

A Study of Interdisciplinary Research Needs: Results from Input of Faculty in Six Engineering Departments in Prioritizing Serial Subscriptions

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INTRODUCTION

The issue of journal cancellations has been a subject of much discussion and controversy, research, conference presentations, and publication in the literature of library and information science, especially in the 1990's. Burgard & Easton (1999) highlight a selection of 14 library Web sites that describe their own cancellation projects. University faculty, particularly in the sciences and engineering, have been vocal regarding the loss of their research materials. Library administrators have found increasingly consultative methods of determining candidates for deselection, the need for the process (Sapp and Watson 1989), and the universality of the problem. A University of Illinois at Urbana-Champaign library website for serials cancellations created their web page "in response to faculty perceptions that journal cancellations were only a local phenomenon" (Burgard & Easton 1999, p.70). Driven by publisher cost increases and reductions rather than increases in university library materials budgets (Rogers, Oder and Albanese 2000), (Nicklin 1991), cancellation of titles, often core title with long runs at the library, has been the widespread result. An analysis of the holdings of cancelled titles at the University of Arizona as reported by Bosch, Jones, & Simons (1994), using their library's online catalog, reveals that out of the sample of 31 titles, 2 subscriptions began in the late 1940's, 3 in the 1950's, 3 in the 1960's, and 11 in the 1970's.

There is little opportunity to provide the library resources needed for new programs when serial subscription cancellation projects focus on reaction to serial price increases rather than changing needs of the curriculum and research. Emerging disciplines are typically accompanied by new periodical literature. One of the key features of emerging disciplines is that they are almost entirely created by a fusion or merging of two or more, often several, traditional disciplines. Desai and Magin (1991) describe their new bioengineering curriculum using terms such as subdisciplines and cross-disciplinary and refer to bioengineering as a "mature interdisciplinary field" (p. 231). Curricular focus areas for the program are: cell and tissue engineering, neural engineering, and bioinformatics. Tissue engineering is a merger of the fields of biochemistry, cell and molecular biology, genetics, biomedical engineering and materials science. Fundamentals for this new curriculum involve studies in biology, chemistry, engineering, physics and mathematical modeling. Important subdisciplines include bioinstrumentation, bioimaging, biotransport, biomechanics, molecular and cell biology, nanotechnology, immunology, and biochemistry.

At the University of Nebraska, Lincoln (UNL) the Civil Engineering Department offers graduate programs in Environmental, Geotechnical, Structural, Transportation, Materials and Water Resources Engineering. Each has a strong interdisciplinary component. Research by faculty in the Departments of Mechanical Engineering, Engineering Mechanics, and Electrical Engineering has a strong materials science component, as does the graduate

curriculum. Faculty from these departments collaborate on research grants with faculty in the Physics and Chemistry Departments through the UNL Center for Materials Research and Analysis.

Richards and Prelec (1992) noted that the primary considerations for making cancellation decisions mirror those used in the selection process, use/anticipated use and cost. Kuma (2002) described the result of a ten-year study of average cost per title of current titles and titles that were cancelled during that period in four science disciplines at a medium-sized academic library at Eastern Illinois University. Cancellation decisions resulted in part from the use of a discipline allocation formula. This formula considered cost and use as well as a number of other factors such as student enrollment and number of faculty per discipline. The high cost of science journal titles and the lower usage statistics and student enrollment in the sciences, relative to other disciplines, apparently did not adequately reflect science collection needs in the formula. The result was the loss of more than half of the science journal collection.

In 1992 Julie Hurd used citation analysis to gather information regarding interdisciplinary research published by scientists in the University of Illinois at Chicago Chemistry Department. Hurd's research results showed that "less than 60 percent of the sample articles authored by chemistry department faculty were published in journals that *Ulrich's [International Periodicals Directory]* classifies as chemistry." (Hurd, p. 289).

Establishing a process that uses faculty input is a high priority in serial selection and cancellation considerations, especially at a research institution. The process, described below, gave librarians and faculty in their departments the opportunity to extend beyond the range of their traditional departmental serial subscriptions, to examine the entire serials collection at their institution for relevance to research needs, and to recommend new, often interdisciplinary, titles that serve to update the collection for current research needs.

THE PROCESS

As a research institution and an Association of Research Libraries (ARL) library, subscriptions to serials (journals and other periodically published titles) comprise a major part of the budget for library materials. The Serials Prioritization Project Team (SPPT) devised a method for collecting into one database all of the information needed to accomplish the task of prioritizing the subscriptions. For the subject (liaison) librarians this method involved three phases:

- "enhancing" a serial subscription database (phase one),
- extraction of related titles for distribution to the departments, obtaining feedback and prioritizing the titles by department (phase two), and
- entering the prioritization number, department, and format preference (e.g. electronic or print) for every title that was ranked into a modified database that had been created for this purpose (phase three).

During phase one library information systems personnel used the information in the online public access catalog database to create a database with primary data for each serial. The data considered to be primary included the title, publisher, pricing history, format(s), number of

copies, location(s) of the serial within the University Library System of a main library and nine branches, including Internet access, call number (primarily in the Library of Congress Call Number System), and other data. For monographic series (books in a series that come in on a subscription basis often on an irregular publication schedule), the record included information about the previous dates of publication and the cost of each issue. A record was created for each subscription, and the records were numbered from 1 to 9423.

Librarians at the University who were involved with collection development in any area were then given a listing of call numbers and the corresponding record numbers in the database. The records were numbered consecutively throughout the call number system, beginning with A (General Works) through Q's (Mathematics and Science), T through TX (Technology) to the Z's (Bibliography and Library Science) and all Library of Congress Subject Heading letters in between (all letters of the alphabet except I, O, W and X). The Q's, (General Science), for example, were records numbered 5022 through 5094 and the T through TX's were records numbered 8162-9160. Librarians "signed-up for" record number ranges, for the most part those that represented their subject areas. Each librarian was given access to the database and the ability to add information to each record. Some of this information was mandatory, (price for each format purchased, whether the subscription was part of a Package Plan, a Membership, or other plan, and whether or not it was available electronically, with specific designation as to whether or not the electronic version was part of a package plan). Additional information was discretionary, such as notes regarding price increase percentages. As the initial deadline for completion of this "enhanced" database neared, librarians and library technical services personnel volunteered to assist in record entry for those who had signed up for large numbers of records.

For Phase two of the process, the database was then set up to enable each librarian to tag records and extract records into labeled files of selected records for specific areas. Specifically, for engineering, two databases were created, one for all of the T's (most of TT, Handicrafts, and all of TX, Home Economics, were excluded), labeled "engineering" and one for other call number ranges, labeled "englistGHKLRQSUZ". The latter included serials from the disciplines of chemistry, physics, biology, geology, geography, mathematics & computer science, education, business, law, agriculture, medicine, and even military science, a total of 599 titles. For "engineering" information for four recently added titles was included in the database and the total number of titles in the "engineering" database was 917. For package plans the database included both the plan as one record, and each of the titles in the plan on separate records.

The author, as Engineering Librarian, was responsible for accomplishing all three phases for six engineering departments, Civil Engineering, Construction Management, Electrical Engineering, Engineering Mechanics, Industrial Management and Systems Engineering, and Mechanical Engineering. As the Physics and Astronomy Librarian she was responsible for the three phases in these disciplines as well. Results for Physics and Astronomy are included, to show the degree of interdisciplinary research requirements from the perspective of the Physicists and Astronomers at this institution.

The resulting files, in either MS Excel or MS Word, at the librarians' discretion, provided a basis for prioritizing serials for each department of assigned responsibility, in accordance with the procedure determined by the SPPT (Project Team). Through announcements, articles in campus news publications, and library web site postings of project details, guidelines, and timetables, the Project Team kept the University community informed of the process. The Project Team produced documents, published on the restricted portion of the University Libraries' web site, that gave "talking points" as suggested responses to questions raised by faculty in the academic discipline departments. Documents on this portion of the web site also furnished guidelines for considerations in the prioritization process. It was the responsibility of the librarian assigned to a given department to produce a prioritized listing of all serials of interest to that department. Each librarian made his her own determination of the method of obtaining and the depth of faculty responses to be solicited. However, the Project Team specified that titles were to be assigned by those faculty to one of three levels of desirability:

1. E for Essential
2. S for Supportive
3. N for Non Essential.

Because of the pervasive interdisciplinary interests among faculty in the six engineering departments, it was necessary for all of the engineering faculty to review titles in both files, "engineering" and "englistGHKLQRSUZ". The Engineering Librarian sent an email with the two MS Excel files as attachments to every faculty member of all six engineering departments and to the physics and astronomy department chair and book chair (department library coordinator). Table 1 shows the level of response provided by each department. Most of the responses were in the form of a return email with the letter E, S, or N in the priority column on the MS Excel sheet sent in the email to the faculty. Some just gave a list of titles and their ratings in the body of a "Reply" email. Others created a new Excel sheet that only contained titles of interest to them. The Engineering librarian compiled the results onto one spreadsheet with a separate column for each department. Initially each title had the letters repeated for each faculty response, so that, for example, a title might have had EES in the column for one department, representing three responses, and the same title might have had just one E in the column for another department. For purposes of producing an actual ranking from the ratings, a coding system was set up so that a letter and number replaced the series of E's, S's, and N's for each title. In this way, the titles were ordered with those titles receiving the most responses as essential ranking the highest, etc.

For example for five faculty responses:

EEEEEE	D1	
EEEEES		D2
EEEE	D3	
EEESS		D4
EEES	D5	and so on.

<Insert Table 1 here>

Phase two involved obtaining ratings that placed each title into one of three categories of importance, transforming the departmental "ratings" into rankings for each department, and merging rated titles from the "engineering" and "englistGHKLQRSUZ" files. The coding system described above provided some ordering to the titles in each file. Additional data were added to the spreadsheet: circulation statistics from the online catalog and "pick-up" statistics (from counting issues left out on tables and not checked out through the circulation system). The latter were available in electronic form from each of the past two years. The three resulting columns of usage statistics were summed to form a total usage for each title and the total was additional input for determining the rank of the title. In some cases the usage was zero, especially for titles only available in electronic format. Due to time constraints of the project and inconsistency of data available, those use statistics that were available for electronic format of the title were not included.

The result was six files of prioritized titles for engineering and one for physics and astronomy. The librarian manipulated the rankings for some titles, mostly reference titles that were needed for general library operation to assure their retention.

Phase three was completed by entering the rank, department, and format preference for every title that was ranked, for each of the six engineering departments and for the Physics and Astronomy Department, into a modified database that had been created for this purpose.

THE FINDINGS

At the completion of Phase three of the SPP, the Project Team took over the databases and began the process of analyzing the data to determine what serial titles were either no longer desired by the campus constituents (not rated by any department or rated as N for non-essential) or were of low enough priority that they could be dropped to respond to budget constraints and new title requests. The data gathered during this project provides an in depth perspective of the fields of interest to the departments as indicated by their serial ratings. The results are compiled into two tables with each table giving a compilation of the subject areas, in terms of Library of Congress Call Number of the title and its representative subject heading, that the selected titles represented, by academic department. Table 2 compiles the disciplines involved, for each of the six engineering departments and the Physics and Astronomy Department, in the top thirty titles submitted to the Project Team in the final rankings. In Table 2 librarian input in the form of two-year circulation statistics enhanced the faculty ratings. In establishing rankings the circulation statistics were not allowed to cause a title to move up or down to a different coding level (D2 to D3, D4 to D3, etc.), only to establish priority within the coding level. However, since coding levels did not necessarily "break" at the thirtieth title, some titles of equal weight from faculty perspective alone might have changed the findings in the table. In Table 3, only faculty perspective is represented in that this table contains subject areas for all titles that were designated by at least one faculty member as rating satisfactory or higher.

<Insert Table 2 here>

The Industrial & Management Systems Engineering Department faculty identified their top titles in eleven subject areas, three titles more than the two departments with the second highest number of subjects represented, Civil Engineering and Mechanical Engineering, each with eight. In terms of the top thirty titles, the Engineering Mechanics Department specified the smallest number of disciplines in their serial selection. In order:

Industrial & Management Systems Engineering	11 subject areas
Civil Engineering	8 subject areas
Mechanical Engineering	8 subject areas
Construction Management	7 subject areas
Electrical Engineering	6 subject areas
Physics and Astronomy	6 subject areas
Engineering Mechanics	4 subject areas

Subject areas with the highest total number of titles selected were:

TA – General Engineering ...	64 title selections
QC – Physics	38 title selections. Of these, 18 came from departments other than Physics.
TK – Electrical Engineering	18 title selections
HD – Economic History	14 title selections. Thirteen of these came from "Management Departments".
T – General Technology	11 title selections.

<Insert Table 3 here>

From Table 3, a total of 38 subject areas are represented. Three departments vie for the highest number of disciplines here as well, this time Electrical Engineering, Engineering Mechanics, and Civil Engineering. In order:

Electrical Engineering	26 subject areas
Engineering Mechanics	25 subject areas
Civil Engineering	24 subject areas
Mechanical Engineering	20 subject areas
Construction Management	13 subject areas
Physics and Astronomy	13 subject areas
Industrial & Management Systems Engineering	12 subject areas.

Again, General Engineering and Physics predominate as the areas with the highest number of selected titles:

TA – General Engineering	475 title selections
QC – Physics	246 title selections. Less than 50% of these came from Physics.

T – General Technology	136 title selections
TD – Environmental Engineering	90 title selections
QA – Mathematics, Computer Science	85 title selections
HD – Economic History	58 title selections. Selections
came from all departments except Physics.	
Q – Science (General)	54 title selections
T – General Medicine	37 title selections

CONCLUSIONS

Faculty from each of the seven departments involved in this study selected titles, as supportive or essential for their research and department serial needs that were well outside of their traditional discipline areas. Faculty from every department except Civil Engineering indicated an interest in medicine, and four departments selected Naval or Military Science titles. The degree of interdisciplinary selection within the technology fields is high. Faculty from all seven departments selected titles in general technology, general engineering, mechanical engineering and electrical engineering.

For the serials prioritization, the outcome of the process, in terms of titles cancelled and those added, will be the final result. Presumably, librarians from other departments besides these seven ranked some of these titles, some perhaps high enough to warrant retention. The university community was given an opportunity to express their interdisciplinary serial needs across department boundaries and this is at least is a step in supporting interdisciplinary research.

EPILOGUE

At the time of final submission of this manuscript faculty are in the process of responding to the announced lists of lower priority titles to be cancelled and higher priority new titles to be added. Therefore all results at this time are preliminary. Identified (also preliminary) for the six engineering departments in this study are a total of 11 higher priority titles to be added and one subscription for online access to a society's print titles to which UNL Libraries currently subscribe. The call number ranges for these 11 titles are as follows: QA (mathematics) 2 titles, TA (general engineering) 2 titles, T (general technology) 1 title, TL (motor vehicles, aeronautics, astronautics) 1 title, HD (economic history) 1 title, GB (geography) 1 title, RC (internal medicine) 1 title and QP (physiology) 1 title.

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Table 1. Number of Responses from Faculty by Department

Department	Number of individual faculty responses - directly to librarian	Number of faculty in department	Responses from Department Chair and/or Department library coordinator (Book Chair)
Civil Engineering	5	28	Book Chair response is included in the 5 responses
Construction Management	1	7	Book Chair compiled responses from department faculty
Engineering Mechanics	5	8	Book Chair response is included in the 5 responses
Electrical Engineering	6	20	Book Chair marked serials as essential and non-essential, speaking for the department, and designated all others on the Engineering list as supportive
Industrial Management and Systems Engineering	2	12	In addition to the two individual responses, the Department Chair compiled responses from other faculty members
Mechanical Engineering	5	13	Book Chair response is included in the 5 responses
Physics and Astronomy	1	36	Department Chair and Book Chair worked together to rate the titles, then solicited reaction from faculty to their ratings.

Table 2. Subject Areas Represented by the Serial Selections of Faculty from Seven Departments – Top 30 Titles as Ranked

Department/LC Call Number and Number of Titles Rated	Mech. Eng.	Elect. Eng.	Civil Eng.	Eng. Mech.	Ind. & Mgmt. Systems Eng.	Const. Mgmt	Physics	Total
Number of Call Numbers Represented	8	6	8	4	11	7	6	
GB - Geography			3					3
HD - Economic History.			1		4	9		14
HE – Transportation and Communications			2					2
HV - Social Service, Welfare, Criminology.						2		2
K - Law						1		1
Q - Science (General)					1		3	4
QA - Mathematics & Computer Science	2			1	4			7
QB - Astronomy							4	4
QC - Physics	7	9		2			20	38
QD - Chemistry							1	1
QP - Physiology.					1			1
R – General Medicine					1			1
RC - Internal Medicine.					2			2
T - General Technology	1	2	1		5	2		11
TA - General Engineering, General Civil Engineering	14	1	9	24	6	9	1	64
TC - Hydraulic and Ocean Engineering			2					2
TD – Environmental Engineering			8					8
TE - Highway Engineering	1		4					5
TH - Building Construction						4		4
TJ - Mechanical Engineering		2		3				5
TK - Electrical Engineering	1	14			2		1	18

TL - Motor Vehicles, Aeronautics, Astronautics	3							3
TP - Chemical Technology	1					3		4
TS - Manufactures		2			3			5
V - Naval Science					1			1

Table 3. Subject Areas Represented by the Serial Selections of Faculty from Seven Departments – all Selected Titles

Department/LC Call Number and Number of Titles Rated	Mech. Eng. 219 Titles	Elect. Eng. 825 Titles	Civil Eng. 212 Titles	Eng. Mech. 469 Titles	Ind. & MSE 52 Titles	Const. Mgmt 106 Titles	Physics 188 Titles	Total
Number of LC Call Numbers Represented	20	26	24	25	12	13	13	
AZ – History of Scholarship & Learning		1						1
GB - Geography			9					9
GC - Oceanography				1				1
HC – Economic History				1				1
HD - <u>Economic History.</u>	3	9	3	1	5	37		58
HE – Transportation and Communications	7		15	1		6		29
HF - Commerce	1	7				12		20
HV - <u>Social Service, Welfare, Criminology.</u>	2		1			3		6
K - Law			1			1		2
L - Education	3	3						6
Q - Science (General)	9	8	4	14	3		16	54
QA - Mathematics & Computer Science	2	8	11	58	5		1	85
QB - Astronomy							20	20
QC - Physics	36	38	2	48			122	246
QD - Chemistry	2	4	8	4			7	25
QE - Geology		1	3					4
QH - Biology		3	5	7			1	16
QP - <u>Physiology.</u>		1		1	1			3
R – General Medicine	1	17		17	2			37
RC - <u>Internal Medicine.</u>					1		1	2
S - Agriculture			1					1
T - <u>General Technology</u>	6	61	18	33	12	5	1	136
TA - <u>General Engineering, General Civil Engineering</u>	71	188	41	137	6	24	8	475

TC - <u>Hydraulic and Ocean Engineering</u>		14	8	1				23
TD – Environmental Engineering		42	38	9		1		90
TE - <u>Highway Engineering</u>	7	11	11					29
TF - Railroads		2						2
TG – Bridge Engineering		2	1	2				5
TH - <u>Building Construction</u>		17	2	4		9		32
TJ - <u>Mechanical Engineering</u>	13	59	4	45	1	4	3	129
TK - Electrical Engineering	21	211	3	24	3	2	4	268
TL – Motor Vehicles, Aeronautics, Astronautics	8	24	3	8				43
TN – Mining, Metallurgy	19	38		20		1	3	81
TP - <u>Chemical Technology</u>	3	53	19	22			1	98
TR - Photography				2				2
TS - <u>Manufactures</u>	4	3		8	12	1		28
U – Military Science	1							1
V - Naval Science			1	1	1			3