Capital Studies Committee so it is useful to consider their criteria with respect to library planning. These are contained in an interim summary report to the Department of Education of the Province of Quebec.12/ The TLH recommendations are summarized as follows:

> ...(it is) generally agreed that an efficient arrangement of library stacks can accommodate, as a working capacity, 14-15 books per square foot of floor space. On this basis the shelves will not be filled completely but will permit 25-33% of open space for collection growth.
>
> ...(it is) extremely rare to find documentation of a need for more than one seat for every five students, so that this rate is suggested for rough planning purposes. There is general agreement that 25 square feet per reader station is an appropriate allocation.

12/ "Report to the Department of Education, the Province of Quebec - Quebec Universities Facilities Study, Vol. 1: Interim Summary Report", Taylor, Lieberfeld & Heldman (Canada) Ltd., December 1967.

Thus, the seating factors reduce to 5.0 square feet per student, or one-half the Indiana University factor. Since no indication is given in the TLII documentation for library service space the Indiana factor of 32% is employed. The results are tabulated in Table 18.

3.1.4. A Suggested Ontario System

Library space may be considered to be composed of three major categories: (1) service and library staff area, (2) reader area and (3) stack area. Statistics on planned library staff and reader seats per 100 students for 1976 for each university library are contained in Table 19. A study was made of the library staff related to students in 1968-69 at several universities across Canada. The results are presented in Table 20. For the Canada-wide study the sample showed an arithmetic mean of 2.02 library staff per 100 students with a standard deviation of 0.59.[14/]

The mean and standard deviation were also calculated for the sample of provincially-assisted universities in Ontario which are included in this study. The mean for this grouping was 2.42 library staff per 100 students and the standard deviation was .38.

14/ The standard deviation is a measure of the dispersion of the individual items from their average . In a normal distribution approximately 68% of the observations will lie within the range bounded by the mean ± one standard deviation, and 95% within ± 2 standard deviations.

TOTAL LIBRARY SPACE REQUIRED (1975-76)
(Method: Taylor, Lieberfeld and Heldman)

University	Projected FTE Enrolment (1975-76)	Reader Space	Service Space	Projected Volumes (1976)	Stack Space	Total Library Space
	1	2	3=Col 2x.32)	4	5	2 +3 +5
Brock	4,850	24,250	7,760	315,000	22,500	54,510
Carleton	14,443	72,215	23,109	1,306,000	93,286	188,610
Guelph	10,800	54,000	17,280	700,000	50,000	121,280
Lakehead	4,630	23,150	7,408	375,000	26,786	57,344
Laurentian	5,250	26,250	8,400	365,000	26,071	60,721
McMaster	13,300	66,500	21,280	1,000,000	71,429	159,209
Ottawa	13,257	66,285	21,211	1,059,000	75,643	163,139
Queen's	10,400	52,000	16,640	1,150,000	82,143	150,783
Toronto	33,856	169,280	54,170	4,300,000	307,143	530,593
Trent	3,260	16,300	5,216	294,000	21,000	42,516
Waterloo	13,921	69,605	22,274	826,000	59,000	150,879
Western	13,300	66,500	21,280	1,246,600	89,000	176,780
Windsor	11,700	58,500	18,720	838,000	59,857	137,077
York	19,800	99,000	31,680	1,500,000	107,143	237,323

Table 18

LIBRARY STAFF AND READER SEAT REQUIREMENTS PER 100 STUDENTS FOR 1976

University	Projected FTE Enrolment (1975-76)	Library Staff	Staff/100 Students	Reader Seats	Reader Seats/100 Students
Brock	4,850	70	1.44	750	15.5
Carleton	14,443	221	1.53	2,963	20.6
Guelph	10,800	169	1.56	N.A.	-
Lakehead	4,630	93	2.01	1,012	21.9
Laurentian	5,250	100	1.90	1,250	23.8
McMaster	13,300	300	2.26	2,898	21.8
Ottawa	13,257	210	1.58	3,430	25.9
Queen's	10,400	350	3.37	3,800	36.5
Toronto	33,856	915	2.70	9,064	26.8
Trent	3,260	67	2.06	1,071	32.9
Waterloo	13,921	286	2.05	3,250	23.3
Western	13,300	696	5.23	5,158	38.8
Windsor	11,700	250	2.14	2,216	18.9
York	19,800	N.A.	-	6,595	33.3

TABLE 19

LIBRARY STAFF PER 100 STUDENTS

(1968-69)

ATLANTIC PROVINCES

Acadia	0.74
Dalhousie	3.03
Memorial	1.01
Moncton	2.38
New Brunswick	-
Prince of Wales	-
St. Francis Xavier	2.00

CENTRAL PROVINCES

*Brock	3.45
*Carleton	2.70
*Lakehead	1.89
*Laurentian	3.03
Laval	2.50
Montreal	1.75
*Ottawa	1.59
*Queens	2.70
R. M. C.	1.72
Sir George Williams	1.11
*Toronto	2.33
*Trent	3.33
Victoria	-
*Waterloo	1.61
Waterloo Lutheran	1.01
*Western	2.33
*Windsor	1.92
*York	2.17

WESTERN PROVINCES

Alberta	2.13
British Columbia	1.69
Calgary	2.04
Lethbridge	3.13
Manitoba	1.27
Regina	1.79
Saskatoon	1.05
Selkirk	0.60
Simon Fraser	2.22
Victoria	2.50
Winnipeg	-

TOTAL SET:

Mean - 2.023

Standard Deviation - 0.589

SAMPLE SET: (Ontario -*)

Mean - 2.421

Standard Deviation - 0.383

DATA SOURCE: Canadian Association of College University Libraries Annual Report, 1968.

TABLE 20

One reason for the larger average in Ontario is the inclusion of the emerging universities. For Ontario the sample of only the emerged universities shows an average of 2.17 compared to 2.92 for the sample of emerging universities. Thus, with growth comes economy of scale.

It would be inappropriate to apply emerging university statistics to operations in 1975-76. By that time the enrolment levels of these universities should have reached levels where economies of scale are realized. In view of this, maximum levels were based only on data from the emerged universities.

These limits were determined in the following manner. Limits on the ratios of library staff per 100 students were set at fixed distances above and below the mean, dependent on the percentage of universities to be included in 1968-69. This distance may be selected to include any percentage (α) of the present libraries in the sample. The normal distribution is avoided here since there is no reason why the set of ratios should be normally distributed. An α value may then be selected from Table 21 to establish a value for β, the distance above and below the mean. The range determined by the mean minus β and the mean plus β contains α % of the sampled university libraries.

At the 80% level, the upper bound becomes 2.70 for both the samples of Canadian university libraries (actually 2.69) and the sample of Ontario libraries, excluding the emerging

β VALUES

Sample	Sample Size	Mean	α Values				
			50	60	70	80	90
Ontario	12	2.42	.50	.53	.61	.83	.91
Canada	32	2.02	.43	.68	.91	1.01	1.28
Canada (Less Emerging Universities)	27	1.85	.48	.58	.74	.84	.85
Ontario (Less Emerging Universities)	8	2.17	.16	.53	.53	.53	.56

e.g. the Ontario mean (2.42) $\pm$ .83 contains 80% of the sample of Ontario university libraries (including the emerging universities).

TABLE 21

universities in both cases. Since any planned operating level below a specified limit is acceptable within the philosophy of this report only the upper bound is meaningful. Table 22 shows the results of applying the derived boundary to the projected 1975-76 enrolment. Any planned university library staff level above the upper bound (2.70) is reduced to at least this level, with the exceptions noted later, while planned levels below the boundary were left at their stated values.

The next step is to provide a space module to accommodate the projected staff requirements. From a study of space planning factors at several universities an average of 150 square feet per staff member was selected as an adequate provision

TOTAL LIBRARY STAFF REQUIREMENTS (1975-76)

University	Staff per 100 Students (1)	Projected FTE Enrolment (1975-76)	Projected Library Staff (3) (1975-76)
Brock	1.44	4,850	70
Carleton	1.53	14,443	221
Guelph	1.56	10,800	169
Lakehead	2.01	4,630	93
Laurentian	1.90	5,250	100
McMaster	2.26	13,300	300
Ottawa	1.58	13,257	210
Queen's	3.00 (2)	10,400	312
Toronto	2.70	33,856	915
Trent	2.06	3,260	67
Waterloo	2.05	13,921	286
Western	3.00 (2)	13,300	399
Windsor	2.14	11,700	250
York	2.70	19,800	535

(1) Upper bound set at 2.70 per 100 FTE students.

(2) These values were raised to 3.00 or the planned limit in recognition of the degree of decentralization at these universities and therefore the need for additional staff at the branch libraries.

The Camp-Meidell adjustment for non-normal distributions yields an upper limit of 2.96 at the 80% limit. The general statement of the Camp-Meidell adjustment is "that at least $100 - \frac{100}{2.25k^2}$ percent of the observations will be included within the limits of $\bar{X} \pm k\sigma$".

(3) Errors are due to rounding

TABLE 22.

for office and service space. This is equivalent to an average of 120 square feet for 60% of the staff and 200 square feet for the remaining 40% or 120 square feet for 75% of the staff and 240 for the remaining 25%. As an example, standards for the University of California range from 75 square feet for clerical staff in the typing pool to 300 square feet for each work station in the receiving and mail section.

The provision of 150 square feet may appear high in comparison to the usual office standard of 120 square feet but it must be kept in mind that library operations contain many public service points in addition to the space required for binding, cataloguing and reference materials. The derivation of required space using this average of 150 square feet is outlined in Table 23.

In the determination of reader space the needs of three users must be considered; faculty, graduate students and undergraduate students. The most frequent method of determining reader space is to calculate seats per 100 users and space per seat. From an analysis of the planning criteria at Ontario universities and several jurisdictions in the United States the following space factors were selected as representative of the standards applied:

Undergraduates

- 25 seats per 100 FTE students and 25 square feet per seat, or 6.25 square feet per FTE undergraduate student.

Graduate

- 30 seats per 100 FTE students and 40 square feet per seat, or 12.00 square feet per FTE graduate student

Faculty

- 10 seats per 100 FTE faculty and 75 square feet per seat, or 7.50 square feet per FTE faculty

LIBRARY STAFF SPACE REQUIREMENTS (1975-76)

University	Projected Library Staff	Staff Space
Brock	70	10,500
Carleton	221	33,150
Guelph	169	25,350
Lakehead	93	13,950
Laurentian	100	15,000
McMaster	300	45,000
Ottawa	210	31,500
Queen's	312	46,800
Toronto	915	137,250
Trent	67	10,050
Waterloo	286	42,900
Western	399	59,850
Windsor	250	37,500
York	535	80,250

TABLE 23

READER SPACE REQUIRED (1975-76)

University	Projected FTE Undergraduate Enrolment	Undergraduate Space	Projected FTE Graduate Enrolment	Graduate Space	Projected FTE Staff	Academic Staff Space
Brock	4,700	29,375	150	1,800	440.9	3,307
Carleton	12,988	81,175	1,455	17,460	864.9	6,487
Guelph	9,500	59,375	1,300	15,600	931.0	6,983
Lakehead	4,497	28,106	133	1,596	265.0	1,988
Laurentian	5,100	31,875	150	1,800	332.3	2,492
McMaster	11,000	68,750	2,300	27,600	892.6	6,695
Ottawa	10,174	63,588	3,083	36,996	1,043.9	7,829
Queen's	8,600	53,750	1,800	21,600	737.6	5,532
Toronto	28,546	178,413	5,310	63,720	2,869.2	21,519
Trent	3,200	20,000	60	720	286.0	2,145
Waterloo	12,324	77,025	1,597	19,164	898.1	6,736
Western	11,200	70,000	2,100	25,200	956.8	7,176
Windsor	11,000	68,750	700	8,400	740.5	5,554
York	18,000	112,500	1,800	21,600	1,337.8	10,034

TABLE 24

The results of the application of these factors to projected enrolment and staff are contained in Table 24.

The final area for analysis is the stack area. Normally, 15 volumes per square foot is the maximum storage that can be achieved in the stacks. This would provide no allowance for slack area. Since we are interested in the determination of the space required to accommodate the planned capacity and not the 1976 volume holdings, this is the appropriate space factor. As was pointed out previously the use of other standards, such as 10 volumes per square foot, would involve double counting since this value has a built-in provision for slack space. The results of the application of this factor are presented in Table 25 below.

REQUIRED STACK SPACE (1975-76)

University	Planned Capacity (Volumes)	Stack Space @ 15 vol per sq.ft
Brock	492,000	32,800
Carleton	2,092,000	139,500
Guelph	1,010,000	67,300
Lakehead	555,000	37,000
Laurentian	585,000	39,000
McMaster	1,260,000	84,000
Ottawa	1,785,000	119,000
Queen's	1,531,000	102,000
Toronto	5,569,000	371,300
Trent	459,000	30,600
Waterloo	1,323,000	88,200
Western	1,704,000	113,600
Windsor	1,177,000	78,500
York	2,000,000	133,300

TABLE 25

The determinations of total library space required are contained in Table 26.

This concludes the application of planning factors from selected systems for the estimation of total library space required by the 1975-76 session. The next step is to compare this required space to the space available by 1975-76 under current building programmes. Cost estimates applied to the estimates of shortage will then provide a range of values for the capital commitments that will be required to meet library facilities' needs for 1975-76.

TOTAL LIBRARY SPACE REQUIRED (1975-76)

University	Staff Space	Undergraduate Reading Space	Graduate Reading Space	Faculty Reading Space	Stack Space	Total Space
Brock	10,500	29,375	1,800	3,307	32,800	77,782
Carleton	33,150	81,175	17,460	6,487	139,500	277,772
Guelph	25,350	59,375	15,600	6,983	67,300	174,608
Lakehead	13,950	28,106	1,596	1,988	37,000	82,640
Laurentian	15,000	31,875	1,800	2,492	39,000	90,167
McMaster	45,000	68,750	27,600	6,695	84,000	232,045
Ottawa	31,500	63,588	36,996	7,829	119,000	258,913
Queen's	46,800	53,750	21,600	5,532	102,000	229,682
Toronto	137,250	178,413	63,720	21,519	371,300	772,202
Trent	10,050	20,000	720	2,145	30,600	63,515
Waterloo	42,900	77,025	19,164	6,736	88,200	234,025
Western	59,850	70,000	25,200	7,176	113,600	275,826
Windsor	37,500	68,750	8,400	5,554	78,500	198,704
York	80,250	112,500	21,600	10,034	133,300	357,684

TABLE 26

3.2 Development of a Cost Base and an Estimation of Required Capital

Appendix B contains the comparisons of the library space requirements generated by the four planning systems to the space which will be available in 1975-76. The results range from a requirement of 195,889 square feet with the Taylor, Lieberfeld and Heldman standards to 1,289,136 using the Indiana University planning criteria. The results are summarized in Table 27 below.

System	Additional Space Required
Taylor, Lieberfeld & Heldman	195,889
Illinois University	615,799
Ontario System	852,972
Indiana University	1,289,136

Table 27

The standards employed by the TLH and Indiana systems bring the two extreme measures above into question. The factor of 14 volumes per square foot used in the TLH system for stack space is most conservative. Many references indicate that a factor greater than 10 per square foot is unrealistic.

> ...the number of 150 volumes per section (100 sections per 1,000 square feet = 15 volumes per square foot) is too often proposed by architects and librarians. While it is a

possible figure, it should be realized that it approaches full capacity and should be used only in cases where additional space is immediately available when capacity is reached. The time to consider what comes next will have passed.15/

The TLH factor for reader space must also be questioned. Twenty-five square feet per seat and one seat for every five students is acceptable for undergraduate students but less than ideal in serving the needs of graduates and faculty.

Statistics for Indiana University represent the other end of the spectrum. The space factors for study and stack space are too generous when applied equally across the university community. A standard of reader seats for 40% of the student population is a factor more appropriate to a graduate school. Discarding these two extremes, the estimate of additional library space required by 1975-76 lies in the range of 600,000 to 850,000 net assignable square feet. The totals for the proposed Ontario system and the Illinois system would be closer if the Illinois space factors for graduate reading space had been applied to headcount enrolment, as the system suggests, rather than to full-time equivalent as was made necessary by the available data.

Construction costs are not normally quoted in terms of net assignable square feet but rather gross square feet. There is often considerable confusion and misinterpretation surrounding these two terms and "net area". The following definitions are those followed in this report and should help to clarify terminology.16/

15/ "Planning Academic and Research Library Buildings", Keyes D. Metcalf, McGraw-Hill Book Company, 1965, p. 396.

16/ "University Space Planning", Harlan D. Bareither and Jerry L. Schillinger, University of Illinois Press, 1968, pp. 6-8.

1. Gross Area

   - the sum of the floor areas included within the outside faces of exterior walls for all stories, or areas, which have floor surfaces.

2. Net Assignable Area

   - the sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant, including every type of space functionally usable by an occupant (excepting those spaces elsewhere separately defined - see 3, 4, and 5 below).

3. Custodial Area

   - sum of all areas on all floors of a building used for building protection, care, maintenance and operation.

4. Circulation Area

   - the portion of the gross area - whether or not closed by partitions - which is required for physical access to some subdivision of space.

5. Mechanical Area

   - the portion of the gross area designed to house mechanical equipment, utility services and non-private toilet facilities.

Net assignable area usually comprises approximately 60% of the gross area. The net area, which includes net assignable, custodial, circulation and mechanical space comprises about 80-85% of gross space. The ratio of total net assignable area to gross is approximately .57 at the University of Toronto and .60 at the University of Western Ontario. Using the conversion factor

of 60% the range of required library space converts to a range of 1,000,000 to 1,400,000 gross square feet.

A study was made of library construction from 1963-68 to estimate a dollar cost for the construction of university libraries in Ontario. Costs per gross square foot, which had been stated in 1949 dollars were converted to 1968 dollars and an average calculated. (Table 28 - $33.28 per gross square foot).

Thus, approximately $40 million will be required by 1975-76 to provide library space for projected 1975-76 enrolment levels. How soon these funds will be needed is the topic of the next section.

3.3 Analysis of Required Library Space (1968-69)

It is useful to consider the anticipated shortage of library space as an inventory problem. The product being demanded in this case is total library space composed of reader, stack and service area. Inventory analysis may be best presented by considering a simple problem.

If a product, such as paperback books, is being produced at a rate of 50 units per day then the cumulative production or market supply could be represented graphically as a straight line (line S-S in Figure 5). Thus, in this example, 150 units would have been produced by the end of the third day.

ESTIMATE OF COST OF LIBRARY SPACE
($/GROSS SQUARE FOOT)

Project	Year	Cost (1949 $)	Cost (1968 $)
Library Addition - Laurentian	1963	12.71	27.96
Library & Dining Assembly - Laurentian	1963 & 1967	16.51	36.32
Weldon Library - Western	1968	13.82	30.40
Library I - Guelph	1966	15.59	34.30
Steacie Science Library - York	1964	18.20	40.04
Library I - Lakehead	1956	13.94	30.67
Library II - Lakehead	1967	12.60	27.72
Queen's	1965	17.65	38.83
Average cost/gross square foot			33.28

TABLE 28

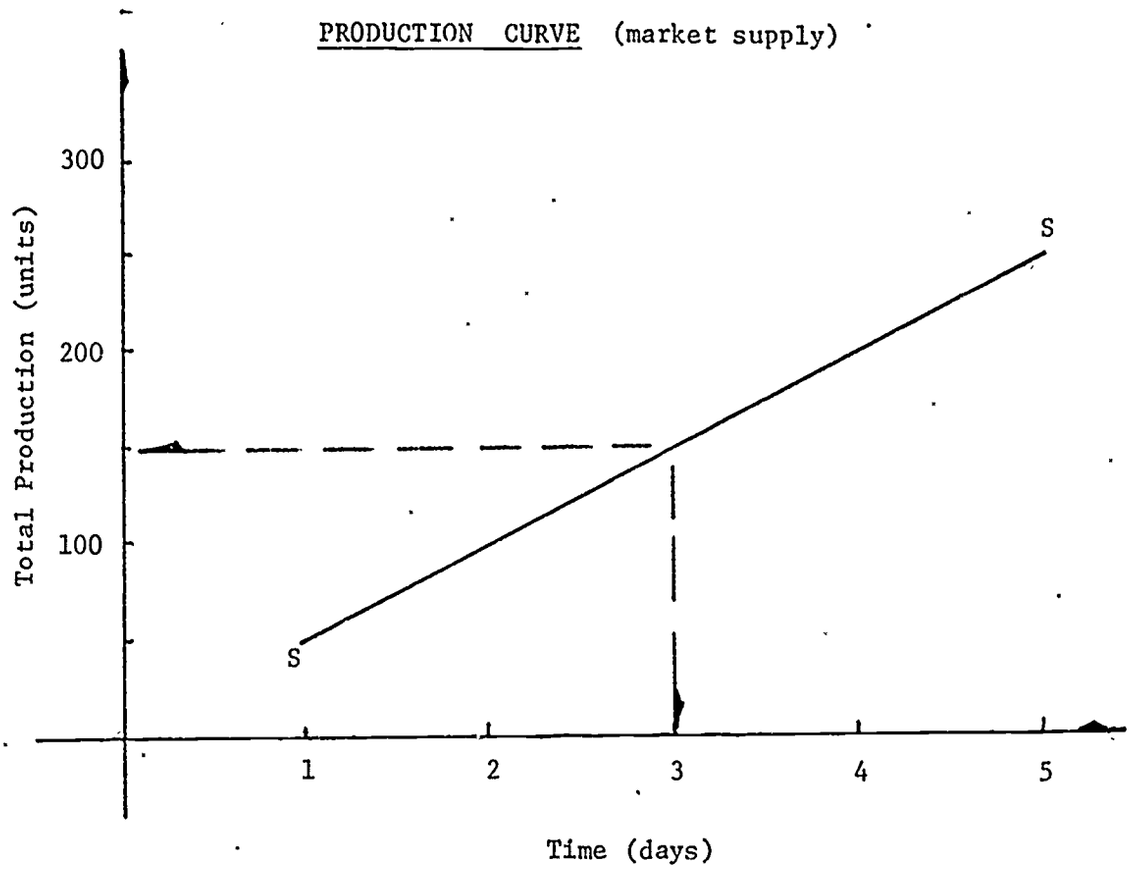


Figure 5.

Assume that the demand for paperbacks follows the pattern outlined in the following chart.

Day	Demand (units)
1	0
2	0
3	100
4	100
5	100

This demand can also be represented cumulatively on this graph as line (D-D) (Figure 6).

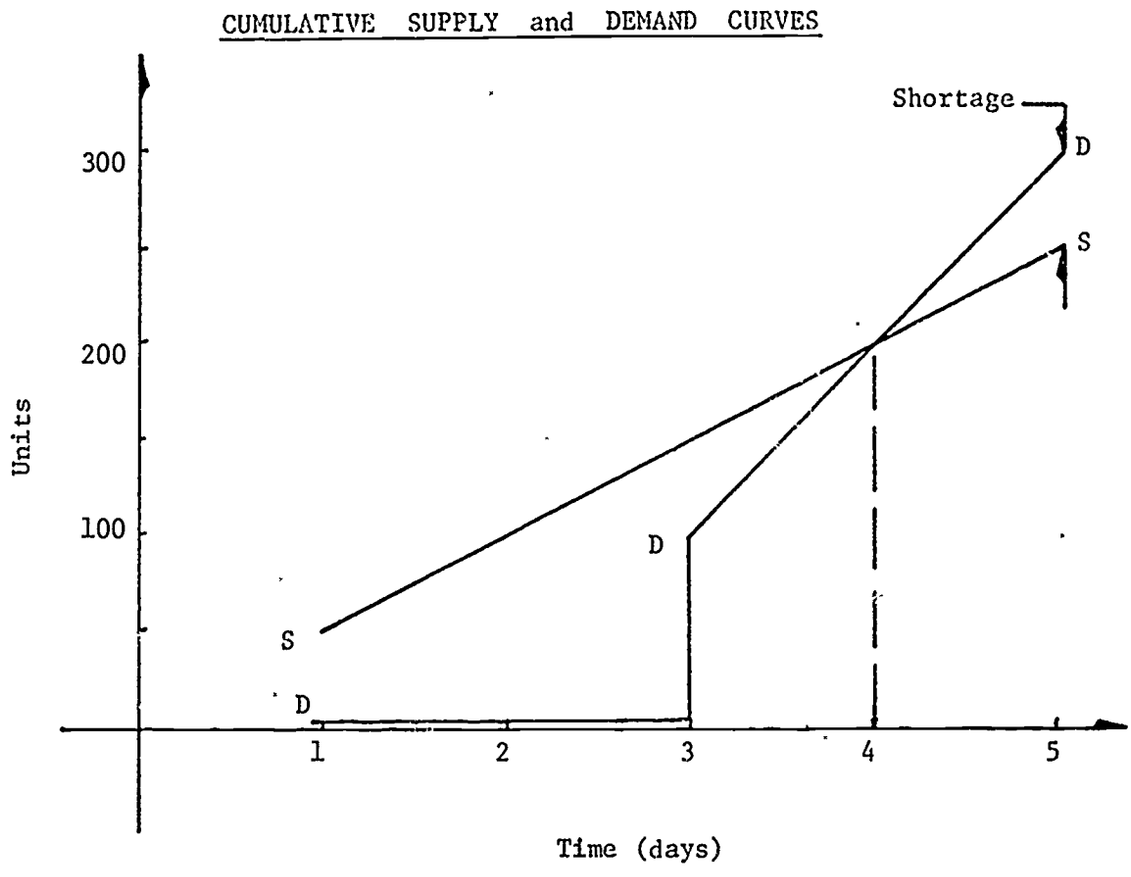


Figure 6.

Figure 6 shows that supply will equal demand on the fourth day and there will be a shortage or unsatisfied demand of fifty paperbacks on the fifth day.

An analogy can be drawn between this example and the library space in the university. Supply is represented by the

number of square feet of library space available to a university plus subsequent additions to be made in the forthcoming years. Demand is represented by the requirements for space in the major areas of the library; reader seats, stack space and general service space. The demand for library space in 1976 has already been determined in the previous section. Comparable measures of demand for 1968 were determined by applying the suggested Ontario system to the 1968-69 operating statistics.

The results of the calculations are presented in Tables 28, 29 and 30. The number of library staff were calculated using the ratios justified for 1975-76. Space standards for stack area were selected from the University of Illinois system since the factors are applied to actual volumes. These factors allow slack area for growth. It is assumed that demand in the intervening years can be considered as a linear function between the two known points.

The supply of library space will generally not be continuous since new space is generated in block fashion as a building is completed and occupied. Figure 7 is an example of how a graph of supply and demand may appear for a single university experiencing a shortage of library space after 1974-75. In this case a building, or additional space, of 20,000 square feet is added in the year 1969-70.

REQUIRED READER SPACE (1968-69)

University	Undergraduate FTE Enrolment (1968-69)	Undergraduate Reader Space	Graduate FTE Enrolment (1968-69)	Graduate Reader Space	FTE Faculty (1968-69)	Faculty Reader Space
Brock	1,249.5	7,809	7.0	84	114.2	857
Carleton	6,732.3	42,077	694.9	8,339	444.7	3,335
Guelph	5,286.7	33,042	470.2	5,642	496.3	3,722
Lakehead	2,437.0	15,233	34.2	410	170.5	1,279
Laurentian	2,018.8	12,618	-	-	127.8	959
McMaster	6,140.7	38,379	1,257.2	15,086	496.5	3,724
Ottawa	6,392.7	39,954	1,465.3	17,584	618.7	4,640
Queen's	6,734.0	42,088	956.6	11,479	545.4	4,091
Toronto	18,933.5	118,334	4,084.2	49,010	1,950.7	14,630
Trent	1,159.2	7,245	2.0	24	101.9	764
Waterloo	6,674.9	41,718	1,230.2	14,762	510.0	3,825
Western	8,944.7	55,904	1,202.0	14,424	730.0	5,475
Windsor	4,871.7	30,448	484.7	5,816	339.0	2,543
York	7,120.7	44,504	456.5	5,478	512.0	3,840

TABLE 28

REQUIRED STAFF AND STACK SPACE (1968-69)

University	Library Staff	Staff Space	Volumes	Stack Space
Brock	38	5,700	111,500	11,200
Carleton	154	23,100	425,509	38,540
Guelph	130	19,500	300,000	28,500
Lakehead	33	4,950	85,000	8,500
Laurentian	44	6,600	125,000	12,500
McMaster	150	22,500	576,000	50,600
Ottawa	113	16,950	305,000	28,900
Queen's	175	26,250	600,000	52,500
Toronto	757	113,550	2,244,498	172,000
Trent	40	6,000	102,000	10,200
Waterloo	118	17,700	280,000	26,700
Western	300	45,000	601,207	53,300
Windsor	100	15,000	370,000	34,100
York	157	23,550	770,068	64,400

TABLE 29

REQUIRED TOTAL LIBRARY SPACE (1968-69)

University	Undergraduate Reader Space	Graduate Reader Space	Faculty Reader Space	Library Staff Space	Stack Space	Total Space
Brock	7,809	84	857	5,700	11,200	25,650
Carleton	42,077	8,339	3,335	23,100	38,540	115,391
Guelph	33,042	5,642	3,722	19,500	28,500	90,406
Lakehead	15,233	410	1,279	4,950	8,500	30,372
Laurentian	12,618	—	959	6,600	12,500	32,677
McMaster	38,379	15,086	3,724	22,500	50,600	130,289
Ottawa	39,954	17,584	4,640	16,950	28,900	108,028
Queen's	42,088	11,479	4,091	26,250	52,500	136,408
Toronto	118,334	49,010	14,630	113,550	172,000	467,524
Trent	7,245	24	764	6,000	10,200	24,233
Waterloo	41,718	14,762	3,825	17,700	26,700	104,705
Western	55,904	14,424	5,475	45,000	53,300	174,103
Windsor	30,448	5,816	2,543	15,000	34,100	87,907
York	44,504	5,478	3,840	23,550	64,400	141,772

TABLE 30

EXAMPLE of LIBRARY SPACE as an INVENTORY PROBLEM

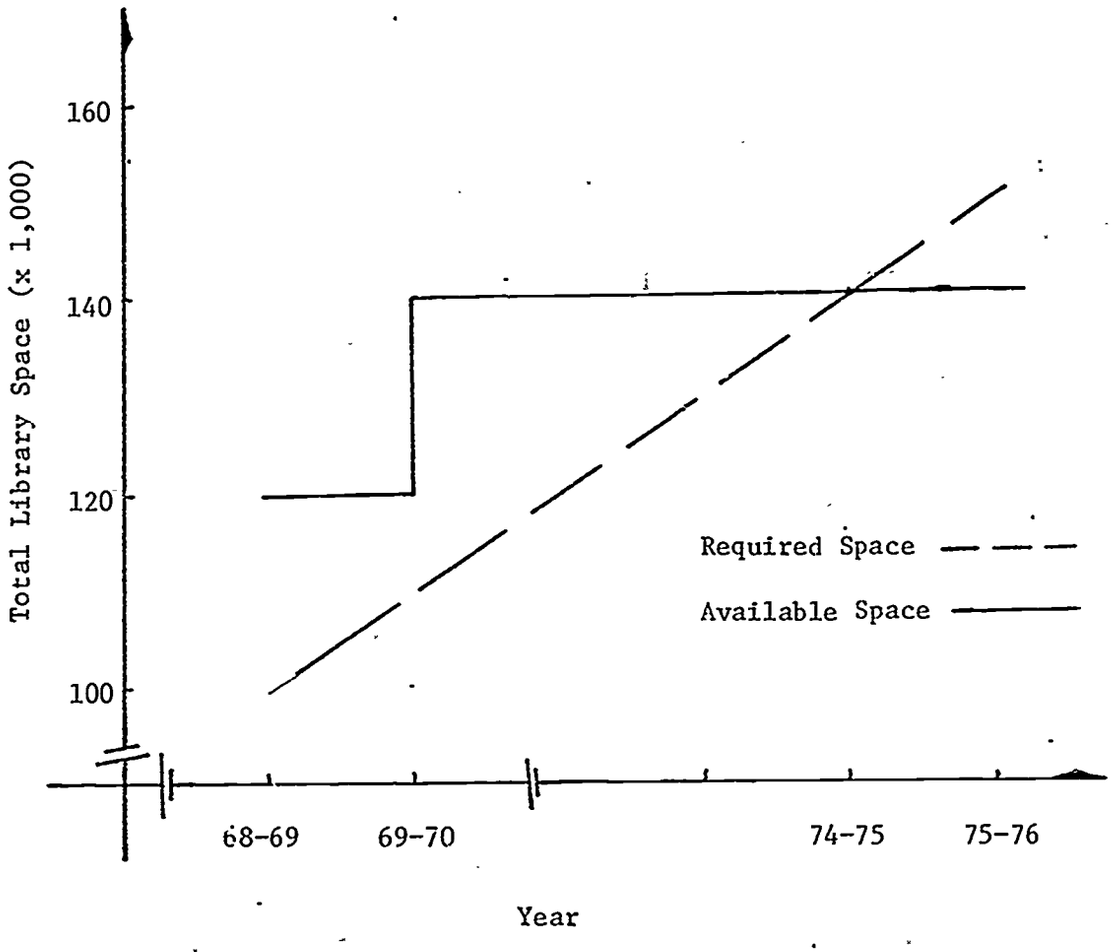


Figure 7.

Demand, as well as supply, could best be represented as a step function since increments to enrolment occur yearly and not gradually throughout the year. However, since yearly data are not available to calculate each point on the graph the demand curve is assumed to be linear between 1968-69 and 1975-76.

Corresponding graphs for all provincially-assisted universities are presented in Appendix C. In some cases the supply of library space is represented linearly instead of by the step function to reflect the gradual acquisition of space

over time. Therefore consideration of library space as an inventory problem indicates that each university library will experience a shortage in the year(s) shown in Table 31. Shortages showing between sessions are arbitrarily assumed to occur in the earlier session.

"Year of shortage" could be employed as an indicator of need; the university experiencing a shortage in an earlier year than another could be considered to be in greater need. This might be a questionable comparison however, since it implies that a university experiencing a shortage from 1968-69 to 1972-73, when it acquires a new building, is in greater need than a university facing a shortage from 1969-70 to 1975-76 with no additional building planned. Also, a shortage of 10,000 square feet of library space at a university with 5,000 students may not be as critical as the same shortage at a university of 2,000 students though both may face the shortage over the same period of time. What must be emphasized is the total years of shortage for the system.

University	Years of Shortage	Total Years of Shortage
Brock	1970-71 to 1971-72	
	1972-73 to 1975-76	5
Carleton	1968-69 to 1975-76	8
Guelph	———	0
Lakehead	1968-69 to 1973-74	
	1974-75 to 1975-76	6
Laurentian	1969-70 to 1975-76	7
McMaster	1968-69 to 1975-76	8
Ottawa	1968-69 to 1975-76	8
Queen's	1968-69 to 1975-76	8
Toronto	1968-69 to 1972-73	5
	1975-76	
Trent	1968-69 to 1969-70	2
Waterloo	1968-69 to 1975-76	8
Western	1968-69 to 1970-71	
	1975-76	3
Windsor	1968-69 to 1972-73	
	1973-74 to 1975-76	7
York	1968-69 to 1969-70	
	1971-72 to 1975-76	6

TABLE 31

4. ANALYSIS OF PROJECTED OPERATING COSTS (1975-76)

An important question concerns whether or not universities can finance the projected level of library operations from projected operating funds ie., how will the cost of acquisitions and library staff salaries compare to the normal percentage of total operating incomes allocated to operating expenses of libraries?

The first step in answering this question is to estimate the operating income for each university in 1976. This is equal to the product of the value of the basic income unit and the number of projected income units. Since all costs estimates are expressed in 1968 dollars (no attempt has been made to apply a cost escalation factor) the basic income unit value is assumed constant at the 1968-69 level of $1450.

The projected income units for each university were calculated from one year extrapolations of the data provided by the Department of University Affairs in the documentation of the interim capital grant formula.[17/] The projected basic operating income for 1976 in 1968 dollars (product of the 1976 projected units and the value of the basic income unit in 1968) does not include special grants, research funds, Federal grants or endowments (Table 32). This additional income is especially significant to those institutions carrying large research programmes such as Toronto and Guelph.

17/ "Documents Describing the Development of an Interim Capital Formula for Provincially-Assisted Universities in Ontario", Department of University Affairs, February, 1969.

The library budget was estimated for 1975-76 by applying the average library staff salary for 1968-69 (determined from the UA-4 forms) to the projected 1976 library staff (Table 32). Acquisitions for 1975-76 were calculated by applying the percentage increases from the previous section (Table 7) to the projected 1976 level of holdings. We wish to calculate the number of volumes to be added in 1975 to reach the projected 1976 holdings.

Let: X = number of volumes in 1976

Y = number of volumes in 1975

i = constant percentage increase

Then: $X = Y(1 + i)$

$Y = X/(1 + i)$

An average cost per acquisition applied to the projected number of additions yields an estimate of the acquisition portion of the library budget. (Table 33). An average of $12.00 (CDN) per addition is used to forecast the acquisitions budget. In 1968 the average price of trade-technical books varied from $5.97 (U.S.) to $12.93 (U.S.) excluding the categories of childrens' books and fiction. For the same period the average price of categories of periodicals ranged from $3.04 (U.S.) to $24.26 (U.S.), childrens' periodicals excepted.[18/]

18/ "The Bowker Annual", 1969.

ESTIMATED UNIVERSITY OPERATING INCOME FROM FORMULA AND LIBRARY EXPENDITURES (1975-76)

University	Projected Income Units	Projected Formula Income ($ x 1,000)	Library Staff	Staff Salaries (Avg=$4717)
Brock	5,800	8,410	70	$ 330,190
Carleton	19,790	28,696	221	1,042,457
Guelph	22,200	32,190	169	797,173
Lakehead	4,900	7,105	93	438,681
Laurentian	5,875	8,519	100	471,700
McMaster	26,200	37,990	300	1,415,100
Ottawa	25,188	36,523	210	990,570
Queen's	21,400	31,030	312	1,471,704
Toronto	68,287	99,016	915	4,316,055
Trent	4,100	5,945	67	316,039
Waterloo	26,100	37,845	286	1,349,062
Western	24,000	34,800	399	1,882,083
Windsor	17,100	24,795	250	1,179,250
York	29,100	42,195	535	2,523,595

TABLE 32

University	Projected Holdings (1975-76)	Percentage Increase Per Year	Acquisitions 1974-75 to 1975-76	Acquisition Budget 1975-76 X	Staff Salaries Y	Total Library Budget (X+Y)/ .916
Brock	315,000	16.0	43,000	516,000	330,190	923,800
Carleton	1,306,000	17.4	194,000	2,328,000	1,042,457	3,679,500
Guelph	700,000	12.9	80,000	960,000	797,173	1,918,300
Lakehead	375,000	14.0	46,000	552,000	438,681	1,081,529
Laurentian	365,000	16.6	52,000	624,000	471,700	1,196,200
McMaster	1,000,000	8.2	76,000	912,000	1,415,100	2,540,500
Ottawa	1,059,000	19.0	169,000	2,028,000	990,570	3,295,000
Queen's	1,150,000	9.7	102,000	1,224,000	1,471,704	2,942,900
Toronto	4,300,000	9.4	369,000	4,428,000	4,316,055	9,545,900
Trent	294,000	16.3	41,000	492,000	316,039	882,100
Waterloo	826,000	16.6	117,000	1,404,000	1,349,062	3,005,500
Western	1,246,600	11.0	124,000	1,488,000	1,882,083	3,679,100
Windsor	838,000	12.4	92,000	1,104,000	1,179,250	2,492,600
York	1,500,000	10.0	136,000	1,632,000	2,471,708	4,480,000

TABLE 33

Selection of the average of $12.00 is a subjective judgement based on the above price information tempered by the knowledge that a portion of the acquisitions is derived from gifts to the library.

The total library budget is equal to the sum of the staff budget, acquisitions budget and a provision for miscellaneous expenditures, set at 8.4% of the total library budget (provincial average for 1968-69)[19/] (Table 33).

Library budgets in Ontario have historically represented about 7% of a university's general income. Projected library budgets as a percentage of formula income derived from the parameters of the operating grants formula are presented in Table 34 for each university.

PROJECTED LIBRARY BUDGETS AS A PERCENTAGE OF FORMULA INCOME

University	Projected Formula Income ($ x 1,000) (1975-76)	Library Budget ($ x 1,000)	Budget as a Percentage of Income
Brock	8,410	924	11.0
Carleton	28,696	3,680	12.8
Guelph	32,190	1,918	6.0
Lakehead	7,105	1,082	15.2
Laurentian	8,519	1,196	14.0
McMaster	37,990	2,541	6.7
Ottawa	36,523	3,295	11.0
Queen's	31,030	2,943	9.5
Toronto	99,016	9,545	9.6
Trent	5,945	882	14.8
Waterloo	37,845	3,006	7.9
Western	34,800	3,679	10.6
Windsor	24,795	2,493	10.1
York	42,195	4,480	10.6

TABLE 34

19/ Data Source: Canadian Association of College and University Libraries, Annual Salary & Budget Survey, 1968.

If the libraries continue to be allocated about 7% of the university general income then many of them will be able to achieve the operating levels set out in this report. The levels will definitely be achievable if the universities alter current budgetary policies and follow the recommendation of CACUL to the Bladen Commission that university libraries should receive a minimum of 10% of the total operating income of the university.

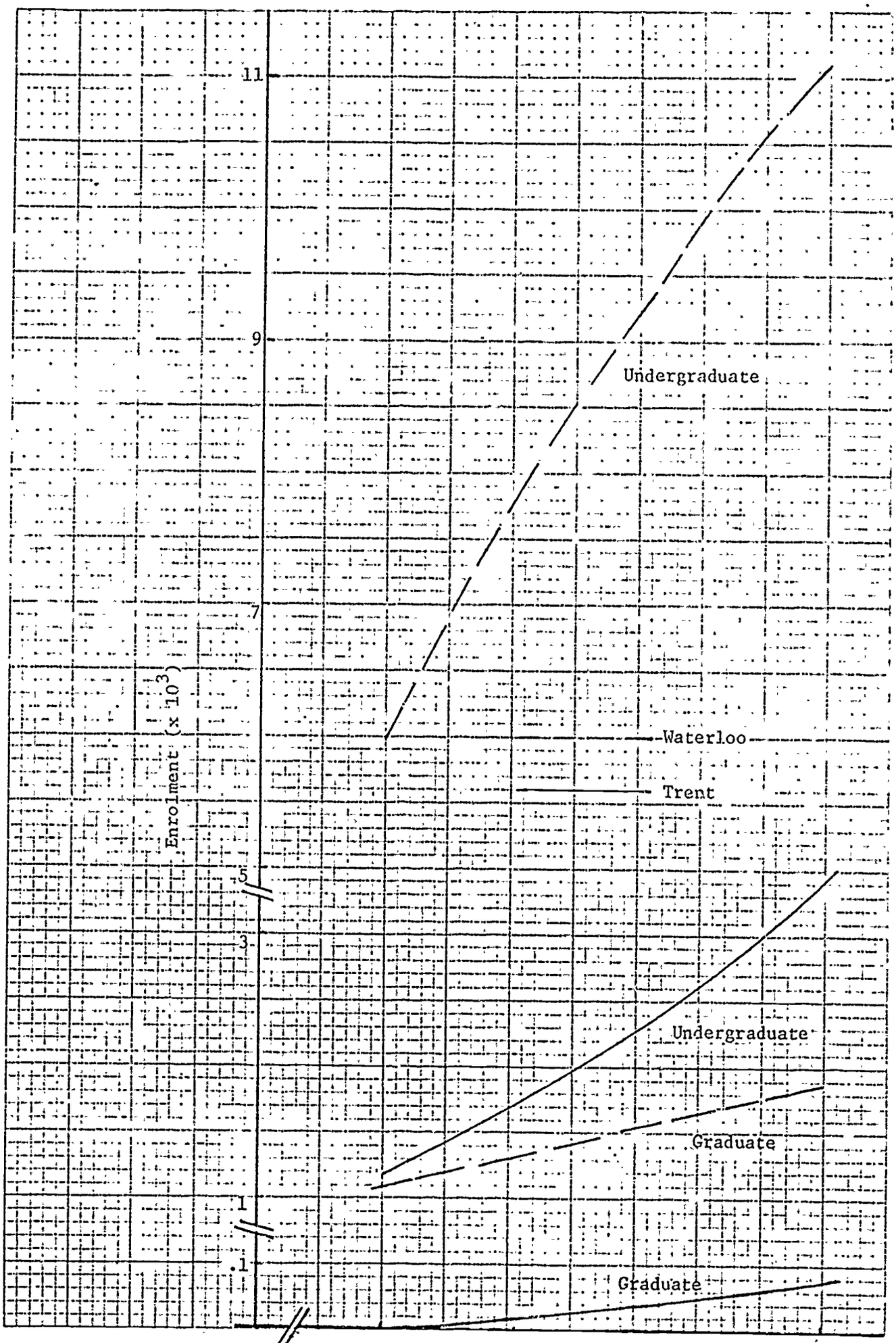
APPENDIX A

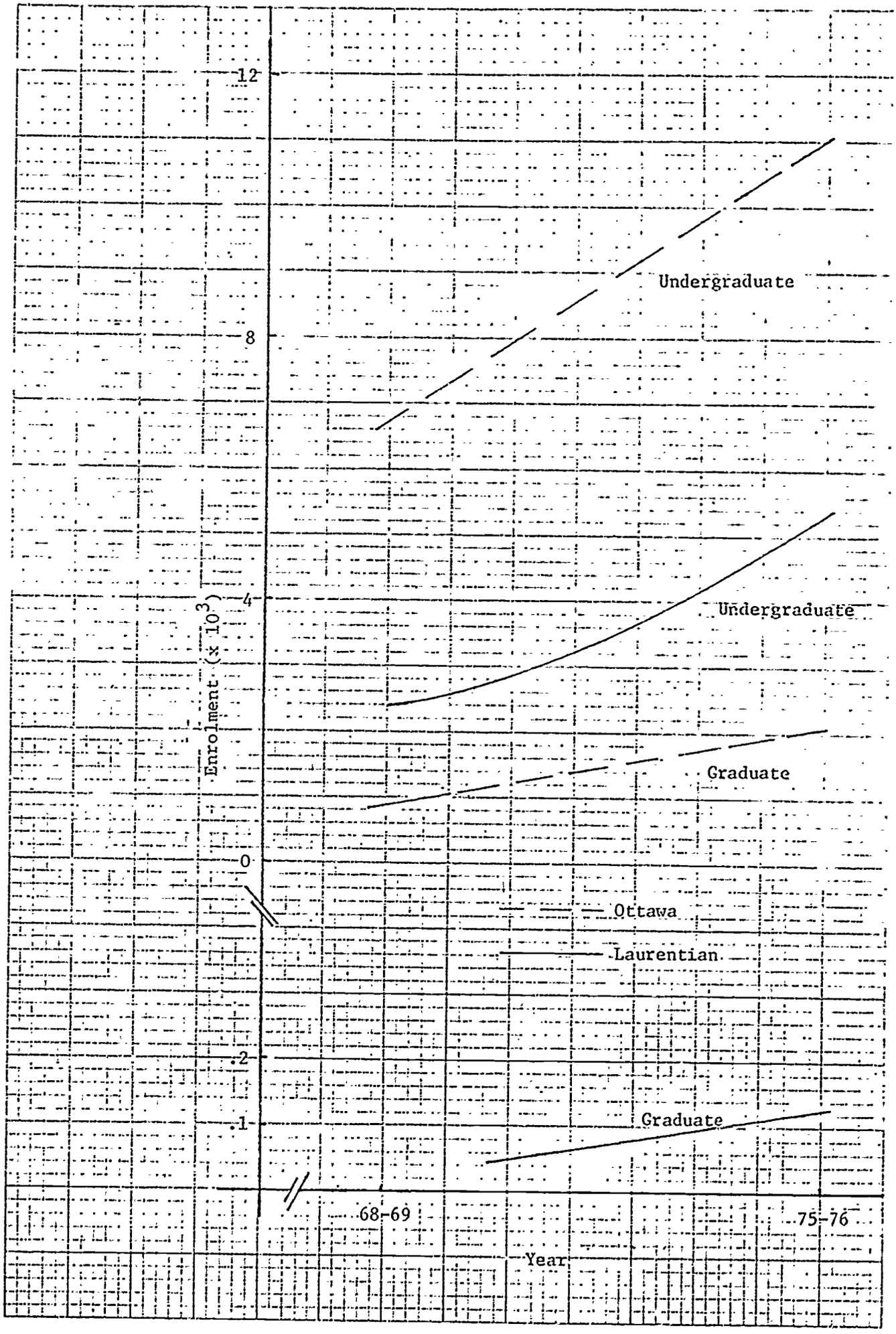
LONG-TERM ENROLMENT DATA
FTE UNDERGRADUATE

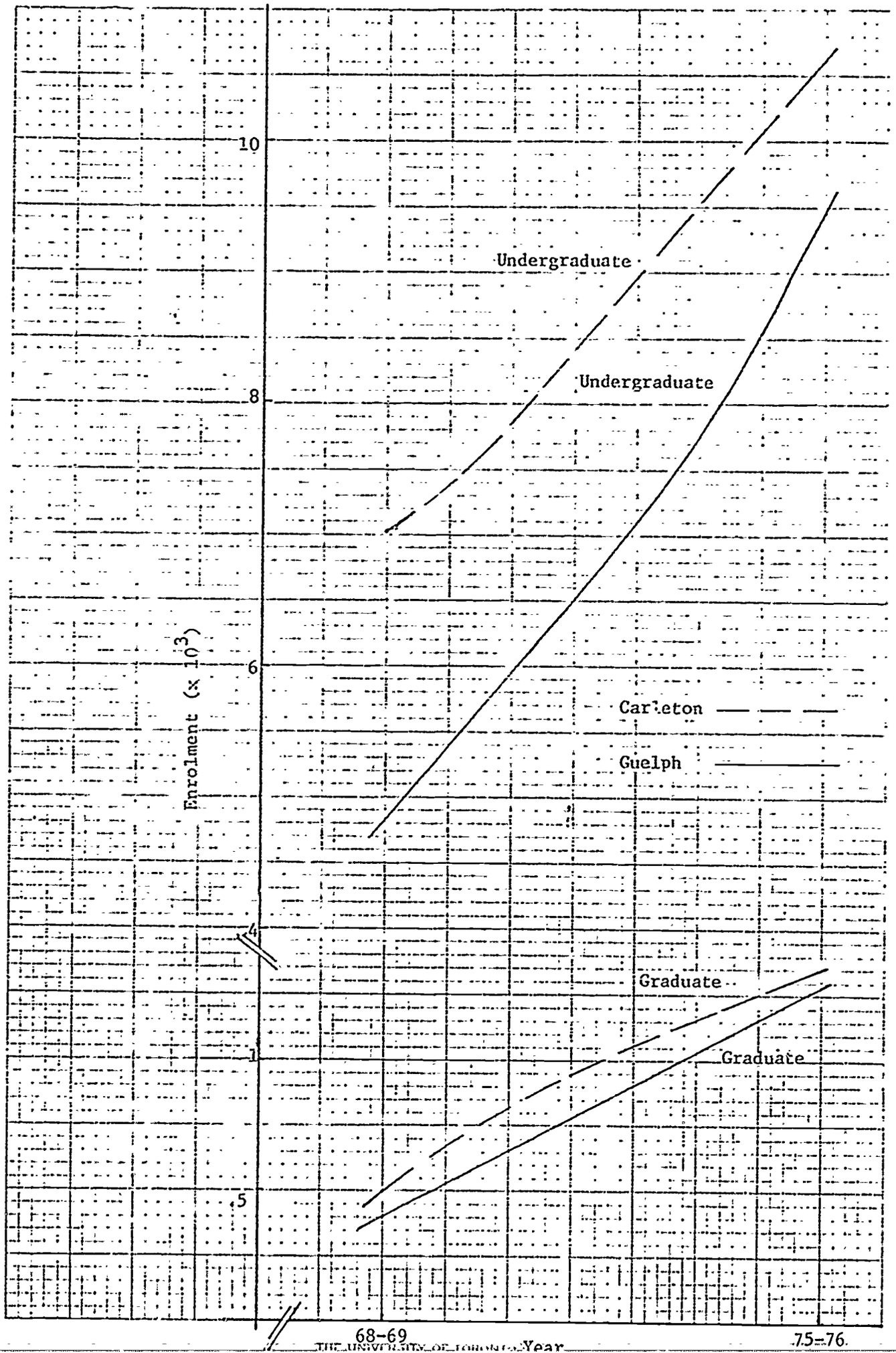
University	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Brock	1,176	1,680	2,453	3,058	3,596	4,062	4,475	4,900
Carleton	6,995	7,528	7,845	8,423	8,984	9,534	10,085	10,650
Guelph	4,818	5,372	5,949	6,496	7,082	7,769	8,534	9,500
Lakehead	2,414	2,857	3,036	3,248	3,439	3,636	3,828	4,000
Laurentian	2,378	2,549	2,899	3,297	3,757	4,212	4,723	5,200
McMaster	6,327	7,109	7,119	7,845	8,789	9,511	10,203	11,000
Ottawa	6,737	7,805	8,325	8,612	9,181	9,844	10,437	11,100
Queen's	6,914	7,410	7,568	7,742	8,023	8,261	8,437	8,600
Toronto	18,789	20,734	21,460	22,267	23,165	24,108	25,020	25,800
Trent	1,156	1,402	1,655	1,950	2,265	2,595	2,955	3,400
Waterloo	6,044	6,865	7,777	8,515	9,235	9,982	10,575	11,100
Western	8,801	9,548	10,010	10,580	11,250	11,670	11,955	11,200
Windsor	4,914	5,960	6,838	7,690	8,440	9,254	10,128	10,800
York	7,204	9,387	11,330	13,030	14,420	15,760	16,920	18,000
Total	84,667	96,206	104,264	112,753	121,626	130,198	138,275	145,250

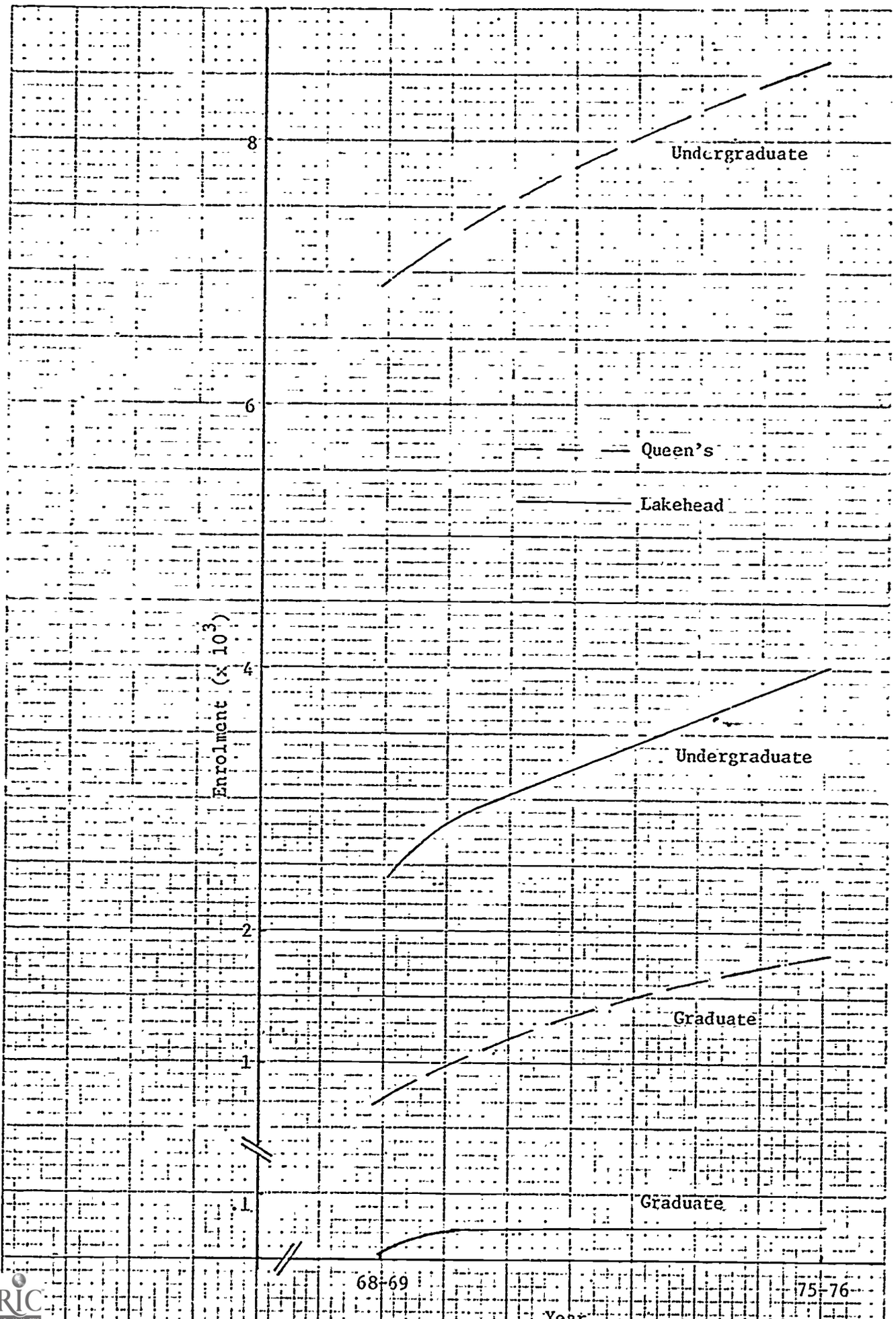
LONG-TERM ENROLMENT DATA
GRADUATE

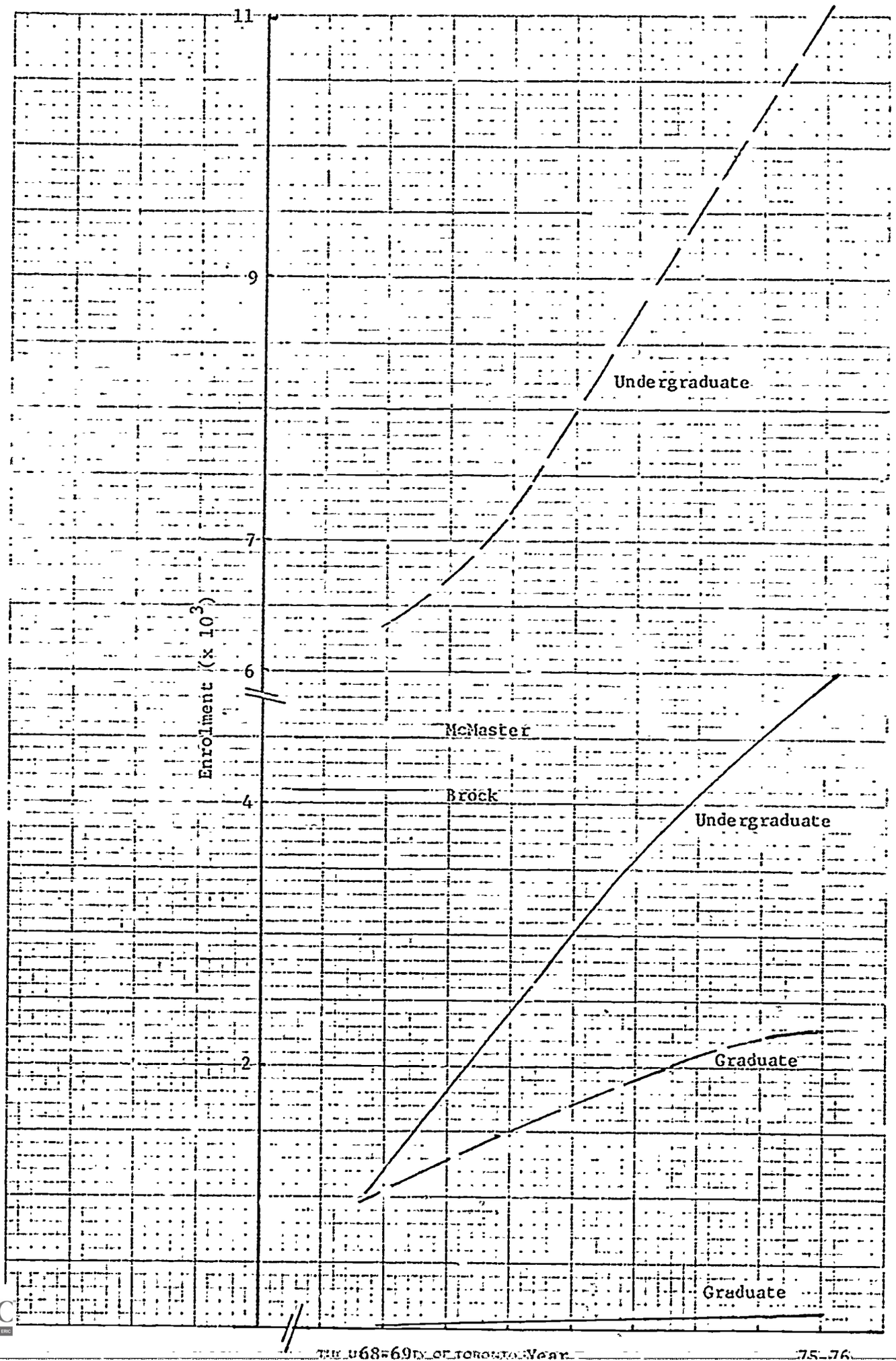
University	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Brock	7	19	38	62	83	104	120	150
Carleton	521	614	845	940	1,050	1,155	1,260	1,350
Guelph	404	542	657	750	863	1,021	1,181	1,300
Lakehead	17	43	45	50	55	60	65	70
Laurentian			51	69	81	98	110	133
McMaster	1,105	1,354	1,515	1,744	1,950	2,102	2,236	2,300
Ottawa	887	1,023	1,220	1,462	1,611	1,763	1,931	2,100
Queen's	811	950	1,116	1,380	1,500	1,610	1,730	1,800
Toronto	3,465	3,810	4,230	4,460	4,660	4,940	5,160	5,400
Trent	4	3	15	25	35	45	55	70
Waterloo	1,108	1,243	1,286	1,391	1,523	1,647	1,755	1,900
Western	1,060	1,256	1,450	1,650	1,770	1,900	2,000	2,150
Windsor	273	314	361	415	480	553	637	700
York	320	514	750	840	1,000	1,130	1,250	1,400
TOTALS	9,982	11,685	13,579	15,238	16,661	18,128	19,490	20,690

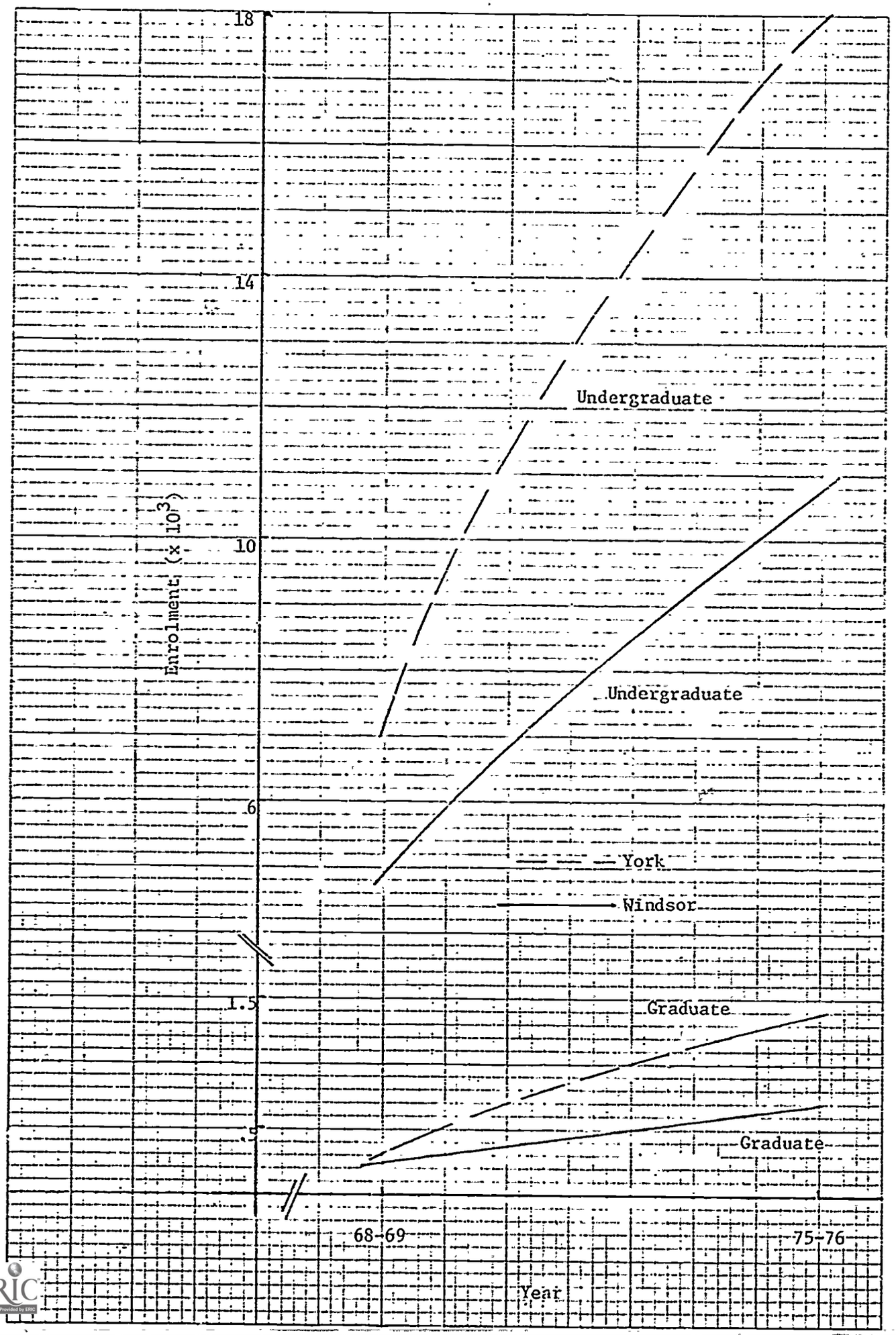

11
9
7
5
3
1
.1
Enrolment (x 10^3)
Undergraduate
Waterloo
Trent
Undergraduate
Graduate
Graduate
68-69
Year
75-76

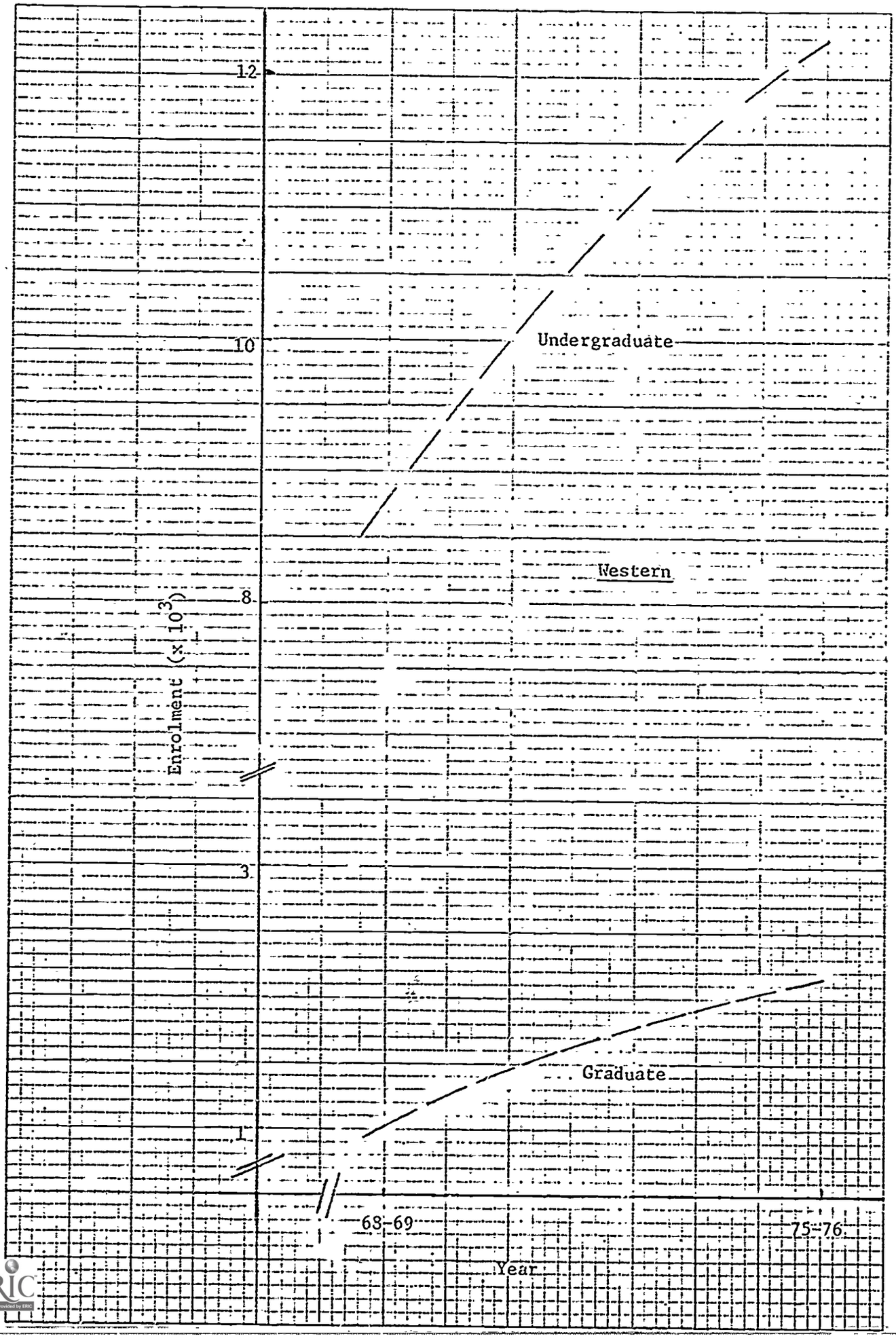

12
8
4
0
2
1
Enrolment ($\times 10^3$)
Undergraduate
Undergraduate
Graduate
Ottawa
Laurentian
Graduate
68-69
75-76
Year

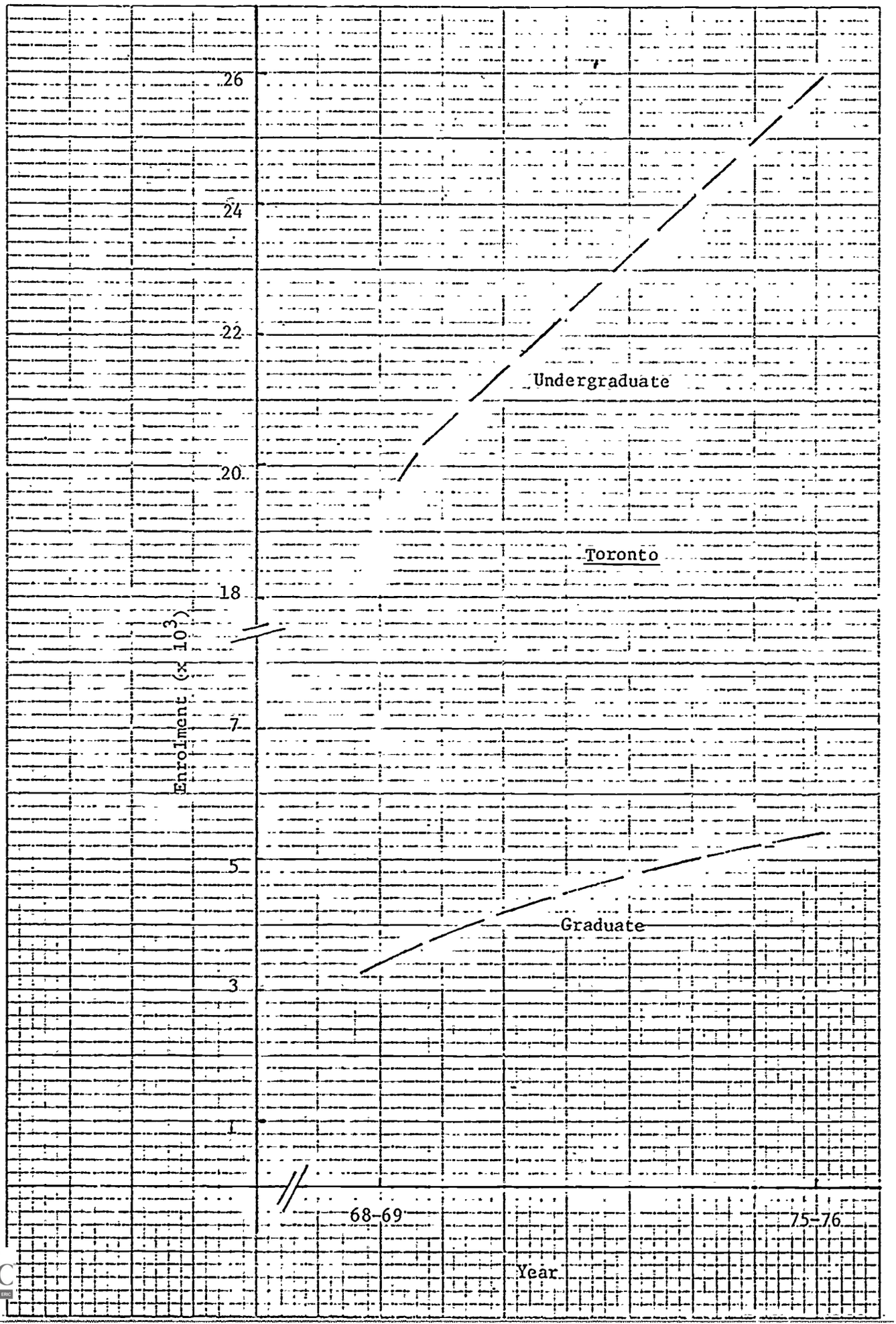

10
8
6
4
1
.5
Enrolment (x 10^3)
Undergraduate
Undergraduate
Carleton
Guelph
Graduate
Graduate
68-69
Year
75-76


8
6
4
2
1
Enrolment ($\times 10^3$)
Undergraduate
Queen's
Lakehead
Undergraduate
Graduate
Graduate
68-69
75-76
Year


11
9
7
6
4
2
Enrolment (x 10^3)
Undergraduate
McMaster
Brock
Undergraduate
Graduate
Graduate
'68-69
Year
75-76


18
14
10
6
1.5
.5
Enrolment (x 10^3)
Undergraduate
Undergraduate
York
Windsor
Graduate
Graduate
68-69
75-76
Year


12
10
8
3
1
Enrolment ($\times 10^3$)
Undergraduate
Western
Graduate
68-69
75-76
Year


26
24
22
20
18
7
5
3
1
Enrolment (x 10³)
Undergraduate
Toronto
Graduate
68-69
75-76
Year

APPENDIX B

ADDITIONAL LIBRARY SPACE REQUIRED (1975-76)
(Method: University of Illinois)

University	Required Space	Available Space	Shortage or (Excess) of Space
Brock	79,131	57,706	21,425
Carleton	245,011	123,165	121,846
Guelph	167,220	212,610	(45,390)
Lakehead	80,403	76,600	3,803
Laurentian	86,004	47,250	38,754
McMaster	215,738	146,352	69,386
Ottawa	238,226	68,157	170,069
Queen's	198,331	169,769	28,562
Toronto	669,180	723,296	(54,116)
Trent	60,991	70,818	(9,827)
Waterloo	211,213	131,745	79,468
Western	232,530	275,130	(42,600)
Windsor	184,701	171,200	13,501
York	314,085	245,100	68 985
Total[1/]			615,799

1/ Arithmetic sum of shortages

ADDITIONAL LIBRARY SPACE REQUIRED (1975-76)

(Method: Indiana University)

University	Required Space	Available Space	Shortage or (Excess) of Space
Brock	95,520	57,706	37,814
Carleton	321,248	123,165	198,083
Guelph	212,560	212,610	(50)
Lakehead	98,616	76,600	22,016
Laurentian	105,800	47,250	58,550
McMaster	275,560	146,352	129,208
Ottawa	280,892	68,157	212,735
Queen's	252,280	169,769	82,511
Toronto	876,899	723,296	153,603
Trent	72,432	70,818	1,614
Waterloo	266,357	131,745	134,612
Western	300,220	275,130	25,090
Windsor	238,240	171,200	67,040
York	411,360	245,100	166,260
Total (1)			1,289,136

(1) Arithmetic sum of shortages

ADDITIONAL LIBRARY SPACE REQUIRED (1975-76)
(Method: Taylor, Lieberfeld, Heldman)

University	Required Space	Available Space	Shortage or (Excess) of Space
Brock	54,510	57,706	(3,196)
Carleton	188,610	123,165	65,445
Guelph	121,280	212,610	(91,330)
Lakehead	57,344	76,600	(19,256)
Laurentian	60,721	47,250	3,471
McMaster	159,209	146,352	12,857
Ottawa	163,139	68,157	94,982
Queen's	150,7 3	169,769	(18,986)
Toronto	530,593	723,296	(192,703)
Trent	42,516	70,818	(28,302)
Waterloo	150,879	131,745	19,134
Western	176,780	275,130	(98,350)
Windsor	137,077	171,200	(34,123)
York	237,323	245,100	(7,777)
Total (1)			195,889

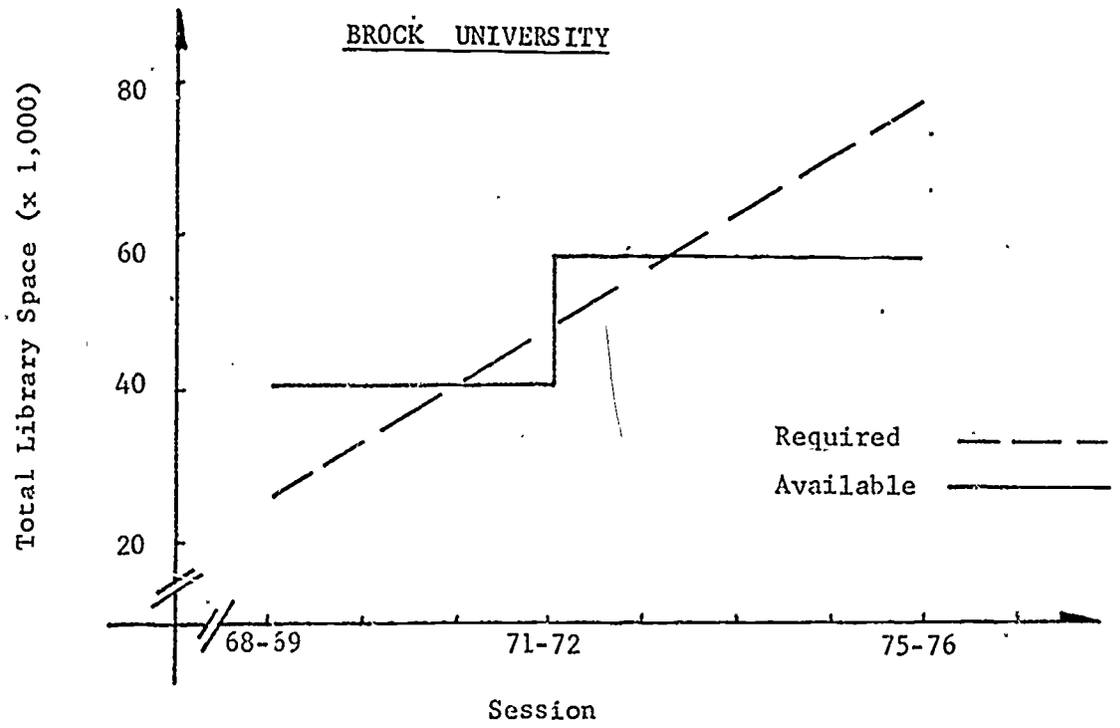
(1) Arithmetic sum of the shortages

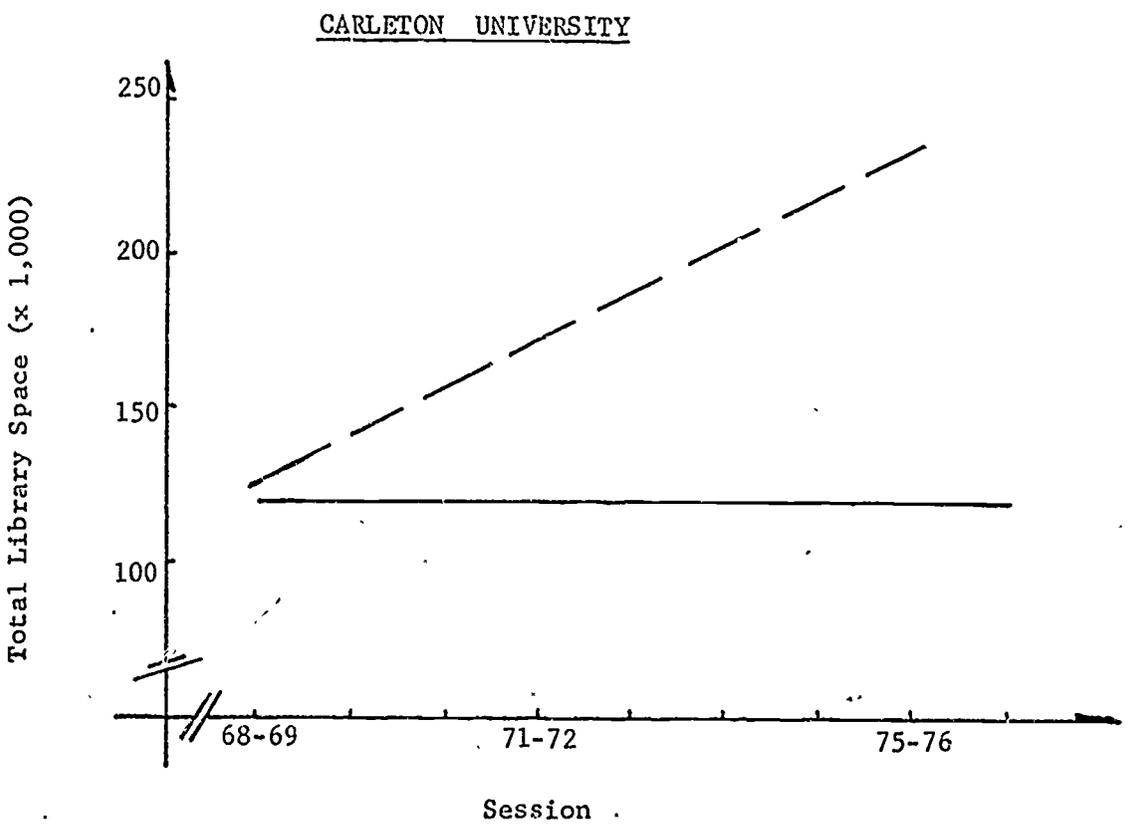
ADDITIONAL LIBRARY SPACE REQUIRED (1975-76)
(Method: Ontario System)

University	Required Space	Available Space	Shortage or (Excess) of Space
Brock	77,782	57,706	20,076
Carleton	277,772	123,165	154,607
Guelph	174,608	212,610	(38,002)
Lakehead	82,640	76,600	6,040
Laurentian	90,167	47,250	42,917
McMaster	232,045	146,352	85,693
Ottawa	258,913	68,157	190,756
Queen's	229,682	169,769	59,913
Toronto	772,202	723,296	48,906
Trent	63,515	70,818	(7,303)
Waterloo	234,025	131,745	102,280
Western	276,826	275,130	1,696
Windsor	198,704	171,200	27,504
York	357,684	245,100	112,584
Total (1)			852,972

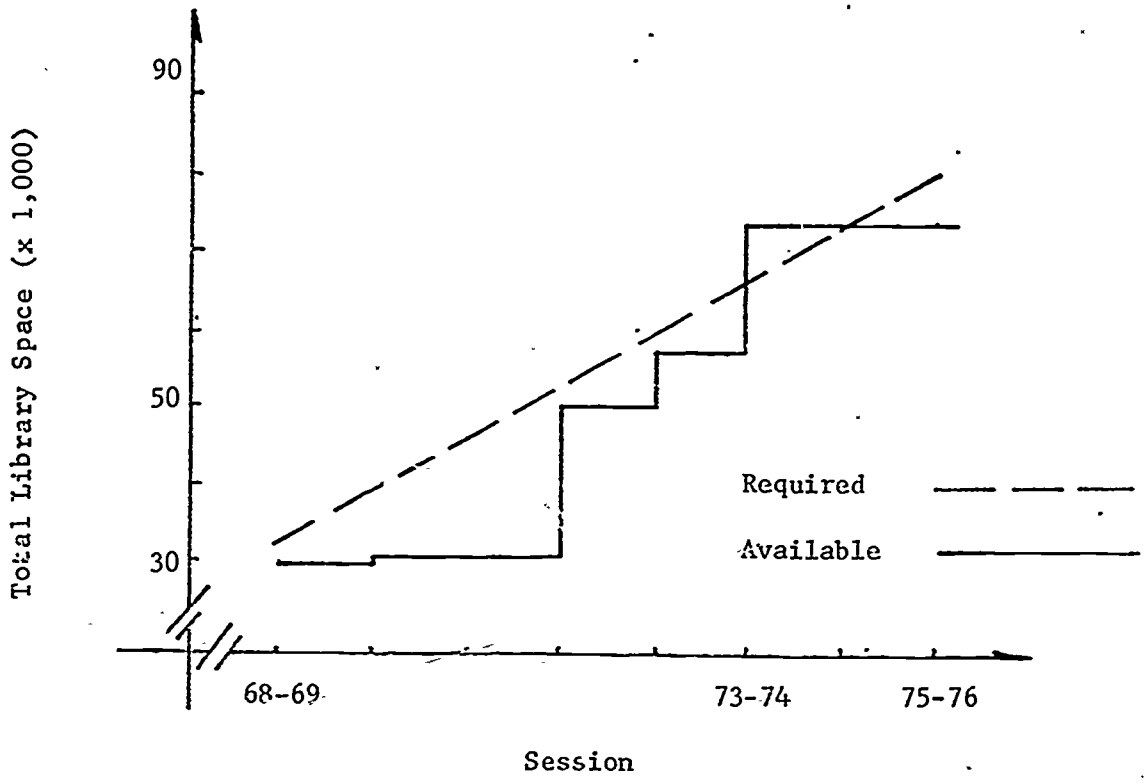
(1) Arithmetic sum of the shortages

APPENDIX C

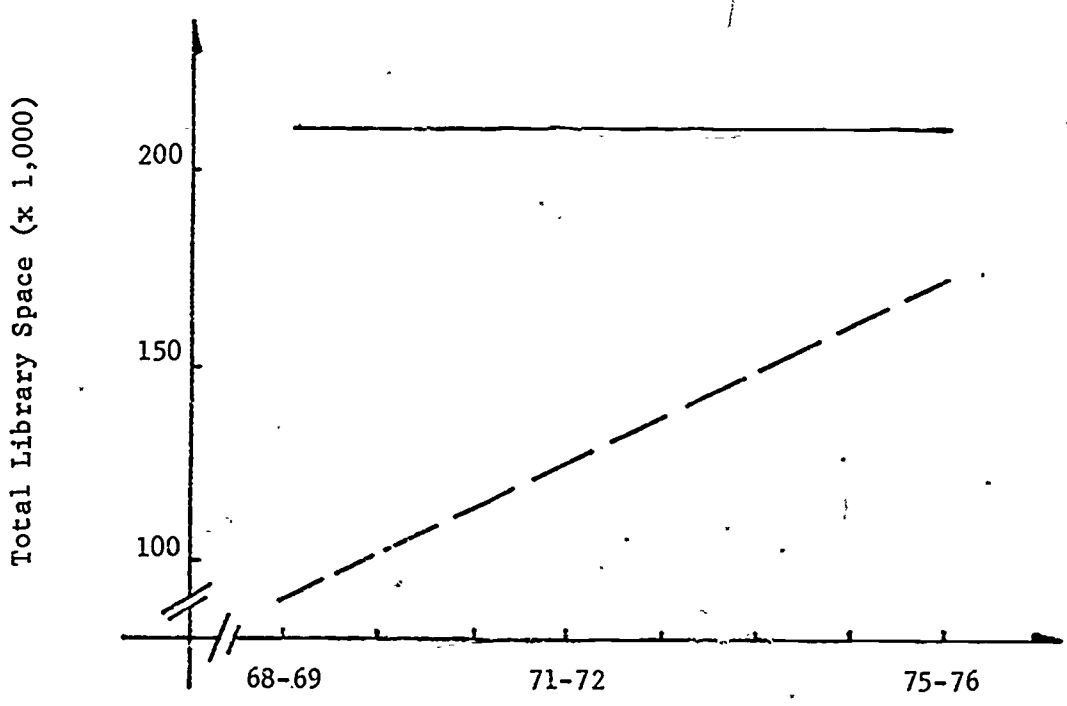

BROCK UNIVERSITY
Total Library Space (x 1,000)
80
60
40
20
68-69
71-72
75-76
Session
Required
Available


CARLETON UNIVERSITY
Total Library Space (x 1,000)
250
200
150
100
68-69
71-72
75-76
Session

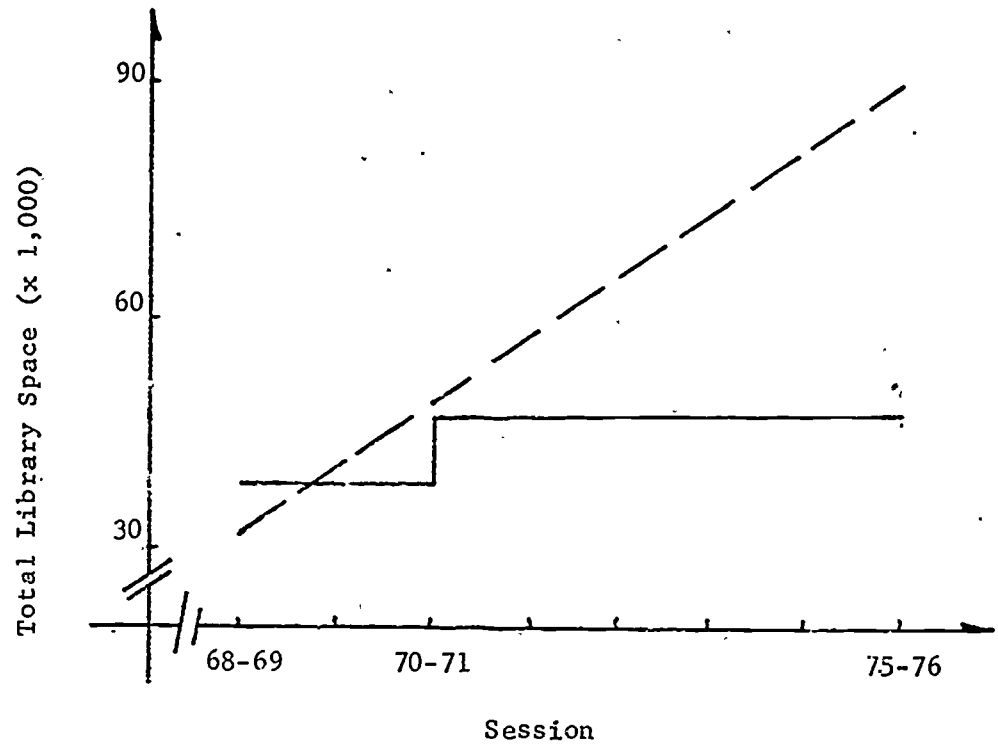
LAKEHEAD UNIVERSITY



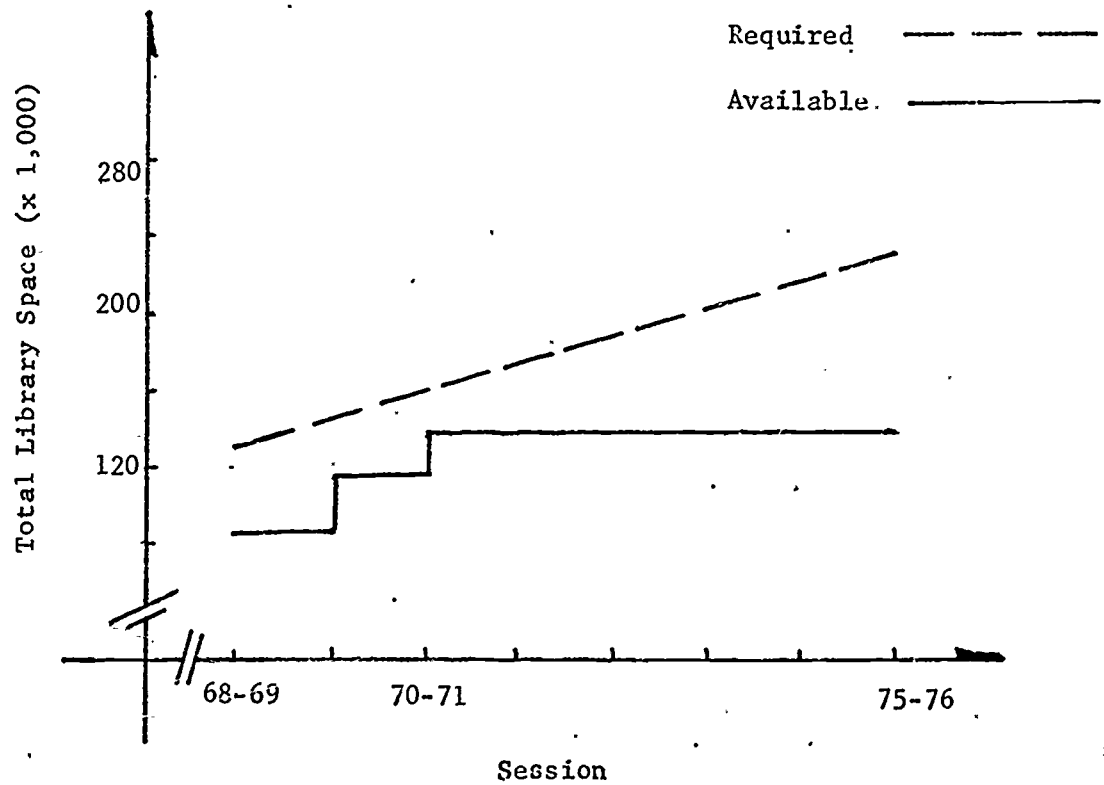
GUELPH UNIVERSITY



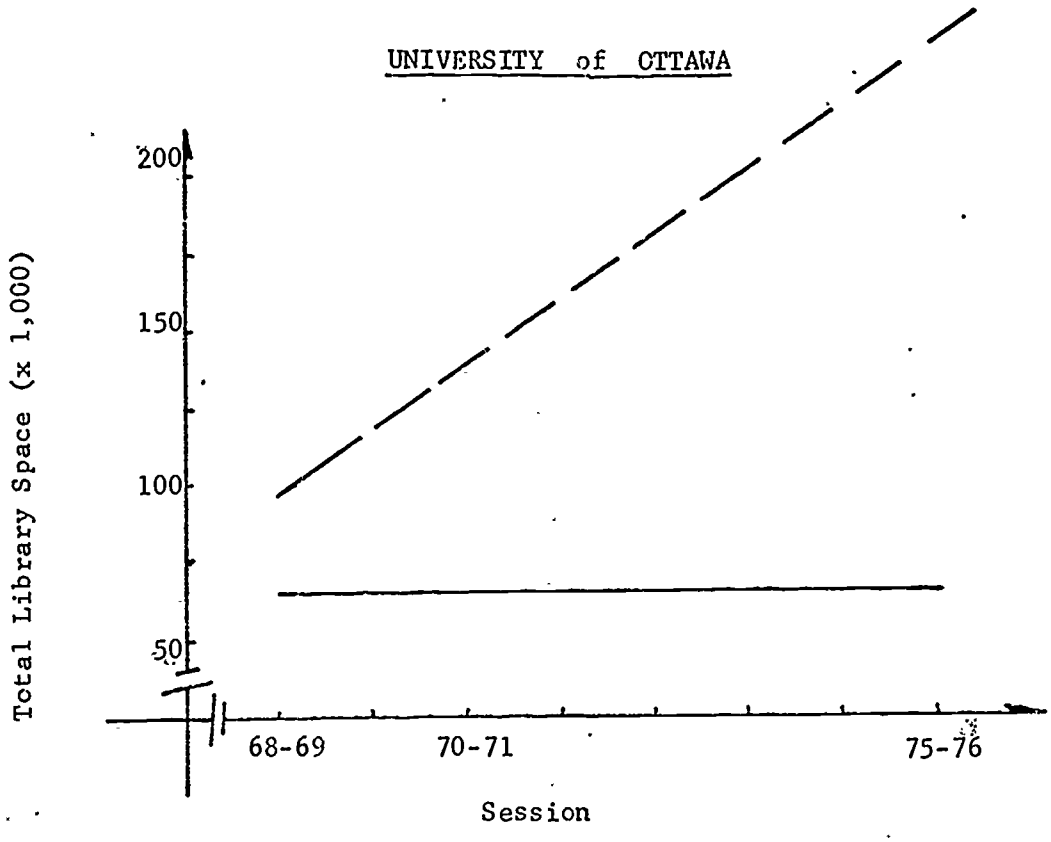
LAURENTIAN UNIVERSITY



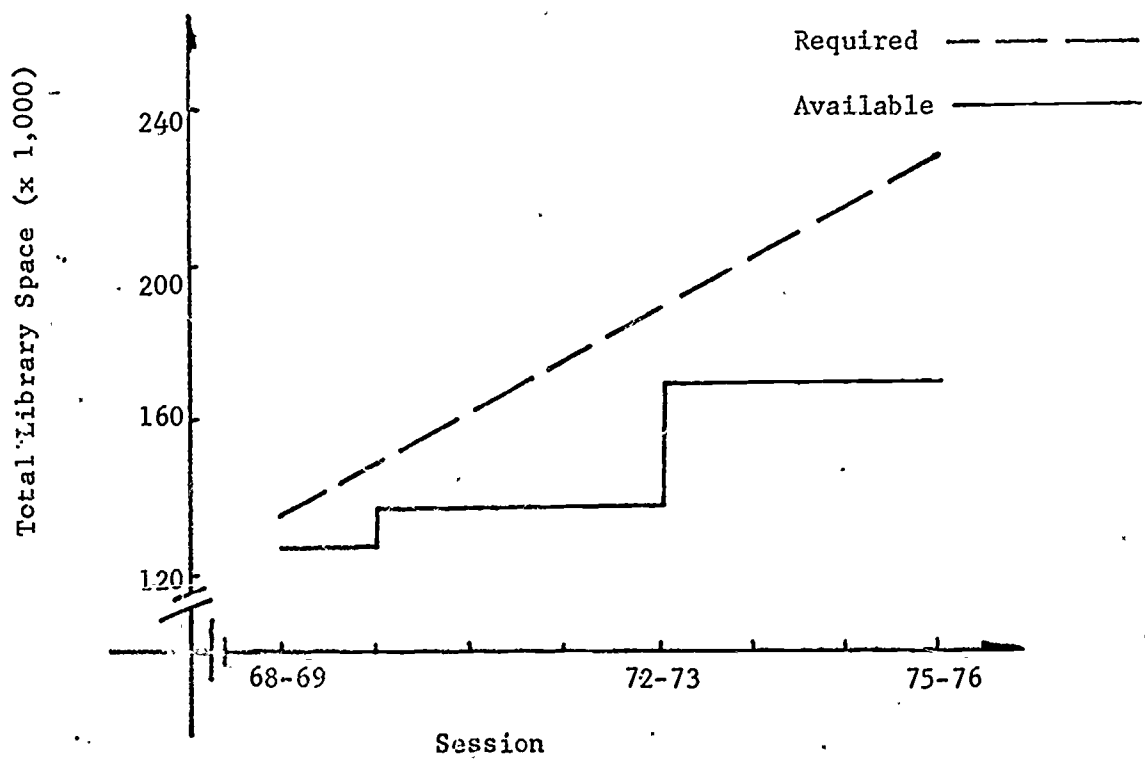
McMASTER UNIVERSITY

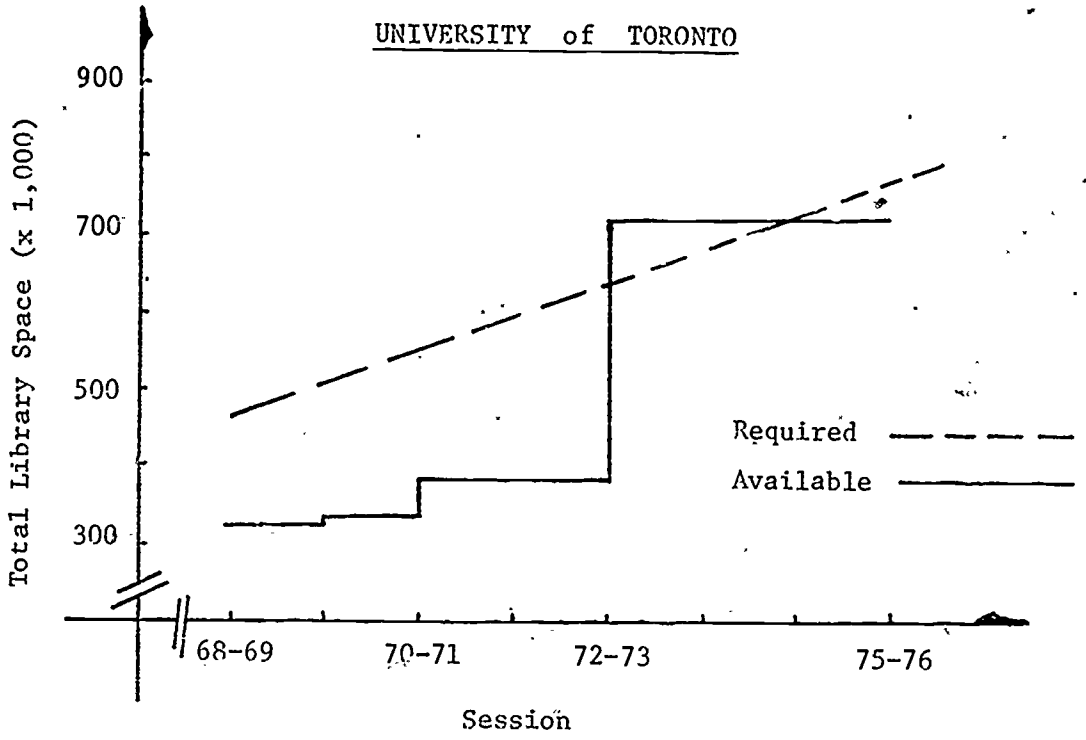


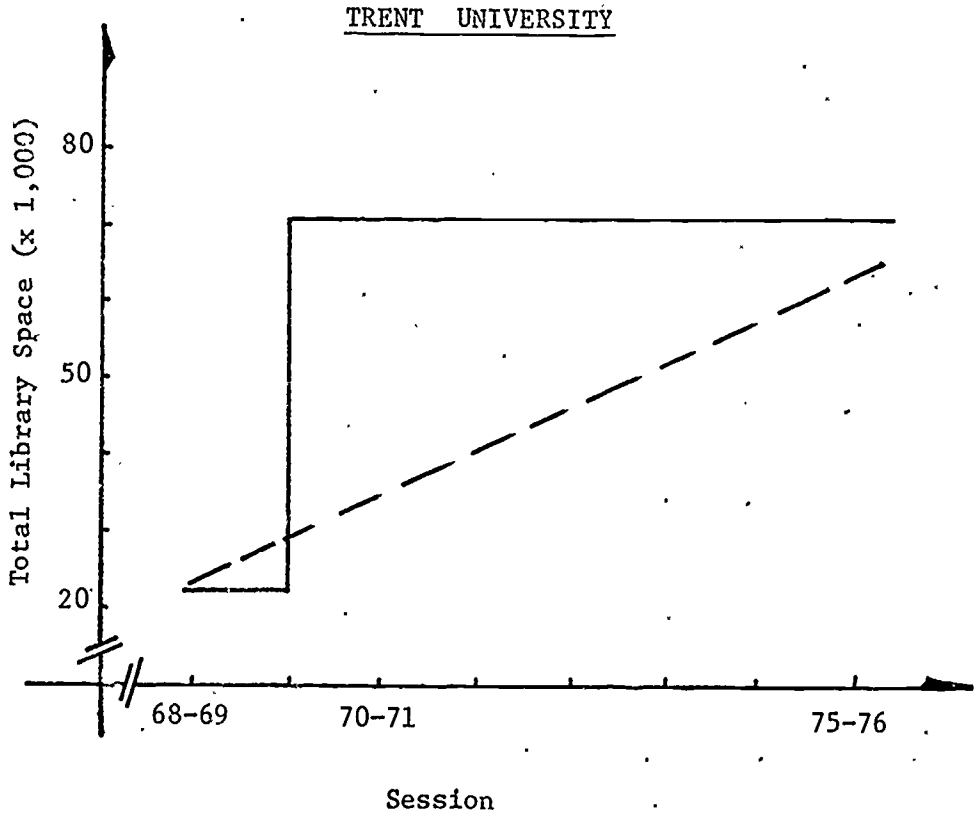
UNIVERSITY of OTTAWA

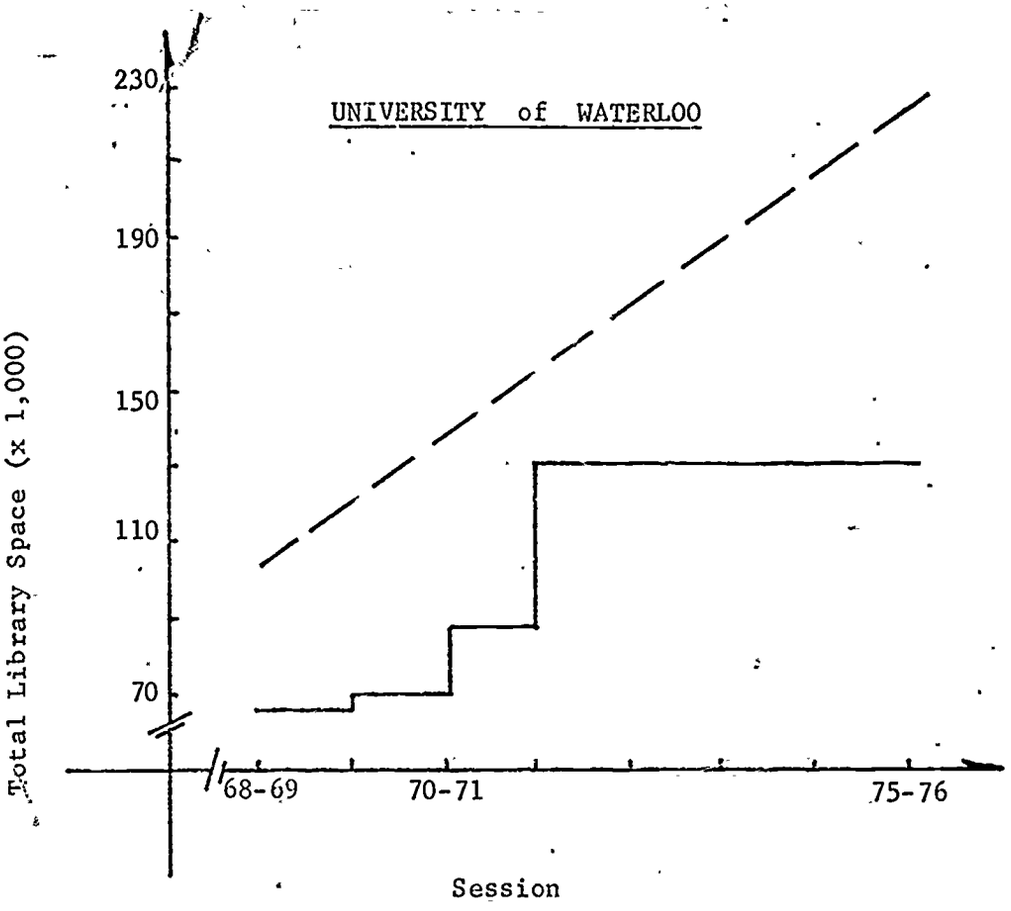


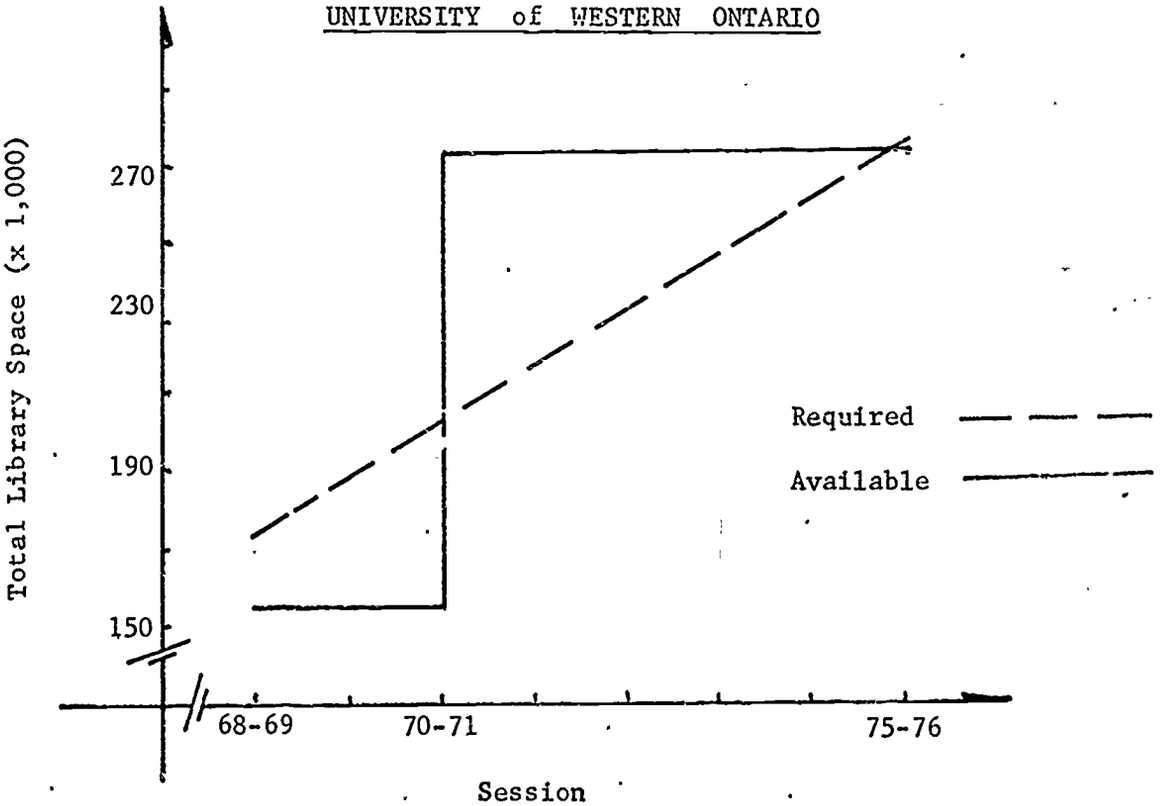
QUEEN's UNIVERSITY



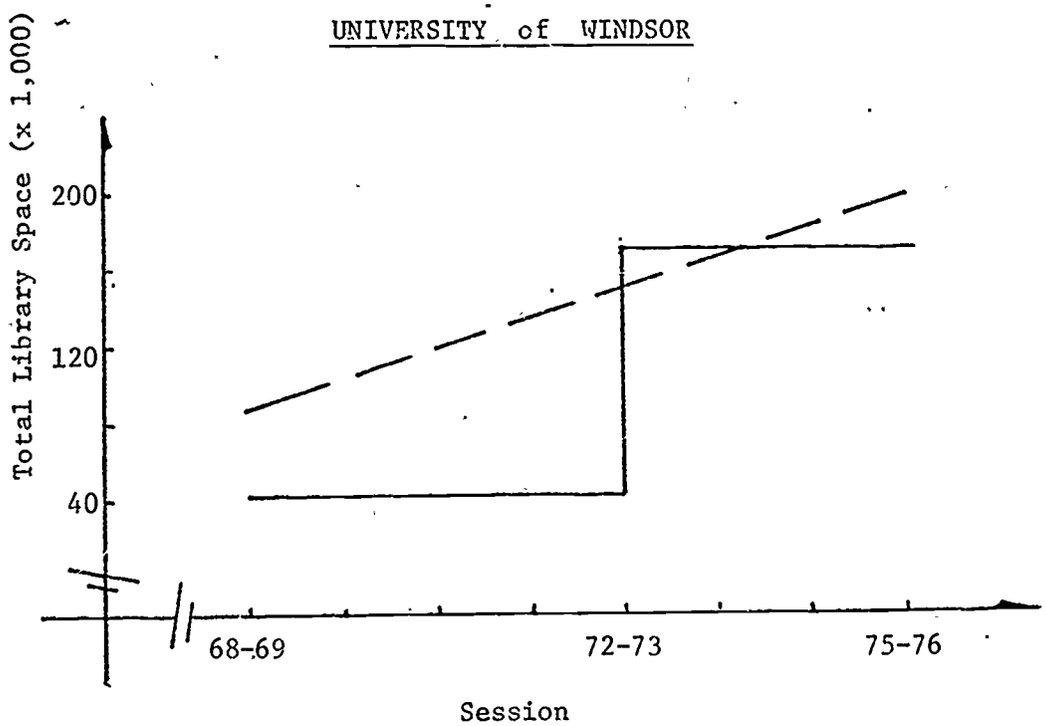

UNIVERSITY of TORONTO
Total Library Space (x 1,000)
900
700
500
300
Required
Available
68-69
70-71
72-73
75-76
Session


TRENT UNIVERSITY
Total Library Space (x 1,000)
80
50
20
68-69
70-71
75-76
Session


UNIVERSITY of WATERLOO
230
190
150
110
70
Total Library Space (x 1,000)
68-69
70-71
75-76
Session


UNIVERSITY of WESTERN ONTARIO
270
230
190
150
Total Library Space (x 1,000)
Required
Available
68-69
70-71
75-76
Session

UNIVERSITY of WINDSOR



YORK UNIVERSITY