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Dilys E. Morris
Iowa State University

Collin B. Hobert
Iowa State University

Lori Osmus
Iowa State University, losmus@iastate.edu

Gregory Wool
Iowa State University

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Abstract

Staff costs for cataloging have declined at Iowa State University Library. This is demonstrated by data from a longitudinal time and cost study begun in 1987. We discuss the national developments, technological advancements, and reengineering efforts that have supported greater cataloging effectiveness and quality. We use the ISU findings as an example of a nationwide phenomenon resulting from the remarkable ability of catalogers to share work through national bibliographic utilities.

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Dilys E. Morris, Collin B. Hobert,
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Staff costs for cataloging have declined at Iowa State University Library. This is demonstrated by data from a longitudinal time and cost study begun in 1987. We discuss the national developments, technological advancements, and reengineering efforts that have supported greater cataloging effectiveness and quality. We use the ISU findings as an example of a nationwide phenomenon resulting from the remarkable ability of catalogers to share work through national bibliographic utilities.

In 1987 the Technical Services Division of the Iowa State University (ISU) Library initiated a time and cost study to investigate the impact of automation on services and products. This study, now in its thirteenth year, has resulted in a number of reports in the literature. The earliest of these provided an overview of cataloging costs (Morris 1992) and a comparison of costs for serials and monographs cataloging (Morris and Osmus 1992). Since then, refinements in the analysis of tasks and costs (and especially in the application of staff overhead) have made more sophisticated and focused reporting possible. At the same time, however, these refinements preclude easy comparison of the earliest three years of the study to the years following.

In the present article, then, we report changes in cataloging costs and productivity since 1990 and discuss the factors contributing to these changes. Morris, Rebarcak, and Rowley (1996) previously noted some of the trends presented here. Morris and Wool (1999) presented a brief discussion of these trends in relation to the value of cataloging.

Literature Review

The literature on cost studies for technical services operations is extensive—as is evident in bibliographies from Dougherty and Leonard (1970) and Tavenner (1988)—but for the most part it is fragmentary, limited in scope, and short on detail. In much of this literature, researchers either estimate in-house operating costs for comparison with prices for vendor-supplied services or offer models for cost-benefit analysis. Of the rest, Lancaster (1977, 265) provides this assessment:

A number of studies on technical processing costs have already been published. . . . While several . . . appear to be very thorough and complete, cost analyses of this type generally have two basic limitations: (a) although many data are presented, it is not always clear how these data were derived, and it is thus impossible for a second investigator to duplicate the methodology to obtain truly comparable data for a second institution or group of institutions, and (b) directly related to the first point, there are no generally accepted standards for what should be measured

Dilys E. Morris (dmorris@iastate.edu) is the retired Assistant Director for Technical Services, Iowa State University Library, Ames. **Collin B. Hobert** (chobert@iastate.edu) is Head, Monographs Copy Cataloging Department, Iowa State University. **Lori Osmus** (losmus@iastate.edu) is Head, Serials and Monographs Original Cataloging Department, Iowa State University. **Gregory Wool** (gwool@iastate.edu) is Monographs Cataloger, Iowa State University.

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in these cost studies and for how the costs should be derived and presented.

This statement is just as trenchant with regard to the subsequent literature, highlights of which include Getz and Phelps (1984); Valentine and McDonald (1986); Leung (1987); Oldfield (1987); and Fiegen, Heitslu, and Miller (1990). Harris (1989) offers an interesting survey of publications on cataloging costs, along with an estimate that cataloging costs between 1876 and 1986 rose 4200%, much faster than general inflation but slower than librarian salaries.

Relatively few examinations of cataloging costs have appeared since Morris (1992). In the most extensive report, Jenda (1992) presents a workflow analysis and time/cost study made to support a decision at the University of Botswana on continuing the library's subscription to Library of Congress (LC) catalog cards. In this study, times for cataloging tasks were measured in an experimental setting. Byrd and Sorury (1993) document a significant time/cost analysis of authority work at Indiana University. El-Sherbini (1995), in an evaluation of outsourcing the cataloging of Slavic-alphabet materials at Ohio State University, includes a brief cost analysis of doing the work in-house. Rider and Hamilton (1996) report tests of the OCLC Online Computer Library Center, Inc. PromptCat service at Michigan State and Ohio State universities, with a cost/benefit analysis based on estimates of staff time and costs as well as other data.

Time and Cost Method

A detailed description of the method employed in this study appears in Morris (1992). A more concise description, reflecting the changes made in 1990, can be found in Rebarcak and Morris (1996). Highlights are recapitulated and more recent developments in the method are presented here.

Data Collection

Five times each year, every technical services staff member, including hourly student employees, tracks all time worked for an entire week. Time is recorded at a task level. Since the first report of this study in 1992, the number of tasks has been reduced through consolidation. Cataloging, for instance, is now divided into nine tasks rather than fourteen. Task consolidation makes data collection easier for staff and supports more meaningful analysis.

Tasks are organized into eight cost centers. Five are product centers, which create products and services: Acquisitions, Cataloging, Catalog Maintenance, Volume Preparation and Preservation, and a special project center,

Conversion. The three other centers are overhead centers, which do not create products: Paid Leave, Automation, and Support Services. The latter two merit some explication.

The Automation Center includes the time of one staff member who provides information technology support for Technical Services. This includes management of servers, software and hardware ordering and installation, software application development (e.g., cataloger's workstation), and reengineering support. It also includes the time all staff spend learning to use general application software (mail systems, operating systems, word processing, etc.) and managing their personal computers. The Support Services Center includes all administration, meetings, professional activities, secretarial support, nondivisional work (such as materials selection or service on librarywide committees), and professional reading.

When participants self-report, there is always a potential for error. Yet there is really no way to control for error, because observation creates an artificial work environment that may not reflect normal work practices. Statisticians rarely recommend correcting for measurement error, because there is no way of knowing the error and any corrections may introduce other errors. Defining tasks clearly and making them reflect actual work processes makes record keeping for participants much easier and improves the chances of reliability. Also, data collection for this study has continued for more than ten years, and examination of the data shows results that reflect changes in library priorities. For instance, after a major serials cancellation program, the data showed increases in serials recataloging. Similarly when staffing was increased to support greater retrospective conversion, associated task time increased. The same is true for major system changes and upgrades; here the data show increases in training and documentation time. Finally, in the study we are not seeking precise data but rather more generalized data; thus staff are asked to estimate time spent at tasks, not to try to record it exactly.

Product vs. Overhead Centers

The division between product and overhead centers allows us to examine separately the time and cost of these different areas. Additionally, it allows layering on, by administrative levels, staff overhead costs to product center costs and demonstrates clearly the effect on product costs of staff time spent in paid leave, meetings, nondivisional work, professional and administrative activities, and automation. Since the earlier reports on this study, an improved approach has been developed for allocating overhead center costs to product center costs.

The software used for data analysis allows sorting of employee data into the various work units. For cataloging,

these are: Monographs Copy Catalogers, Monographs Faculty Catalogers, Serials Copy Catalogers, and Serials Faculty Catalogers. Each of these units spends time in various product centers (e.g., Cataloging, Ordering, Conversion). All units also spend time in the overhead centers (Leave, Support Services, Automation). The total cost for the overhead centers is allocated back to the product centers proportionately to the cost of each product center in a series of steps. First, the overhead costs of a work unit are allocated to its product centers (e.g., the cost of the time copy catalogers spend in Leave, Support Services, and Automation is allocated back to their product center costs). Then the department head overhead costs are allocated to the product centers of all the units supervised. Finally, the technical services office administrative overhead costs are allocated to all units in the division.

Thus costs are presented at four different levels: (1) center and tasks only; (2) center with the work unit overhead costs allocated; (3) center with the work unit and department head overhead costs allocated; (4) center with the work unit, department head, and technical services administrative office overhead costs allocated. This granulation is possible when looking at any group of employees.

Costs and Production Statistics

The salary with benefits of each employee is calculated for every sample week, and hourly salaries are determined. The hourly salary of each employee is multiplied by task time to arrive at a task cost for each employee. Task times and costs, which form the basis of all analysis, are also summed into centers. Production statistics are collected for each sample week and are used to determine unit costs. For cataloging, the production unit is titles cataloged. Cataloging statistics and time are collected in four tasks: copy cataloging, full original cataloging, minimal original cataloging, and recataloging.

Unit Costs

Unit costs are calculated by first taking a task (e.g., copy cataloging) or a group of tasks (e.g., copy, original, and recataloging) and dividing them by the production statistics (e.g., number of titles cataloged). This gives the cost of doing a task or a group of tasks. Then the other center task costs (training, policies and procedures, authority work, consulting, and problems) are allocated to the cataloging task cost. Staff overhead costs are added to the unit cost also in a series of steps. First, the overhead cost of the catalogers is allocated within their work units. Then the costs of each administrative level above the catalogers is added incrementally. Departmental administration is the overhead cost of two department heads. Each department head has costs spread

to centers other than Cataloging. The technical services administration overhead costs are allocated across all centers to all units. This process could continue upwards through as many levels of administration as exist, each adding a further cost.

Results

Center Time and Costs

Table 1 shows the weekly relative time and costs of the eight ISU technical services centers during 1997/98 and gives historical data for time only. In 1997/98 product centers represent 64% of technical services time and 57% of total divisional staff costs. Conversely, the overhead centers represent only 36% of the divisional time, but 43% of the cost, reflecting the high proportion of time spent by administrative positions in the Support Services Center. Since 1990/91, time in overhead centers has grown somewhat because of increases in Leave and Automation.

Within the product centers, Cataloging ranks second in hours after Acquisitions. Since the beginning of the study in 1987, Acquisitions has consistently been the largest center and Cataloging the second largest. Volume Preparation and Preservation is the third largest center. Conversion is in fourth place and is declining as a major card catalog conversion project nears its conclusion. Catalog Maintenance is the smallest product center and shows the greatest reduction over time.

Cataloging Center Tasks

The task times and costs in table 2 include all types of cataloging and all formats, including monographs and serials, nonbook formats, and electronic resources. As one might expect, copy cataloging is the largest task, even while it does not include OCLC PromptCat title processing, which is done as part of Acquisitions. Authority work is counted as a separate task only when it is done as a separate task. If it is completed during the actual process of cataloging, the time is collected in the cataloging task. Most of the authority task time results from post-cataloging authority work completed from system-supplied lists of new, changed, and conflicting headings. Authority work done apart from this process by catalogers averages a mere three hours and \$69 per week.

Recataloging is the third largest task; most serials cataloging is recataloging and accounts for much of the task time. Full and minimal original cataloging are not large tasks. The consulting and problems task covers work that requires special handling or investigation. The training, revision, and documentation task includes all the instructional elements from documenting new policies and procedures to

Table 1. Technical Service Centers: Weekly Averages

Product Centers	Time		Costs		Costs with Overhead	
	Hours	%	\$	%	\$	%
Acquisitions	653	25	11,326	23	16,968	34
Cataloging	384	15	8,009	16	15,799	32
Volume Preparation and Preservation	322	12	4,077	8	7,581	15
Conversion	207	8	3,415	7	6,171	13
Catalog Maintenance	111	4	1,611	3	2,830	6
Product Center Total	1,676	64	28,438	57	49,349	100
Overhead Centers						
Support Services	512	20	12,766	26		
Leave	333	13	6,740	14		
Automation	70	3	1,405	3		
Overhead Center Total	915	36	20,911	43		
Grand Total	2,591		49,349			

Product Centers	1990-98							
	1997/98	1996/97	1995/96	1994/95	1993/94	1992/93	1991/92	1990/91
	%	%	%	%	%	%	%	%
Acquisitions	25	27	25	24	25	27	25	24
Cataloging	15	17	15	15	16	18	18	18
Volume Preparation and Preservation	12	6	5	5	7	8	9	8
Conversion	8	10	13	12	12	5	3	4
Catalog Maintenance	4	5	7	7	9	11	12	13
Product Center Total	64	65	66	64	68	69	67	67
Overhead Centers								
Support Services	20	18	21	21	20	20	21	23
Leave	13	16	12	14	10	10	10	9
Automation	3	2	2	1	2	1	2	1
Overhead Center Total	36	35	34	36	32	31	33	33

Table 2. Cataloging Center Tasks: Weekly Averages, 1997-98

Tasks	Time		Cost	
	Hours	%	\$	%
Copy Cataloging	196	51	4,150	51
Authority Work	49	13	705	9
Recataloging	43	11	924	11
Full Level Original	26	7	656	8
Consulting/Problems	24	6	651	8
Minimal Original	18	5	323	4
Training/Revision/Documentation	15	4	402	5
Other	13	3	243	3
Total	384		8,054	

Note: Professional staff may work more than 40 hours in a week but are not paid for these "over 40 hours." The total cost is calculated as if staff were paid for the over 40 hours. When the nonpaid costs hours are removed the total drops to \$8,010 (cost in table 1).

training staff and revising their work. For a full description of the tasks see appendix.

Productivity and Copy Cataloging

Annual cataloging statistics at ISU (monographs and serials) show that production rose from 31,225 titles cataloged in 1990/91 to 44,158 titles in 1997/98, a 41% increase. At the same time, as shown in table 3, average weekly Cataloging Center hours dropped by 30%. The data also shows that the percentage of time spent cataloging (copy, recataloging, and original) grew while the time spent at other Cataloging Center tasks dropped.

Table 4 shows statistics only for monographs cataloging and shows the changes in the types of records used in cataloging and the growth in original cataloging since 1990/91. Use of Cataloging in Publication (CIP) records dropped by 95% and member records increased by 86%. Copy cataloging increased overall by 27%. The PromptCat Service supplied LC records for an additional 6,325 monographs. These titles were received in Acquisitions and bypassed

Table 3. Cataloging Center, 1990-98

Year	Annual No. Titles Cataloged	Weekly Hours	Cataloging Tasks					Total %	Authority Task %	Other Tasks %
			Copy %	Recatalog %	Original					
					Full %	Minimal %				
1990/91	31,225	550	34	13	5	2	54	20	26	
1991/92	31,832	478	36	15	4	3	58	19	23	
1992/93	29,566	453	35	13	3	1	52	28	20	
1993/94	34,367	428	40	19	4	2	65	16	19	
1994/95	40,022	393	35	15	5	3	58	21	21	
1995/96	40,801	400	43	10	5	4	62	16	22	
1996/97	41,241	410	46	9	6	5	66	14	20	
1997/98	44,158	384	51	11	7	5	74	13	13	

Note: Difference between 1990/91 and 1997/98 figures: 12,933 titles (41%), -166 weekly hours (-30%)

Table 4. Monographs Cataloging Records

Copy Cataloging	Cataloger Reviewed						Total No. %	Total PromptCat No. %	Titles	
	DLC		CIP		Member				No.	%
	No.	%	No.	%	No.	%			No.	%
1997-98	17,809	59	326	1	12,034	40	30,169	6,325	36,494	
1990-91	10,890	46	6,467	27	6,483	27	23,840	0	23,840	
Change	6,919	64	-6141	-95	5,551	86	6,329	27	12,654	53

Original Cataloging	Full		Minimal		Total Titles	
	No.	%	No.	%	No.	%
1997-98	1,121	40	1,679	60	2,800	
1990-91	554	36	966	64	1,520	
Change	567	102	713	74	1,280	84

cataloging. Full original cataloging production doubled while minimal level cataloging increased by nearly 75%.

Cataloging Per-Title Costs

In 1997/98 the average cost of cataloging a title at ISU was \$16.25 (table 5). This cost covers all material formats and all levels of cataloging and recataloging, including PromptCat titles. Just seven years earlier the cost was \$20.83 (or \$24.95 in constant dollars), representing a 22% drop, or a 34% drop when adjusted for inflation.

The time a cataloger actually engages in creating and editing records costs about \$6.13 per title. When the associated costs of authority work, training, conferring, policy development, and documentation are added, the cost increases to \$7.49 to catalog any type of publication. With all staff overhead costs (Leave, Support Services, and

Automation) through the assistant director level added, the price doubles to \$15.07. With the addition of post-cataloging authority work, the total is \$16.25.

The 6,325 PromptCat titles, which bypassed cataloging, are included in calculating the \$16.25 cost. However, there is no handling time (and thus cost) recorded in the Cataloging Center. If the PromptCat titles are excluded from the per-title cost calculations, the bottom-line cost increases to \$18.28. This means that when considering total titles cataloged, the PromptCat service decreases the overall per-title cost by about \$2 a title.

Costs vary between sample weeks, depending on the mix of cataloging done during the week and the relative time spent cataloging as opposed to developing new procedures, attending to professional activities or vacationing. Copy cataloging shows the greatest cost stability and original cataloging the least. Serials cataloging at \$59.33 per title

Table 5. All Cataloging Costs Per Title: Weekly Average

Seven-Year Comparison						
	1997/98		1990/91			
		Constant Dollars	CPI Adjusted to 1997/98 Dollars			
	16.25	20.83	24.95			
1997/1998 Only						
Cataloging Center	All		Monographs		Serials	
	\$	%	\$	%	\$	%
Cataloging Tasks	6.13	41	4.97	41	18.11	30
Other Tasks	1.36	9	1.17	10	4.61	8
Total Cataloging Costs	7.49	50	6.14	51	22.72	38
Overhead Centers						
Catalogers	4.57		3.50		27.50	
Department Administration	1.67		1.36		5.03	
TS Administration	1.34		1.11		4.08	
Total Overhead Costs	7.58	50	5.97	49	36.61	62
Total Cost	15.07		12.11		59.33	
Post-Cataloging Authority Work	1.18					
Grand Total	16.25					
PromptCat Titles Excluded	18.28					

(including recataloging) is five times more expensive than monographs cataloging (\$12.11 per title). The 1997/98 salary ranges and benefits percentages for faculty librarians and library assistants are shown in table 6.

Copy Cataloging Costs

In table 7 it is demonstrated that monographs copy cataloging is considerably less expensive than serials copy cataloging. It shows an average cost of \$12.22 to copy-catalog a monograph as opposed to \$88.24 for a serial. No PromptCat titles are included in these calculations.

Table 8 shows that for monographs copy cataloging, the

Table 6. Salary Ranges in Dollars, 1997-98

	Minimum	Maximum
Library Assistant 1	21,632	21,632
Library Assistant 2	24,847	28,856
Library Assistant 3	26,601	31,508
Library Assistant 4	29,775	34,703
Benefits Rate: 30%		
Faculty Librarians	38,555	53,735
Benefits Rate: 22%		

total task cost is four times higher at ISU if it is completed by a faculty cataloger rather than a library assistant. It also demonstrates that it is twice as expensive for a faculty cataloger to catalog a monograph originally than to revise copy.

Original Cataloging: Full and Minimal

Table 9 shows the cost of all staff doing full original cataloging. On average it costs \$70.54 per title to catalog any format originally. The cost includes some original records contributed by library assistants. Full original cataloging not only is the most expensive cataloging, it shows greater fluctuations in cost between sample weeks. It is about 3.5 times more expensive to catalog a serial originally than a monograph.

Minimal level cataloging (table 10) is used mostly for serial analytics and ISU theses. Minimal level records are normally K-level records and include all fields required in the OCLC Bibliographic Formats and Standards, 2d edition. The monograph minimal level cataloging cost of \$30.90 is almost half the \$58.72 cost for full-level original cataloging.

Recataloging

It costs \$31.03 (table 11) to recatalog any title. Serials recataloging (\$42.25) is about 3.5 times more expensive than

Table 7. Copy Cataloging Cost Per Title: Weekly Average, 1997-98

	Monographs		Serials	
	\$	%	\$	%
Cataloging Center				
Copy Cataloging Task	5.05	41	26.83	30
Other Tasks	1.18	10	7.09	8
Total Cataloging Costs	6.23	51	33.92	38
Overhead Centers				
Catalogers	3.5		40.78	
Dept Administration	1.37		7.51	
TS Administration	1.12		6.03	
Total Overhead Costs	5.99	49	54.32	62
Total Cost	12.22		88.24	

Table 8. Monographs Cataloging Cost Per Title: Weekly Average, 1997-98

	Library Assistant		Faculty Cataloger			
	Copy		Copy		Original	
	\$	%	\$	%	\$	%
Cataloging Center						
Cataloging Tasks	4.26	48	12.08	34	24.55	33
Other Tasks	1.04	12	2.11	6	4.14	5
Total Cataloging Costs	5.3	60	14.19	40	28.69	38
Overhead Centers						
Catalogers	1.45		15.9		34.8	
Department Administration	1.15		3.18		4.46	
TS Administration	0.97		2.55		5.48	
Total Overhead Costs	3.57	40	21.63	60	46.74	62
Total Cost	8.87		35.82		75.43	

monographs recataloging (\$11.96) and represents nearly 43% of all recataloging. In 1997/98, recataloging represented only 9% of all technical services cataloging but 64% of serials cataloging.

Analysis

During the 1990s the ISU Technical Services Division flattened its organizational structure, driving decision-making downward and reducing revisions and handling. Additionally, many jobs were reclassified upwards as positions were reduced. While salaries increased, cataloging costs dropped, quality remained high, productivity and speed increased, and new services were offered. The flat-

Table 9. Full Original Cataloging Cost Per Title: 1997-98 Averages

	All		Monographs		Serials	
	\$	%	\$	%	\$	%
Cataloging Center						
Cataloging Task	27.25	39	22.97	39	61.65	31
Other Tasks	6.19	9	5.40	9	16.09	8
Total Cataloging Costs	33.44	47	28.37	48	77.74	38
Overhead Centers						
Catalogers	22.90		18.53		93.03	
Department Administration	7.83		6.43		17.11	
TS Administration	6.37		5.39		14.12	
Total Overhead Costs	37.10	53	30.35	52	124.26	62
Total Cost	70.54		58.72		202.00	

tening of the organizational structure at ISU shifted much decision-making to lower-level supervisors and catalogers, reducing divisional overhead and costs. It also conferred more policy development responsibilities on the faculty catalogers, reduced their involvement in production work, and freed time for them to pursue new cataloging initiatives. While contributing to cost savings, this process was itself made possible by the efficiencies stemming from shared cataloging and process automation.

These developments are not unique to ISU, but are occurring in academic libraries across the country. The ISU findings can therefore be seen as an example of a nationwide phenomenon based on the remarkable ability of catalogers to share work through national bibliographic utilities.

Center Time and Costs

It is important to examine product center costs both with and without staff overhead (see table 1). Looking at the product centers alone shows the average weekly time spent in a center and the resulting cost. Centers can be examined and compared over time. By tracking the overhead centers' time separately and allocating their costs back to the product centers, the real staff costs of doing business (and the very significant impact of time spent in Automation, Leave, and Support Services) can be seen. Such knowledge can guide administrators in making decisions about assignments and structure.

With staff overhead allocated, the average weekly expenditures for the Acquisitions Center in 1997/98 increased nearly 50% from \$11,326 to \$16,968. Volume Preparation and Preservation shows an 85% increase, Conversion, 80%, and Catalog Maintenance, 73%. Cataloging, however, increased nearly 100%, from \$8,010 to \$15,799. Cataloging has a higher staff overhead cost because there is a larger ratio of faculty librarians to library assistants than in any of the other product centers.

ISU data consistently demonstrate that faculty librarians have much higher overhead costs than other staff. As faculty members eligible for tenure, they are subject to high expectations for library, universi-

Table 10. Minimal Level Original Cataloging Cost Per Title: Weekly Averages, 1997-98

	Monographs		ISU Theses Only	
	\$	%	\$	%
Cataloging Center				
Cataloging Task	12.75	41	8.93	49
Other Tasks	2.78	9	1.94	11
Total Cataloging Costs	15.53	50	10.87	60
Overhead Centers				
Catalogers	9.27		3.25	
Department Administration	3.34		2.06	
TS Administration	2.76		1.91	
Total Overhead Costs	15.37	50	7.22	40
Total Cost	30.90		18.09	

Table 11. Recataloging Cost Per Title: Weekly Average, 1997-98

	All		Monographs		Serials	
	\$	%	\$	%	\$	%
Cataloging Center						
Cataloging Task	12.59	41	5.18	43	12.75	30
Other Tasks	2.77	9	1.09	9	3.23	8
Total Cataloging Costs	15.36	50	6.27	52	15.98	38
Overhead Centers						
Catalogers	9.53		3.37		19.83	
Department Administration	3.36		1.25		3.55	
TS Administration	2.78		1.07		2.89	
Total Overhead Costs	15.67	50	5.69	48	26.27	62
Total Cost	31.03		11.96		42.25	

ty, and professional service; consequently, they serve on more committees and task forces and attend more conferences than other staff. They are much more likely to carry supervisory or administrative responsibilities. Furthermore, all are expected to meet standards for research and publication that justify the granting of tenure. This means that less of their time is spent in activities that create a product or service (product centers) and more of their time is spent in the Support Services Center. This pattern demonstrates why, as far as possible, employees with professional status should only do work others cannot. Anything a professional does will be at a much higher cost when it is examined on a per-item basis.

Historically, the figures for leave time reflect an anomaly in the time sampling. Beginning in 1994/95 one sample week for each year always includes a university

holiday. The 1996/97 sample weeks unexpectedly included two holidays.

The Catalog Maintenance Center dramatically decreased in time and costs. The steadily improving capabilities of the online catalog, coupled with the conversion of cataloging to machine-readable form, have eliminated paper work forms and reduced the number of steps necessary for maintaining records. The improving quality of shared cataloging records has reduced the need for much catalog maintenance. Work centers around the transfer and withdrawal of materials. ISU discontinued the last vestige of card files with the closing of the shelf list in January 1998.

A reorganization in 1997 added the Preservation department to technical services and accounts for the unusual increase the following year in the Volume Preparation and Preservation Center time and costs.

Cataloging Center Tasks

Improved online catalog systems and the conversion of paper records have allowed staff to spend more time cataloging and less time on cataloging support tasks (see table 2). It is more effective to solve problems online rather than batching problems to do remote resolution (e.g., walking to the shelf list). Authority work has declined as the number of authority records online has increased. Time formerly spent on authority work is now spent on cataloging. A larger percentage of student employees are employed in post-cataloging authority work, producing a relatively low cost percentage (9% of total center costs but 13% of total time).

Now that library assistants accept and edit OCLC member records at the first receipt of titles, the time spent rechecking titles for LC copy has dropped dramatically. In 1990/91 searching for copy consumed 19 hours a week. Because of the more streamlined workflow resulting from PromptCat and the use of OCLC member records by copy catalogers, the time catalogers spend sorting and referring work has also dropped. In 1990/91 this task averaged 30 hours a week. The file maintenance time for material in process also dropped from 6 hours a week in 1990/91. Today all three of these tasks are collected in the "Other" task with an average of 13 hours a week or 3% of the center time.

An important factor in reducing per-title cataloging cost is increasing the proportion of time spent cataloging and reducing the time in problem solving, revision, or other miscellaneous tasks such as searching for copy, file maintenance, and sorting for later handling. In 1997/98, 74% of the Cataloging Center time was spent in the four cataloging tasks (copy, minimal and full original, and recataloging) that

result in titles cataloged, whereas in 1990/91 only 54% was spent in these tasks.

Productivity and Copy Cataloging

Cataloging productivity has increased because of task automation and the improved quality and fullness of cataloging records available through OCLC (see tables 3 and 4). Improvements in these two areas supported reengineering, which changed work flows and cataloging assignments.

Technology has reduced costs by speeding up work processes and thus increasing productivity. Catalogers' workstations overcome local system idiosyncrasies, reduce keying, and increase accuracy. Desktop access to files saves time and allows greater control over work routines. Online authority files and shelf lists allow quicker problem resolution. The advent of new tools such as LC's Cataloger's Desktop and Classification Plus has brought quicker access to many of the rulebooks and reference tools catalogers consult.

A more timely upgrading of CIP records in recent years, especially by the OCLC CIP Upgrade Program, has allowed a high percentage of trade books to be covered in the PromptCat service. By making full-level LC records available for check-in by acquisitions staff, PromptCat effectively diverts a large percentage of new materials out of the cataloging workflow. As at other libraries, the Acquisitions Department at ISU was able to absorb PromptCat processing with no increases in staffing, giving copy catalogers time to handle OCLC member records that require review. However, during the year that PromptCat was introduced and the following year during which new cataloging assignments were assimilated, copy cataloging costs rose as time was spent monitoring the PromptCat titles and training copy catalogers in OCLC member copy cataloging policies. Table 3 shows a dramatic drop in "all other tasks" time once the reengineering was completed.

Technology also supports the flattening of organizational structures, further reducing costs. To use technology effectively, work is completed with limited referrals or revisions. This requires staff with broader knowledge working more independently at higher salaries. Such an approach reduces the need for supervisory staff and allows the flattening of the organizational structure and position reductions. A reorganization of technical services at ISU during 1991/92 eliminated an entire level of middle management. This significantly reduced overhead costs, but it would not have been possible without the technological support made available for more independent work throughout the operation.

Copy catalogers are expected to accept without change as many records as possible and to identify for examination and enhancement only the more problematic records. Automated authority systems that identify new headings and

conflicts defer much authority work, which both speeds the copy cataloging process and contributes to the acceptance of shared cataloging. Copy catalogers judge whether investigation of headings is required or whether a record can be accepted as is. Copy cataloging is an authorization and enhancement process that adds value to the catalog by making it more consistent and logical for users.

Copy catalogers refer to faculty catalogers only those records for which they lack the necessary knowledge or expertise to complete the cataloging. In addition, they have fewer other responsibilities and can dedicate more time to cataloging, thus reducing overhead costs. Cataloging is done more quickly, productivity increases, and costs drop.

As a result, faculty catalogers now have more time for original cataloging and for pursuing new initiatives that both improve local services and move the profession forward. They catalog all Web resources selected for the ISU Library Web site. They also have developed mechanisms to transfer information from the MACHine Readable Catalog (MARC) record in order to create the Web page, streamlining and moving to cataloging a time-consuming activity formerly handled by reference librarians and selectors. They are investigating enhanced subject access for the Web site to provide better access for users. These developments were possible because of the special skills and knowledge of these professionals.

Cataloging of electronic resources is taking an increasingly large percentage of faculty cataloger time as these catalogers work with acquisitions and public services staff to develop policies and procedures in this constantly changing format. Because of the growth and the high level of interest in electronic journals, serials faculty catalogers are especially heavily involved with electronic resources. As format stability increases and local policies and procedures are better established, much of the work with electronic resources will be delegated to library assistants because an increasing percentage of these publications have cataloging copy in OCLC.

Cataloging Per-Title Costs

After Morris (1992), a more accurate and detailed approach to allocating staff overhead costs was developed and costs were recalculated. The overhead costs for Cataloging increased while the other product centers experienced a drop in costs. The recalculated per-title cataloging costs also increased.

As table 5 demonstrates, the overhead centers increase the per-title cataloging costs substantially. At the same time, it is important to note that the overhead costs at ISU may be higher than at other institutions because professional librarians at ISU are members of the faculty and are expected to conduct research and contribute to the knowledge base of library science. Technical services faculty also engage in demonstration projects that develop prototypes for new or improved services, helping to move the profession forward.

All the costs of these activities contribute to the per-title cost when overhead is included.

Online Authority Files

The growth of cooperative authority work has contributed to cataloging effectiveness as well. During fiscal year 1997 the Name Authority Cooperative Program (NACO) contributed 146,858 new records to the national authority file available through OCLC. In NACO's twenty-year history this was the first year that participants contributed more new headings than LC, and the trend continues (Morris 1998). Such increases in the number of personal and corporate names under authority control simplify the cataloger's task of ensuring the consistent use of names within the catalog. They also constitute a major improvement in linking users' entry vocabulary to catalog records.

At ISU, the OCLC online authority files, the NOTIS library system, and the Peter Ward authority tapes were used to build and maintain authority records. Based on the number of titles cataloged, it costs \$1.18 per title in staff time to do post-cataloging authority work. This includes the checking and problem resolution of all new and conflicting headings identified by NOTIS. This post-cataloging authority work also includes all Marcive-cataloged government publications and retrospectively converted titles, but their count is not included in the number of titles cataloged. If they were, the per title cost of post-authority work would be lower.

Copy Cataloging

With monographs, most shared cataloging is handled by copy catalogers, whereas with serials, a higher percentage of copy cataloging is done by faculty librarians (see table 7). At ISU the presence or absence of a call number determines who handles a serial record. Also, because serials are constantly changing, their records require more updating. Copy cataloging for serials (\$88.24 per title) is less cost-effective than for monographs (\$12.22). If there is cataloging copy for a serial title, the cataloger must deal with resolving discrepancies between current issues and what is recorded. This is only slightly less time-consuming than cataloging a serial originally. At ISU much effort is spent connecting related serials and providing full authority work, so that library users can successfully find the titles they need. It will be important to determine whether similar cost differences between serials and monographs copy cataloging exist at other institutions. It would also be important to determine what further can be done to upgrade serial titles continuously in OCLC in order to reduce local costs.

Monographs copy cataloging, too, may be performed by faculty librarians or library assistants. Nearly all library assis-

tants cataloging monographs at ISU are classified at the highest level, Library Assistant IV. They handle both LC and OCLC member records and use their judgement in referring materials to faculty catalogers. The referral costs are included in the library assistant's cataloging costs. Table 8 shows that it is four times more expensive for a faculty cataloger to catalog a monograph with copy than for a library assistant. Cataloging by library assistants is less expensive for two reasons: (1) they spend a higher percentage of their time in the Cataloging Center, thus less time in overhead centers, and (2) they catalog more titles in an hour.

Looking at the Cataloging Center costs only, a library assistant's cataloging of a monograph costs \$5.30, but a faculty librarian's costs \$14.19. The faculty librarian is handling the more difficult cataloging, which requires classification, more problem resolution, and record editing. Faculty librarian costs are further driven up by their overhead costs. A library assistant's overhead cost is 16% of the total cost of cataloging a monograph, whereas for a faculty librarian it is 44%. As noted earlier, this cost is not unique to catalogers; every faculty librarian carries much greater overhead costs because of institutional expectations placed on professionals. This is true of selecting a book, answering a reference question, or any other library service.

Original Cataloging

At the same time, the transfer of most OCLC member copy cataloging to library assistants allows faculty catalogers more time to contribute quality records to the OCLC database (see tables 9 and 10). Now that LC uses contributed records, there is more incentive to do original cataloging locally, because catalogers can now expect that their work will be used and enhanced by LC instead of being bumped from the national database by a subsequent LC record. Table 4 demonstrates that full original cataloging of monographs at ISU doubled in seven years, minimal level records increased by nearly 75%, and overall original cataloging increased by 84%. As more libraries contribute quality records promptly, the benefits to LC and other libraries continue to grow.

Serials original cataloging is a lengthy and expensive process (\$202 per title). Because serials cataloging is usually not straightforward, a cataloger could begin work on a difficult title during cost study week but not complete the cataloging until the following week. Thus the time and costs of the effort would be recorded but no product (cataloging statistic) would result. Even though serials original cataloging is a highly expensive activity at ISU, the overall cost of all cataloging is only \$16.25 per title. This demonstrates that a library can keep its cataloging costs low and support expensive original work that benefits many libraries.

Minimal level original cataloging is limited to monographs and included 1,679 titles in 1997/98. This type of

cataloging has proven to be more expensive than anticipated. Both library assistants and faculty catalogers contribute minimal level records but it is primarily a task performed by library assistants.

The cataloging of ISU theses comprises 41% of this category. This cataloging is completed by a library assistant using local subject headings and classification and with some authority work involved in establishing names. To reduce costs much of the work has since been delegated to students with revision by a library assistant.

Another 31% of minimal original records consist of serial analytics created by a higher-level library assistant. A monographs cataloging record is made for selected serial issues to increase access to unindexed contents. Many are special topical issues or proceedings of conferences. The analyzed serial issue remains part of the serial run, and the analytic cataloging directs the user to the serial call number and specific issue numbering. The OCLC K-level standard is exceeded in providing transcription of the series statement as well as the series tracing. Notes of an explanatory or informational nature are supplied when the name or title entry needs supplementary information for clarification, most often conference name, date, or place information.

Recataloging

Sixty-six percent of monographs recataloging consists of adding copies and volumes (see table 11). Added volume recataloging frequently requires additions of contents and editor information. The remaining monographs recataloging includes reclassifications and other enhancements requested by public services. Serial recataloging includes title changes; cessations; closing of records due to subscription cancellations; adding notes; changing and adding access points to other names, titles, or formats; as well as added copies and added volumes. Recataloging of serials is more likely to result in complete revision of a cataloging record than is monographs recataloging, although monographic sets may pose similar challenges. Library assistants completed 68% of the serials recataloging in 1997/98. The faculty serials catalogers were more likely to do the most complex recataloging and to add notes about availability of the serial in electronic form.

Serials Cataloging

ISU, with a strong scientific serials collection, has a tradition reaching back to the early part of the century to create and maintain complete and clear serial records and to connect related publications. Underpinning this philosophy is the awareness that serials cataloging is used for the life of the serial by other staff who perpetually receive and maintain the serial issues. It is expected that serials cataloging will

reduce problems and work in other areas. Public services staff regularly request enhancements to serials cataloging to resolve any public access problems. As a result, serials cataloging (copy, original, and recataloging) at ISU is the most expensive cataloging activity. It is nearly five times more expensive to catalog a serial than to catalog a monograph. Because other libraries may put a smaller effort into serials cataloging, examples follow that demonstrate ISU's attention to this service.

For both original and copy cataloging, issues are checked and variances noted. Issuing bodies are determined, dates of involvement given, and authority work completed to establish appropriate forms of names and cross-references. Certain supplements, special issues, and indexes are noted. All holdings statements identify missing issues, location of issues, and any issues split between locations. If the title is not unique, it is qualified and given a uniform title according to national standards; this is done even when editing cataloging copy. If the serial is related to other titles, these titles are linked together with notes and appropriate fields. The serials catalogers make circulation decisions for serials according to the kind of serial and its location. In 1997/98, they still labeled issues with the call number, marked the inside of bound volumes, and filled out forms to have pamphlet boxes made for shelving of loose issues and also to route information to other units; these activities have since been discontinued due to greater use of online records. While minimal level cataloging is used for monographs, it is not for serials.

Time and Cost Analysis in the Multi-Institution Environment

Library technical services operations at four other universities (California-Santa Barbara, Cornell, Missouri-Kansas City, and Vanderbilt) have recently joined with ISU to develop an instrument for comparative time and cost analysis. Uniform cost centers and tasks have been agreed upon and production statistics have been identified to be used for unit costing. A systematic sampling process is used, drawing sample weeks from a normalized list of weeks. Weeks with holidays and short weeks at the beginning and end of the fiscal year are excluded. Data for six sample weeks in 1998/99 were gathered and another six weeks are being sampled in 1999/2000. Software is in development to produce reports for analysis of data.

Conclusions

At ISU, cataloging costs per title have declined consistently (even without adjusting for inflation) over the past seven years. This has happened primarily because of the long-

term, unique collaborative efforts of catalogers, which allow them to share work globally. This sharing began long before online catalogs and modern telecommunications, but the powerful and constant technological developments of recent years, combined with pressure for improved cost-effectiveness and new services, have leveraged this collaboration to revolutionize cataloging.

The number of ready-to-use catalog records in the utilities grows with each passing year. Quality control measures at OCLC combine with initiatives such as the Program for Cooperative Cataloging (PCC) to enhance the overall quality of available records. These developments allow catalogers to accept, with less examination and editing, records contributed by libraries other than LC. Meanwhile, the more timely upgrading of CIP records in recent years allows more automatic acceptance of LC records through programs like OCLC's PromptCat. As a result, ISU has been able to shift its monographs copy catalogers from handling LC records to editing records from other libraries. Faculty catalogers then have time to create more original records and develop new services in the changing information environment.

Because the factors that are driving cost reductions at ISU (shared cataloging, internal process automation, expanding role of support staff) characterize cataloging operations throughout North America, we believe the findings of this study could have been replicated to a considerable degree at any large or medium-sized academic library during the past decade. In fact, any library keeping cataloging and personnel budget statistics should be able to perform a rough per-title cost analysis over time, which would contribute to a more comprehensive view of cataloging cost trends during the 1990s.

Such an analysis, however, cannot take the place of systematic time and cost data gathering as a means for tracking the use of personnel resources. As both the need to improve cost effectiveness in technical services and the emergence of new technologies to improve efficiency continue, the information obtained in this type of study can prove invaluable to administrative planning. So, too, can similar information derived from other libraries, but only if task categories and time samples are similar enough across institutions to make meaningful comparison possible. This can be difficult to achieve without considerable coordination of effort.

The development of a multi-institution cost and time analysis tool based on the ISU model will support comparisons between libraries and identify differences and similarities. More data on the use of technical services staff will help all libraries in meeting expectations for continuous improvement and will also support further collaborative efforts.

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Appendix Cataloging Center Tasks

Training, Revision, Procedures, and Policies

- Training: Used by individuals training others and staff being trained who are accomplishing no work. If work is accomplished, time is counted in appropriate task.
- Demonstrations and presentations
- Procedure and policy documentation
- Revising of others' work when done as a separate task

Consulting and Problems

- Consulting and responding to inquiries and questionnaires, including e-mail
- Problem solving falling outside of normal procedures and guidelines. Often work is referred because an individual did not know how to proceed. Does not refer to complex investigation or verification which is part of an assigned task.
- Processing requests to review cataloging and requests to expedite/find in-process material
- Liaison work with public service and collection development staff

Authority Work

- Searching, verifying, and establishing names, subjects, series, and uniform titles for new title cataloging and recataloging. Use only if performed as separate task, otherwise count in cataloging task.
- Establishing or revising existing authority records for local use or NACO participation
- Communication with LC on authority issues

Other

- Sorting, shelving, boxing, distributing, and retrieving and any file maintenance
- Searching and printing cataloging copy, if done as separate task; if not, count as cataloging task
- OCLC updates, if done as separate task

Copy Cataloging

- Verification and modification (description and classification) of an existing catalog record, including adding call numbers and subject headings. Does not include recataloging of a local record.
- Item record creation and bar coding if done as part of cataloging task
- Verification of call numbers if done as part of cataloging task
- Passing records into the local system if done as part of cataloging task

Full Level Original Cataloging

- Creation of cataloging records (description and classification) which meet national standards for full cataloging; includes new records derived from variant edition records
- Item record creation and bar coding if done as part of cataloging task
- Verification of call numbers if done as part of cataloging task
- Passing records into the local system if done as part of cataloging task

Minimal Level Original Cataloging

- Creation of cataloging records (description and classifications) which does not meet national standards for full level cataloging
- Creation of local provisional records
- Item record creation and bar coding if done as part of cataloging task
- Verification of call numbers if done as part of cataloging task
- Passing records into the local system if done as part of cataloging task

Recataloging

- Subsequent changes to a cataloging record (description or classification); for serials, include cessations, title changes, and addition of notes
- Adding additional copies and volumes to a cataloging record
- Item record creation and bar coding if done as part of cataloging task
- Verification of call numbers if done as part of cataloging task
- Passing records into the local system if done as part of cataloging task