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Transforming Data to Build Knowledge for Healthy Libraries

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ABSTRACT

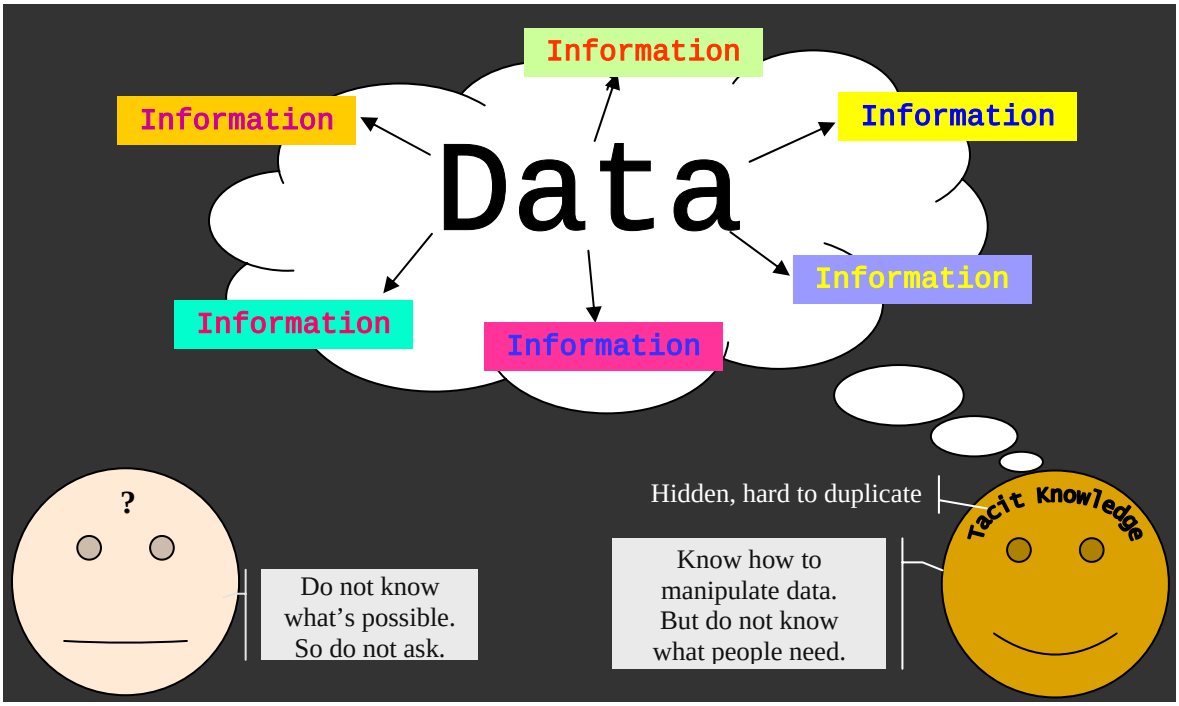
The explosion of recent technologies enables libraries to collect or generate raw data which, in the past, might have been impossible. Proper treatment of the raw data, using appropriate statistical tools, enables us to liberate information. Collective or individual experiences inherent to a library added to the information extracted from collected data can build knowledge that a library can use when making decisions. This paper will discuss different methods to collect or generate raw data, different types of statistical analysis, and the dissemination of information that builds a basis for institutional knowledge. Actual data (satisfaction survey data, inventory data, and circulation data) collected in a medium-sized academic library in the state of Illinois, USA, are used to demonstrate how statistics are utilized to assess quality in library services.

1. Introduction

The explosion of recent technologies has revolutionized the manners of collecting or generating data in libraries. Numbers which, in the past, might have been impossible to gather are now available, thanks to sophisticated integrated library systems. Some data can be generated and stored by themselves even without being recognized (Atkins, 1996). Often data are stored in a relational database so that, with proper treatment, the data may be liberated from the storage device and transformed into information that may be used in decision-making processes in our library. It is a challenge to know what kind of data exists and what kind of information can be extracted from the existing data (Owrage, 2006). Even Bill Gates (2006) claimed that "locating sources of knowledge within complex organizations can be daunting." To make things more complicated, often those who need the information do not even guess what they possibly can have. On the other hand, those who can manipulate the data might not know what kinds of information their people need. Knowledge Management (KM) tries to reduce the gap between these two groups of people (Figure 1).

One of the core theoretical definitions of Knowledge Management is tacit knowledge versus explicit knowledge. Distinction and relationship between these two concepts have been extensively discussed (Nonaka, 1991, & Wagner-Dobler, 2004). Tacit knowledge is a skill or ability confined within a person which comes and goes with the person who owns it (Conte, 2006). Unfortunately, tacit knowledge is very difficult to codify. Simply putting what a person knows on a piece of paper does not mean that an eventual reader can duplicate what the original owner of that tacit knowledge can do or could have done. Tacit knowledge often is silently hidden inside a person while explicit knowledge can be readily understood by a wider audience but it may not be generated without tacit knowledge (Figure 1).

Figure 1. Tacit knowledge and data mining



KM theories have been shifted from emphasis on intervention using technology in the 1990s to understanding the human aspects in the process of knowledge creation in the new millennium (Davenport, 2005), especially the socialization aspects of interaction (Nonaka, Toyama, & Konno, 2000). In the library setting, individual departments often operate somewhat in isolation with limited communications between various departments. Data held by one department, but needed by different people from several departments, can be unintentionally hidden from one another. Thus, communication is the essential channel to bring together what people are looking for with what is currently available including each individuals' assets hidden in tacit knowledge within themselves, as Chou and He (2004) proposed in their unified model of dynamic knowledge creation with emphasis on socialization.

Further discussions on 'what KM is' will be trusted to the theory builders. The main purpose of this paper is to discuss different methods of collecting or generating raw data in the library, manipulating the data to pull meaningful information, and disseminating the information that builds a strong base for institutional knowledge. Three data sets will be used in our discussion here to illustrate how the information gleaned can build knowledge and affect the decision-making process when the data are interpreted together in the specific library context. The three data sets are: patron satisfaction survey data, materials inventory data, and circulation data.

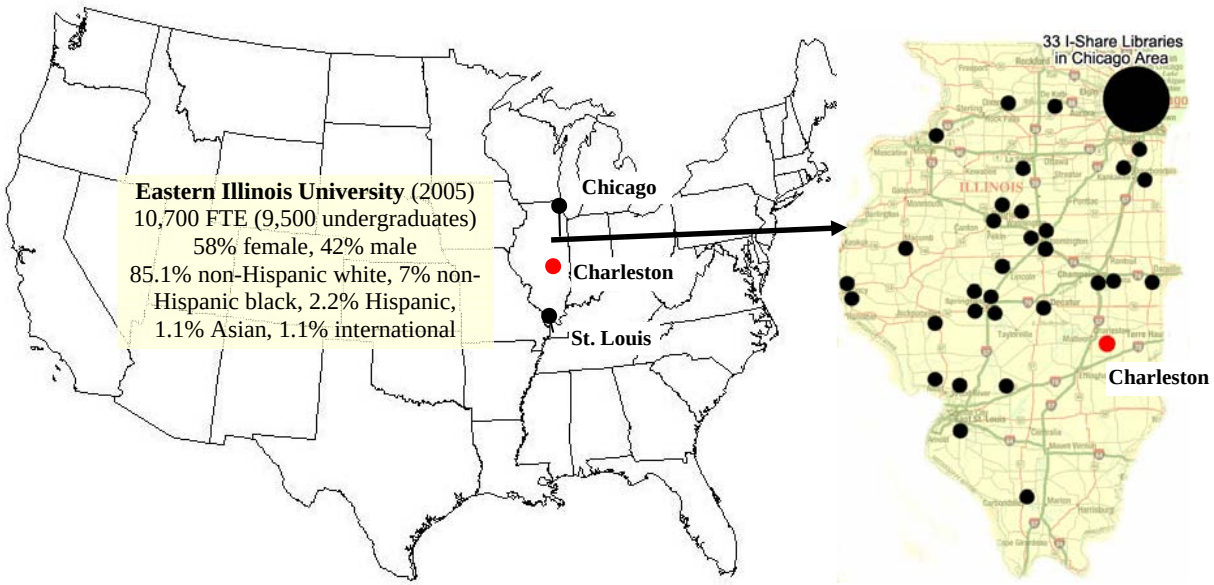
2. Booth Library Satisfaction Survey Data

There are different ways to collect library satisfaction data. Commercialized web-based tools such as LibQUAL can make the overall survey process easier to administer than using a printed form or a locally-developed electronic form. If LibQUAL is not affordable or does not fit your goal, simple surveys are quite easy to administer in the library. However, either method can create unintentional selection bias (Collier, Mahoney, & Seawright, 2004) because certain patrons will answer web-based surveys more readily than others or certain constituents will come to the library more often than others. In other words, you cannot control who will respond to a web survey or who will come to the library and complete a survey. Randomization, the essence of survey technique, can be compromised, which may make it difficult to generalize the results to a larger population. To overcome these difficulties, Booth Library at Eastern Illinois University has been conducting the survey in a unique way for the past four years.

Eastern Illinois University is located in a rural area of central Illinois, USA, 200 miles south of Chicago, and 120 miles west and north of Indianapolis and St. Louis respectively. It hosts 10,700 students (9,500 undergraduates). Interestingly, 47% of Eastern's students come from Chicago and its vicinity. Booth Library is centrally located on campus and is a member of a large academic library consortium, CARLI[1], in Illinois. Booth Library shares an online union catalog, I-Share[2], with 64 other academic libraries in CARLI (Figure 2). Our patrons have privileges in all the other 64 I-Share Libraries and we welcome their patrons to our library.

[1] CARLI: Consortium of Academic & Research Libraries in Illinois (184 libraries) www.carli.illinois.edu
[2] A subset of 65 libraries in CARLI shares a union catalog called "I-Share."

Figure 2. Demographics of Eastern Illinois University & locations of 65 I-Share Libraries



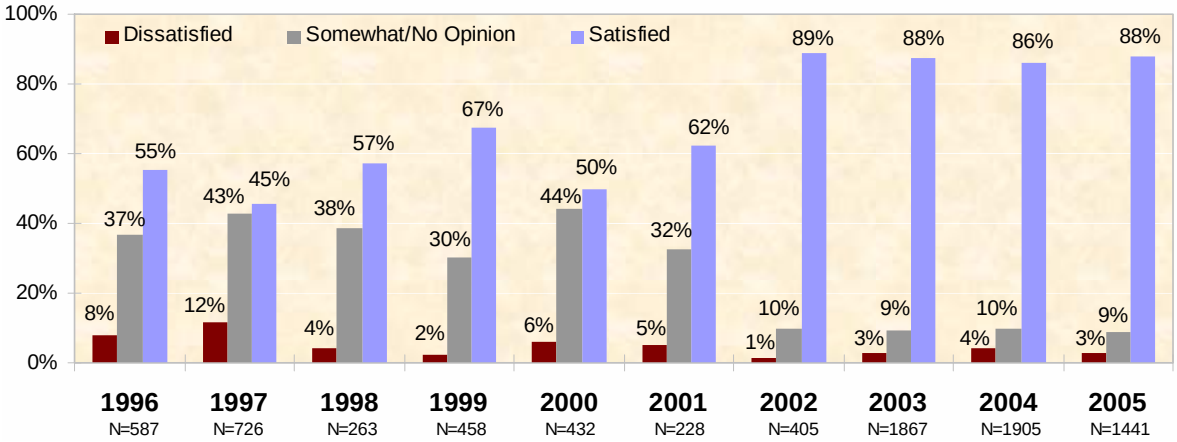
For the past ten years, Eastern Illinois University has conducted library satisfaction surveys. During the first seven years, surveys were conducted only in the library. The results were positive, in general, but the number of responses gathered declined each year. In 2003, following a recommendation of a faculty member outside the library, the library decided to include the voices from students who are not always physically in the library and therefore administered the survey inside the classrooms. The day and time of the week when the most students were in class was identified. Using Scantron sheets, the library survey was administered simultaneously to students in their classrooms and processed at the Academic Assessment and Testing Center. We now have data from the last four years for longitudinal comparisons. The results of the 2004 survey from undergraduate students are used, in the present discussion, unless otherwise specified.

In 2004, approximately 2,250 (1,950 from undergraduate students) responses were collected. The questionnaire (Appendix 1) is comprised of twenty eight questions: eleven[3] questions dealt with perceived usage of different services provided by the library ('Yes/No' options), fourteen[4] questions assessed perceived satisfaction with services (five options: Strongly disagree, Disagree, Neither agree nor disagree, Agree, and Strongly agree), and three questions collected demographic information[5]. 'Strongly agree' and 'Agree' were combined into "Satisfied," while 'Disagree' and 'Strongly disagree' were combined into "Dissatisfied" to simplify the data for better understanding. "Neither agree nor disagree" was interpreted as "No Opinion."

[3] On usage: book, periodicals, materials, ILL, e-resources, study area, computers, instruction, Online Catalog, library website, & Copying machine
[4] On satisfaction with services: those 11 questions asked for usage plus library hours, staff, & overall satisfaction
[5] Frequency of library use, status, and class rank if a respondent is a undergraduate student

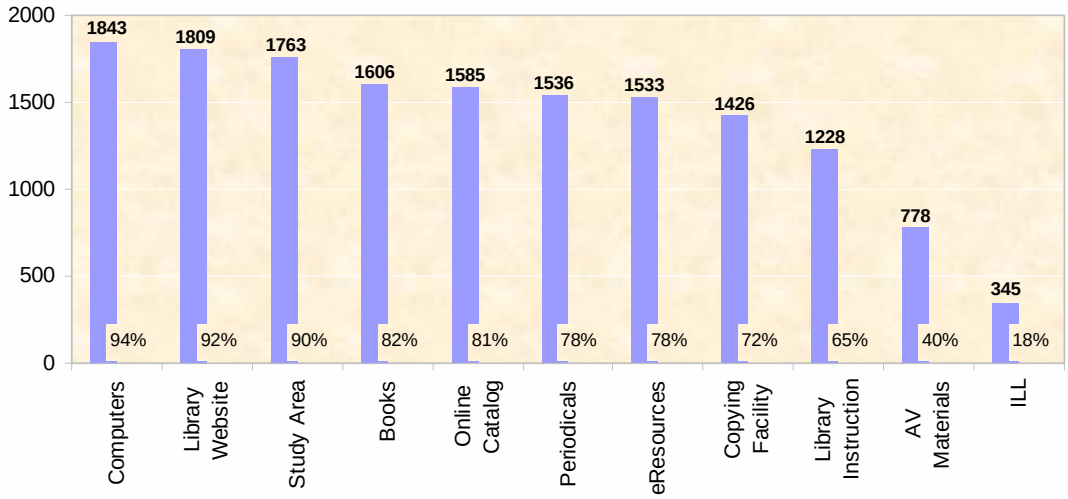
Graph 1 shows the change in overall satisfaction with library services during the past ten years. It is clear that students became more vocal about their opinions on overall satisfaction. Since 2002, the "No Opinion" group (depicted in gray) decreased as overall satisfaction with library services increased. What made this change possible? One possible explanation is the impact of our facility renovation which was completed in January 2002. The survey was conducted two months after the library moved back into the building following more than two years of renovation.

Graph 1. Satisfaction rate with overall library services, 1996-2005

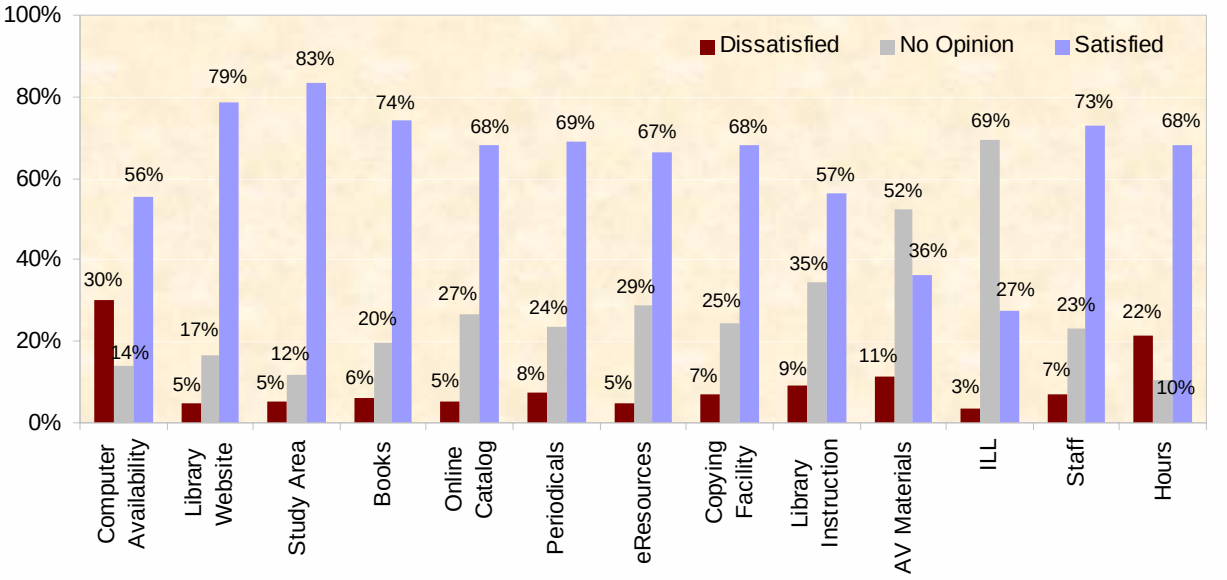


Percentages of students who claimed to use our services ranged from 18% to 94% (Graph 2). The three services used the most were computers (94%), library website (92%), and study areas (90%). **Graph 3** shows the satisfaction rate for each service area. The first eleven sets in **Graph 3** show the satisfaction rate with the services depicted in **Graph 2**. The last two sets in same graph show the satisfaction rate with library staff and library hours respectively. The gray bar (No Opinion) on **Graph 3** dropped as the number of users increased. In other words, the more they use our services the more opinionated our students have become about their experience with the services they receive.

Graph 2. Number of students who claimed to use services (2004, N=1986)

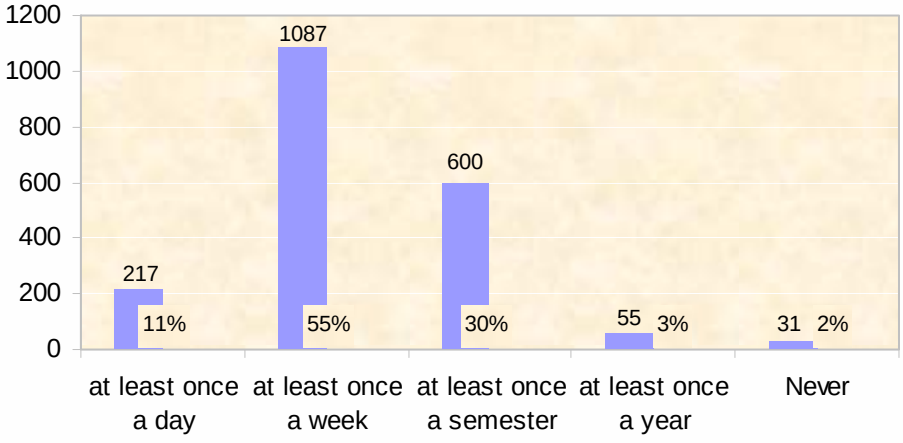


Graph 3. Satisfaction rate with different services (2004)



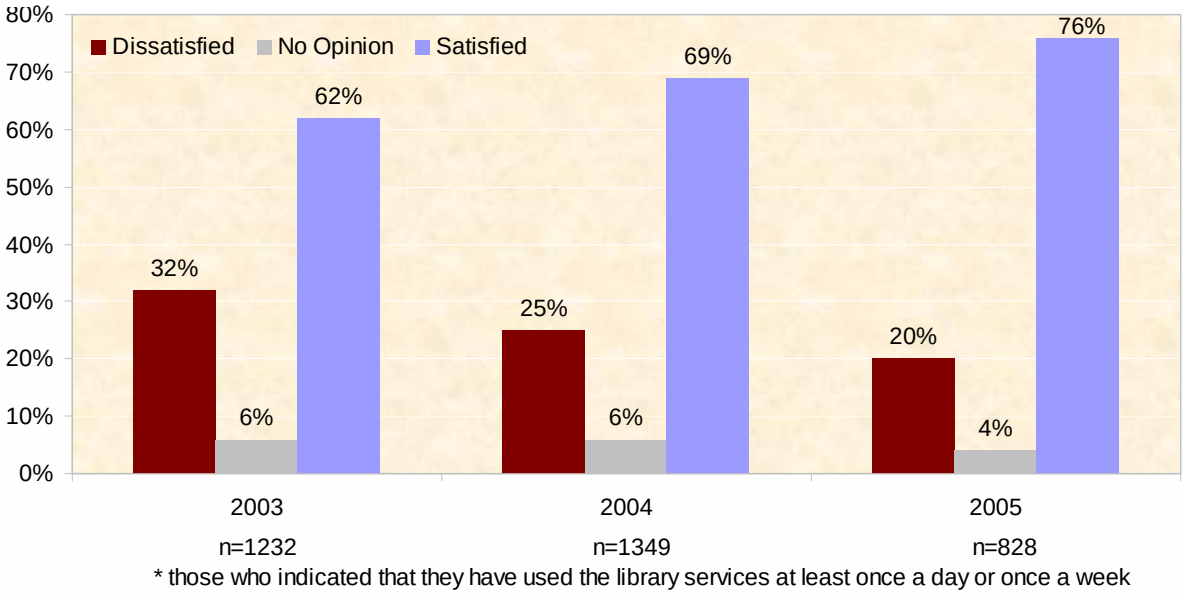
As shown in **Graph 4**, two thirds of the students indicated that they used the library services at least once a day (11%) or at least once a week (55%). These two groups of students were defined as "frequent users." The response from this group was then used to review the two most dissatisfied areas of services, the number of library hours and the availability of computers for the past three years (Graph 5 & 6).

Graph 4. How frequently do you use Booth Library services? (2004, N=1990)



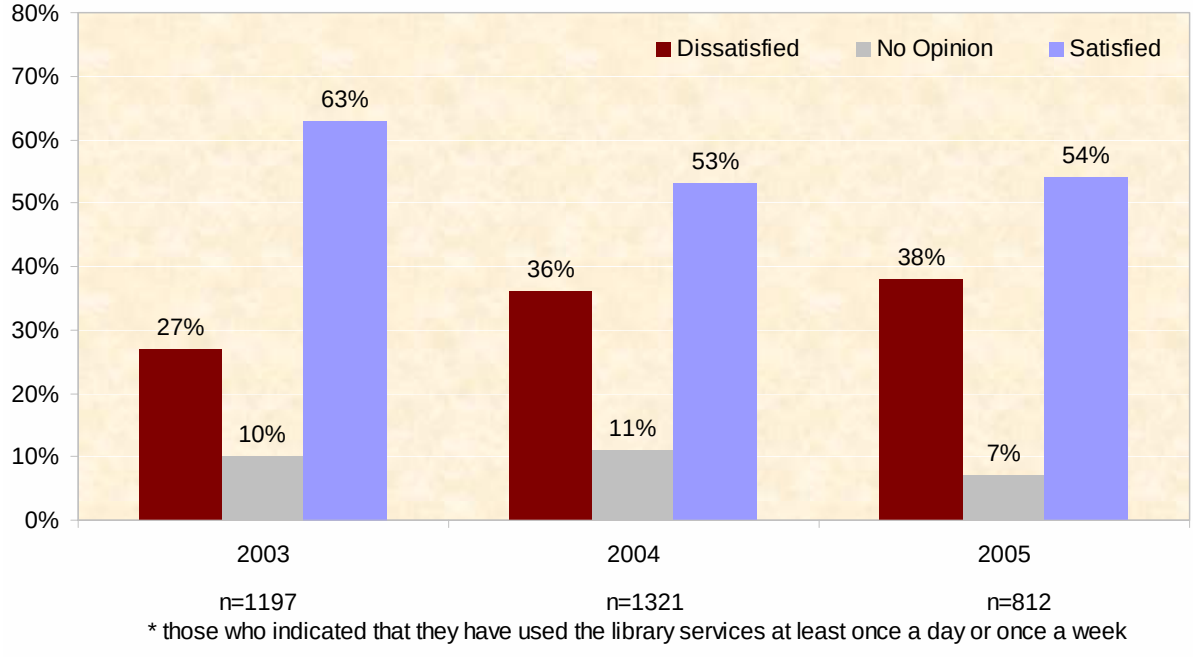
Graph 5 shows the satisfaction rate for the number of library hours among frequent users for the past three years. On this matter, students were not shy at all about their opinions. Only a few students had "No Opinion" (less than 6 % in all three years among frequent users).
In 2003, one year after the library came back to the renovated space, students really wanted the library to stay open late on the weekend nights. The dissatisfaction rate in 2003 was 32% among frequent users which dropped to 25% in 2004. Beginning fall 2004, the library extended its hours to 1AM from 12AM on Sundays through Thursdays. In 2005, the dissatisfaction rate dropped even further, down to 20%. The differences in satisfaction rate over three years were statistically significant ($Chi^2 = 49$, $p < .000$).

Graph 5. Satisfaction rate with library hours among frequent users*



Graph 6 shows the change in satisfaction rate among frequent users with the availability of computers over time. Dissatisfaction increased from 27% to 38 % over the past three years. The satisfaction rate over time is statistically significantly different ($Chi^2 = 44$, $p < .000$). The library computer lab has 61 computers with up-to-date applications installed (Figure 3). When the e-Classroom in the library is not used for instruction, the 24 computers in that classroom are made available for student use. The reference area provides 55 computers for research purposes only.

Graph 6. Satisfaction rate with the availability of computers among frequent users*



There are several computer labs throughout the campus, and at any given moment students can find unoccupied computers in most of these labs. The data provided by Eastern's Information Technology Services (ITS) clearly verifies that the computers in the library have been used the most among all the computers in the labs on campus[6]. In addition to these statistics, the fact that 94% of the students claimed they had used computers in the library; and, the high dissatisfaction rate with the availability of computers in the library strongly indicates that students want to use the computers in the library and will wait for availability rather than seek out computers in another building.

Since remodeling the library computer lab is not an option, in response to this demand, the library installed thirty more computers on selected desks throughout the library in Fall Semester of 2005. Physically, these areas were the least used by students in the past as a study area. Since the computers were installed, these areas became very popular to students, especially to those seeking a quieter place to work (Figure 4). It is hoped that 2006 satisfaction survey will reveal the impact of these additional computers on the satisfaction rate regarding the availability of computers.

Figure 3. Computer Lab in the library

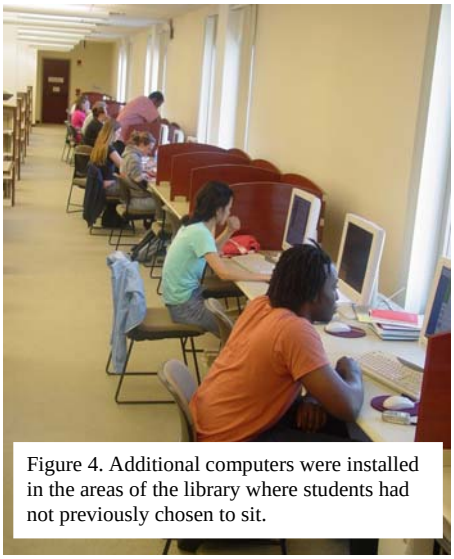
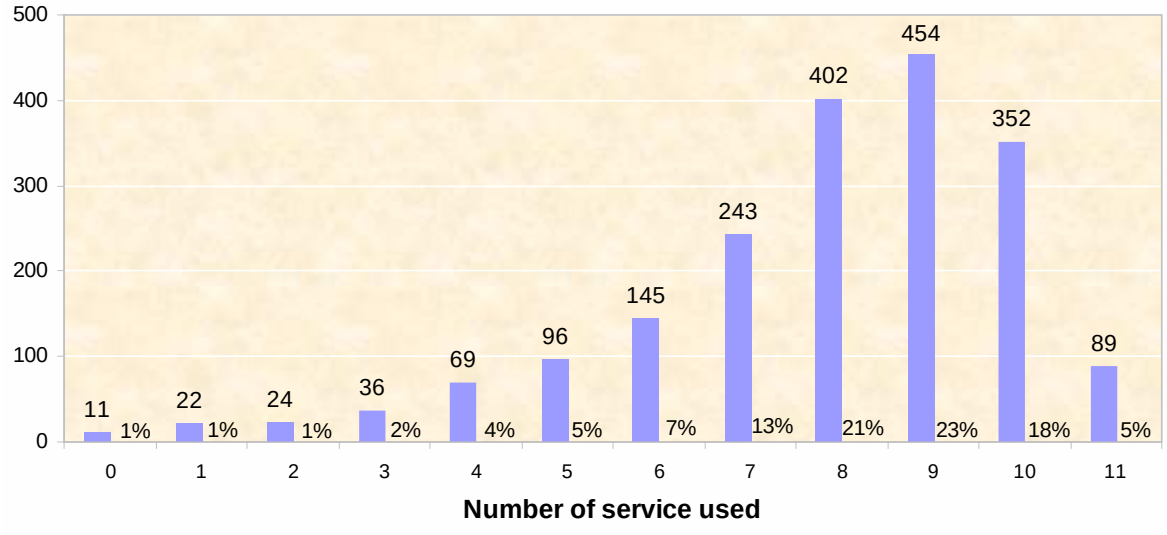


Figure 4. Additional computers were installed in the areas of the library where students had not previously chosen to sit.

Does this phenomenon indicate that students at Eastern are following the national trend of "library as a place" rather than library as a storehouse for materials (Wright, 2006)? Maybe not. Eighty percent of students responded that they had used seven or more services that the library provided (Graph 7). Eighty-two percent of students claimed to use books provided by the library (Graph 2). These numbers indicate that Booth Library is more than "just a place" to students. Can inventory data, as well as circulation data, prove that the library is more than just a place for students or more than a storage space for books?

[6] ITS collects the usage on computer applications from each individual lab on campus. During the month of March 2006, the library had recorded the highest usage for both the overall number of uses (over 47,000), as well as use per computer (774 per computer).

Graph 7. Number of students who claimed that they used services (2004, N=1943)



3. Booth Library Inventory Data

Before integrated library systems (ILS) were developed, libraries performed inventory using card shelf list. Drawers of the card catalog were used to compare the books actually on the shelf or checked out, to identify missing items. In the past, stacks were often closed to the public so that there were fewer disturbances to the inventory compared to the open stacks which most contemporary libraries have. Thus, a book found mis-shelved could be considered a shelving problem in a closed stacks environment. This might be why literature on inventory used the term 'mis-shelved' instead of 'misplaced.' On the other hand, it could have been difficult to generate meaningful data with manual shelf-reading or inventory, which might have resulted in the scarcity of literature written on this topic. In this paper, 'misplaced' is used for the term 'mis-shelved' because it is not really obvious which books are mis-shelved by staff or misplaced by users because Eastern Illinois University maintains a policy of stack areas being open to the public.

A feature of the ILS replaced drawers of catalog cards with a print shelf-list. This was used for a brief period. However, comparing call numbers printed on a sheet of paper to actual items on the shelf was a good experiment in testing human limitations. In addition to the development of the ILS, recent advances such as wireless technology and scanning tools make the inventory process much more interesting and engaging for the operators. Booth Library developed an inventory system with the human limitations in mind, which is currently named "Library Stacks Management System[7] (LSMS)."

Each morning the LSMS automatically generates and stores in a library server a Shelf-List and an Active-Status-List[8] for a predefined section. In the stacks, staff members scan the

[7] Visit www.library.eiu.edu/download/WSM/welcome.html to view the LSMS.
[8] A list of items in the predefined range with active status attached such as "Charge, Renewed, etc." These items theoretically should not be on the shelf.

barcode of each item on the shelf using a scanner attached to a laptop computer which is wirelessly connected to the server. As barcodes are scanned, the system audibly notifies the operator instantly if the items are out of order, not found, or identified with an active status such as 'Charged' or 'In Transit.' Since people have a tendency not to monitor the screen as they scan barcodes, and monitoring the screen after each scan significantly impairs the speed of the process, the system uses sound and color to alert the operator whenever a problem is detected. Different from most manual inventories, much data can be obtained automatically during this process. The system logs the following: 1) time of scanning to the second, 2) out of order items, 3) items not found (either not in the system or wrong place), 4) scanning error, 5) items with active status, and, finally, 6) books not on the shelf which should be. However, the raw data obtained right after scanning process provides nothing but lines of numbers, see green box (Table 1). If it was stopped here, this would be another example of information buried in numbers and data. In order to unveil the information hidden to the eye, it needs to be properly manipulated. Among the information generated from the inventory data, only misplacement data will be presented in this paper. The full report will appear after our entire stacks have been inventoried.

At the end of December 2005, approximately 192,000 books were scanned in the following call number ranges in the stacks: G, H, N, and P. The rate of misplaced books may be different from section to section, where a section is defined by the detailed LC call number ranges (Table 2). The misplaced rate was calculated by dividing the number of misplaced books by the number of books scanned in each section (Table 2). The misplaced rate can provide an overall picture of misplacement but it may not reveal how badly books were misplaced in terms of a misplaced distance which is defined as "the distance between where a book was found and where it should have been located." Even if libraries wanted to know this, it was almost impossible to measure in the past. Since the inventory data collected at Booth Library was sufficient to generate the misplaced distance, a program was written to calculate the distance as well as the time spent in each scanning, see burgundy box (Table1).

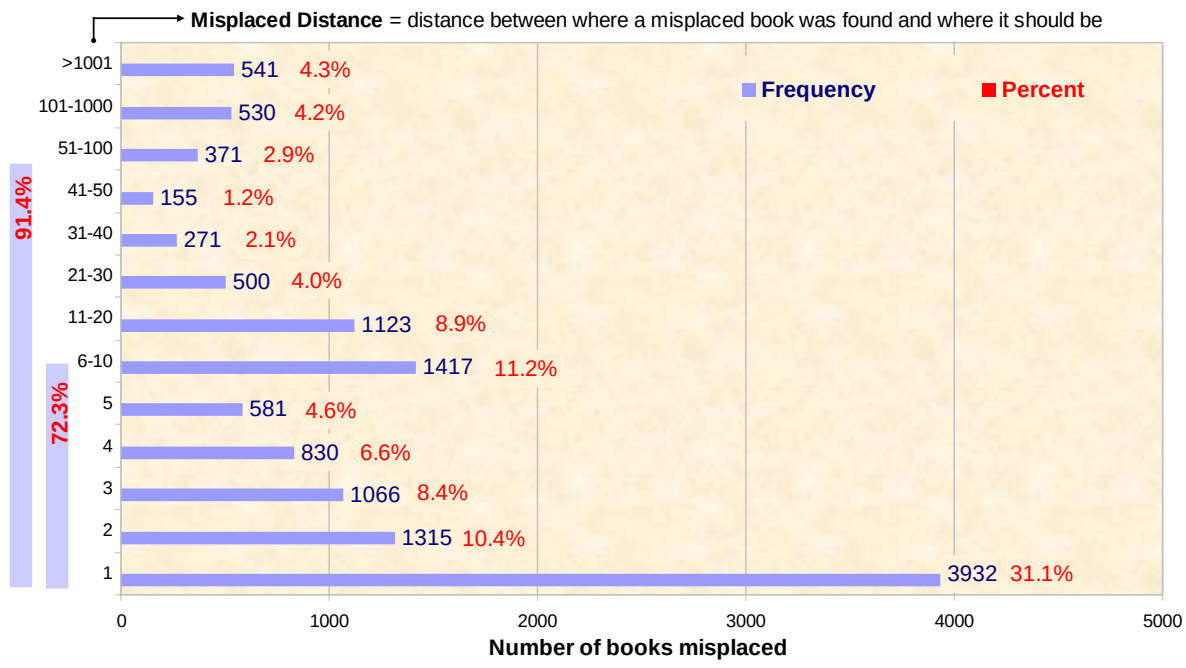
Table 1. Log of items scanned during the inventory procedure

Right after scanning				After programming	
Time of scanning	**Barcode**	**Status**	**Call Number**	**Distance**	**TimeDiff**
5/26/2005 2:37:45 PM	32211130227190		NK9990.C4 W53		14
5/26/2005 2:39:58 PM	32211130719675	W	NB553.L247 A4 1998x	-8496	133
5/26/2005 2:40:06 PM	32211130227192		NX1 .A46 no.4		8
5/26/2005 2:40:38 PM	32211130227193		NX1 .A74		32
5/26/2005 2:40:57 PM	32211130227191	W	NK9990.C4 W53	-2	19
5/26/2005 2:41:20 PM	32211130227194		NX7 .A7x		23

Among 192,000 items scanned 12,661 (6.6%) items were recognized as items misplaced. **Graph 8** shows the extent of misplaced rate in terms of misplaced distance. Over 72% of misplaced books were found within a range of 1 to 10 books. Another 16% were found within 10 to 50 books. The fact that 9 out of 10 misplaced books can be found within two shelves should be a relief. However, over 4% of misplaced books were found between 100 and 1,000 books from its ideal location, and another 4% were found beyond 1,000 books. Some of the items were misplaced due to a label error. These can be difficult to identify without an electronic system. Fortunately, the amount of mislabeled items is very small.

In addition to misplaced distance, the misplaced rates based on detailed call number ranges were calculated (Table 2 and Graph 9). It is a fact that sections with more uses have more misplaced items than sections with fewer uses, but it has hardly been proven scientifically. Can it be proven with inventory data obtained in conjunction with circulation data?

Graph 8. Number of books misplaced in terms of misplaced distance



4. Booth Library Circulation Data

A variety of information can be extracted from circulation data thanks to integrated library systems. First of all, 82% of the students who responded to the survey claimed that they had used the books provided by the library. During the period of mid-February 2006 to the end of April 2006, 3,839 (40%) undergraduate students borrowed items from the library. However, Eastern Illinois University is a residential university with the majority of students living on campus, so they can use the books in the library without charging them out. This hypothesis can be tested by considering three variables simultaneously: the misplaced count, the charge count, and the browse count.

In the present paper only areas parallel to inventory data are used for discussion. Data obtained since Endeavor's Voyager system was installed in the summer 2002 are used for discussion. The charge counts and browse counts were retrieved based on detailed call number ranges. It is obvious that a section with more books will have a larger charge or browse count. To better understand the intensity of use, the charge/browse rate was calculated by taking the total charge/browse count in each section divided by the item count for that section regardless of publication date (Table 2). **Graph 9** and **Graph 10** will be helpful to visualize the relationship between the charge rate and the misplaced rate, and the relationship between the charge rate and the browse rate, respectively. **Table 3** also shows the correlation coefficients among three variables.

Table 2. Misplaced rate and charge rate by detailed call number rage

	Total Scanned	Total Misplaced	Misplaced Rate (%)	Item count	Charge count since summer 2002*	Charge rate	Browse count since summer 2002*	Browse rate
G	1889	82	4.3%	2260	787	0.35	789	0.35
GA	217	6	2.8%	244	23	0.09	50	0.20
GB	1002	60	6.0%	1302	449	0.34	310	0.24
GC	448	53	11.8%	515	550	1.07	378	0.73
GE	225	14	6.2%	244	215	0.88	231	0.95
GF	314	11	3.5%	323	106	0.33	90	0.28
GN	1534	71	4.6%	1705	1186	0.70	990	0.58
GR	518	27	5.2%	652	635	0.97	400	0.61
GT	737	64	8.7%	792	1501	1.90	1191	1.50
GV	8458	929	11.0%	9108	9808	1.08	6404	0.70
H	2286	63	2.8%	3753	590	0.16	833	0.22
HA	1355	83	6.1%	1590	231	0.15	275	0.17
HB	3381	112	3.3%	3586	1038	0.29	846	0.24
HC	7753	381	4.9%	8552	2049	0.24	1329	0.16
HD	18891	1167	6.2%	20174	6520	0.32	5156	0.26
HE	2498	209	8.4%	2975	597	0.20	565	0.19
HF	10742	649	6.0%	14281	4299	0.30	3804	0.27
HG	6418	326	5.1%	6598	1054	0.16	983	0.15
HJ	1981	51	2.6%	2150	155	0.07	158	0.07
HM	3024	185	6.1%	3251	1770	0.54	1542	0.47
HN	2496	104	4.2%	2708	1283	0.47	786	0.29
HQ	7201	689	9.6%	8046	9732	1.21	6475	0.80
HS	72	9	12.5%	84	150	1.79	75	0.89
HT	1576	62	3.9%	1716	893	0.52	679	0.40
HV	9198	812	8.8%	10763	9788	0.91	5694	0.53
HX	1194	56	4.7%	1232	510	0.41	236	0.19
N	4707	205	4.4%	5468	4361	0.80	4998	0.91
NA	2068	145	7.0%	2279	1601	0.70	1632	0.72
NB	801	84	10.5%	889	766	0.86	712	0.80
NC	1194	196	16.4%	1365	1728	1.27	1597	1.17
ND	3572	420	11.8%	4022	3252	0.81	3012	0.75
NE	522	56	10.7%	552	346	0.63	423	0.60
NK	2406	210	8.7%	2637	1939	0.74	1571	1.05
NX	590	30	5.1%	649	316	0.49	336	0.52
P	2755	133	4.8%	3263	1887	0.58	1860	0.57
PA	1676	102	6.1%	1756	1021	0.58	530	0.30
PB	179	8	4.5%	190	47	0.25	58	0.31
PC	723	45	6.2%	771	368	0.48	373	0.48
PD	73	3	4.1%	89	27	0.30	19	0.21
PE	2167	145	6.7%	2299	1548	0.67	1477	0.64
PF	382	16	4.2%	410	45	0.11	48	0.12
PG	1568	113	7.2%	1622	486	0.30	322	0.20
PH	96	3	3.1%	100	13	0.13	22	0.22
PJ	317	32	10.1%	342	265	0.77	150	0.44
PK	175	12	6.9%	186	84	0.45	66	0.35
PL	721	41	5.7%	777	398	0.51	380	0.49
PM	64	8	12.5%	64	41	0.64	27	0.42
PN	13805	608	4.4%	16193	8268	0.51	7829	0.48
PQ	8247	476	5.8%	8864	2131	0.24	1689	0.19
PR	20776	1414	6.8%	22079	11788	0.53	9554	0.43
PS	21881	1660	7.6%	23600	21372	0.91	14407	0.61
PT	4044	96	2.4%	4533	767	0.17	574	0.13
PZ	247	10	4.0%	251	88	0.35	67	0.27
Total	**191164**	**12546**	**6.6%**	**213854**	**120872**	**0.57**	**128030**	**0.60**

*In February 2002, Booth library moved back into the renovated space and started to use Endeavor's Voyager, an integrated library system, since summer 2002. The system can provide even more detailed circulation data.

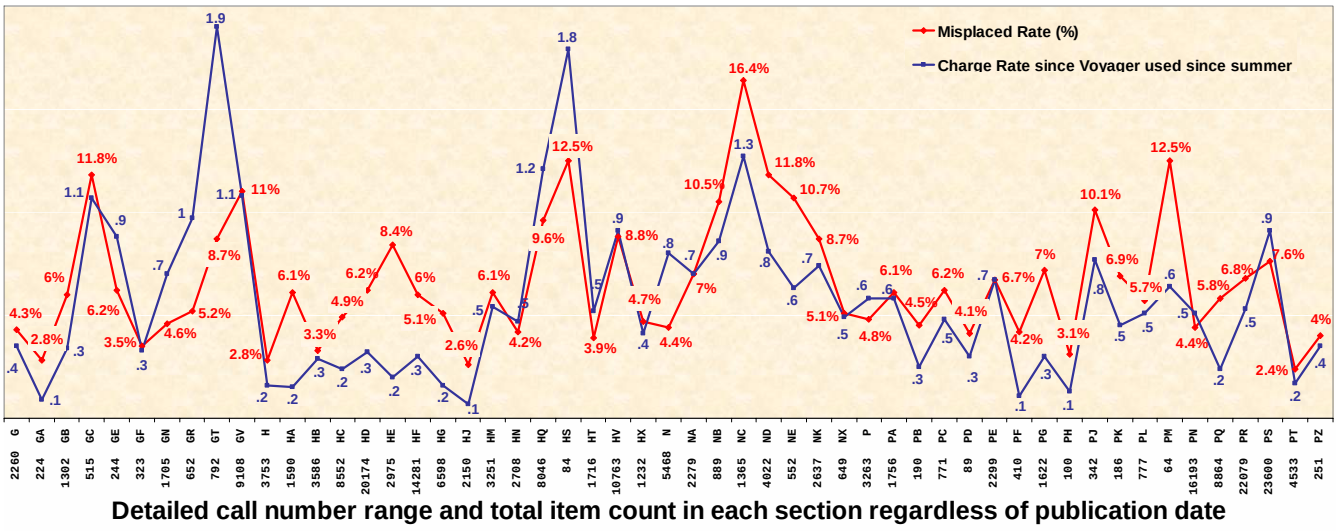
Table 3. Correlation coefficients among three variables

	Charge Rate	Browse Rate
Misplaced Rate	.694 **	.631**
Charge Rate		.906**

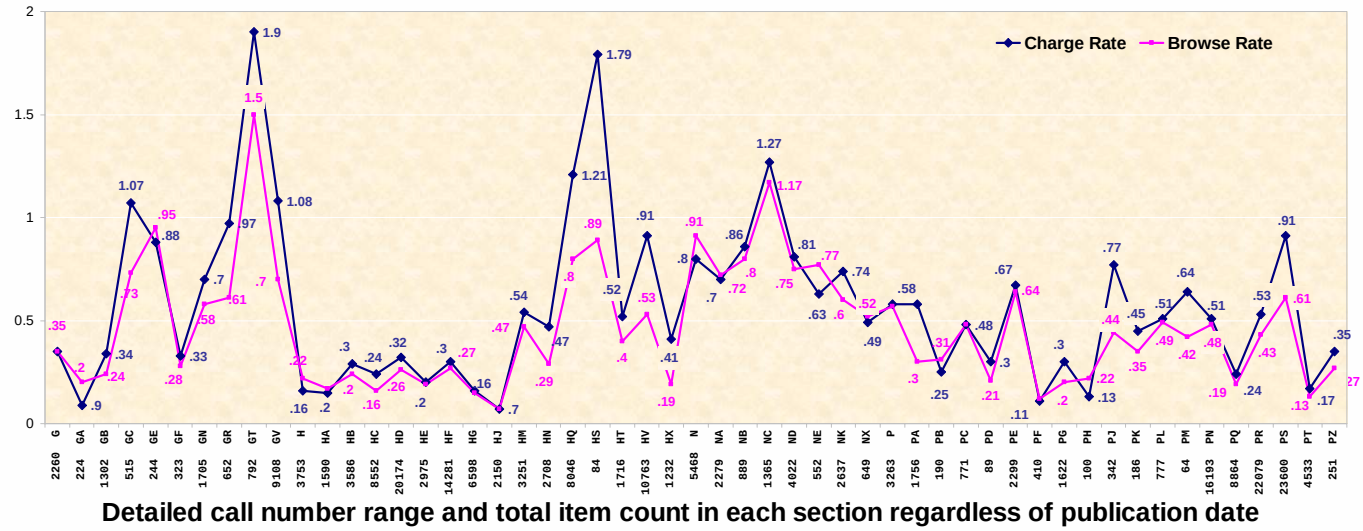
** Correlation is significant at the .001 level (2-tailed).

It is clear that these three variables vary together. The correlation coefficient R between the misplaced rate and charge rate is .69 ($p < .01$). Approximately, 48% ($.69^2$) of misplaced items in the stacks can be attributed to circulation. The correlation coefficient between the misplaced rate and the browse rate is .63 ($p < .01$). Again, 40% of misplaced items in the stacks can be explained by patrons using books while in the library. The extent of using books in the library is almost as great as that of borrowing them (Graph 10).

Graph 9. Misplace rate & recent charge rate (charges made since summer 2002)



Graph 10. Charge rate vs. browse rate (charges and browses made since summer 2002)

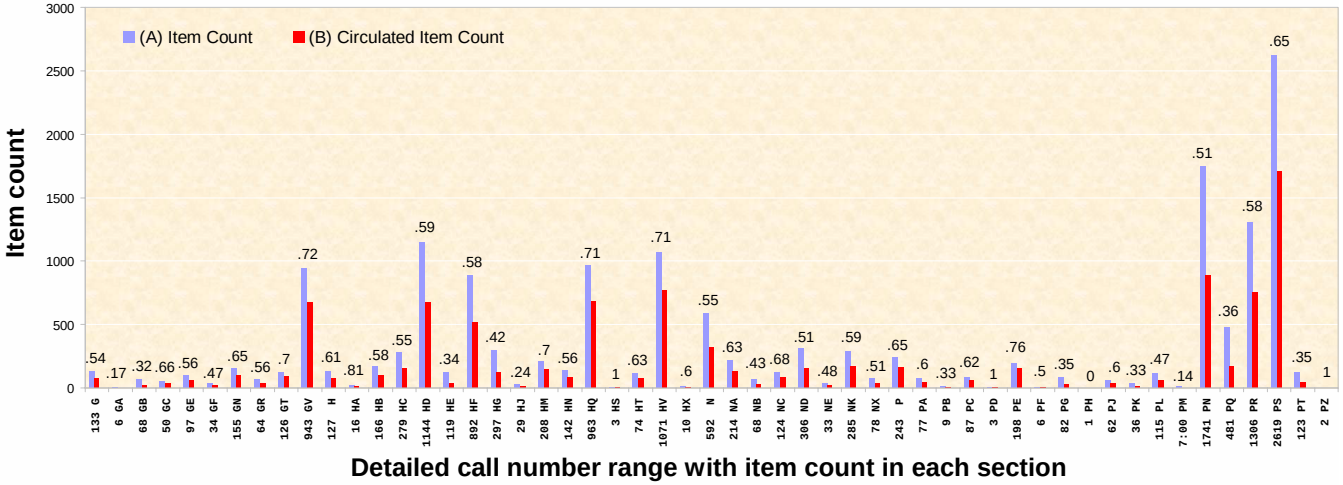


More than 40% of undergraduate students borrowed materials from the library during the Spring Semester 2006. An unknown number of students used an almost equal amount of materials in the library. Eighty-two percent of students who responded to the survey data claimed they had used books provided by Booth Library (Graph 2). All these facts sufficiently demonstrate that students at Eastern Illinois University use our library beyond merely using the computer labs.

This data also can be useful in identifying the strong or weak areas of the collections held in Booth Library. With proper manipulation, the integrated library systems can identify areas which have a high charge or browse rate but a low item count, or vice versa. **Graph 9** illustrates the usage of print materials since summer 2002, by showing the extent of mislocation and the charge counts over the entire collection, regardless of publication date. In this next case, our investigation will be focused on materials recently acquired, which is defined as "items published since 2000" (Table 4, Table 5, Graph 11 & Graph 12). Note, Booth library is more likely to purchase newly-published items rather than retrospective materials. Books recently acquired at our library have a relatively healthy circulation record. Sixty percent of collections recently acquired in the stacks area have been circulated within the last three years. Circulated items were charged, on average, 2.7 times during the same period of time.

Table 4 shows the circulation statistics of recently-acquired stacks books of the LC classes G, H, N, and P. Column A is the item count, Column B is the number of circulated items, Column C is the number of browsed items, and Column D is the number of items which have circulated or browsed. Column E is the ratio between the number of circulated items and the item count (B/A). Column F is the ratio between the number of circulated or browsed items and the item count (D/A). For example, the GC section had 50 items published since 2000, of which 33 items were circulated and 27 items were browsed; 38 items were either circulated or browsed or both (11 were circulated only, 22 were circulated and browsed, and 5 were browsed only)**.** In short, two thirds of the books published since 2000 in the GC section have been circulated since summer 2002. On average, the circulated items in the GC section were charged out more than 5 times per item (Col J) during the same period.

Graph 11. Circulated item ratio from the summer 2002 for items published since 2000

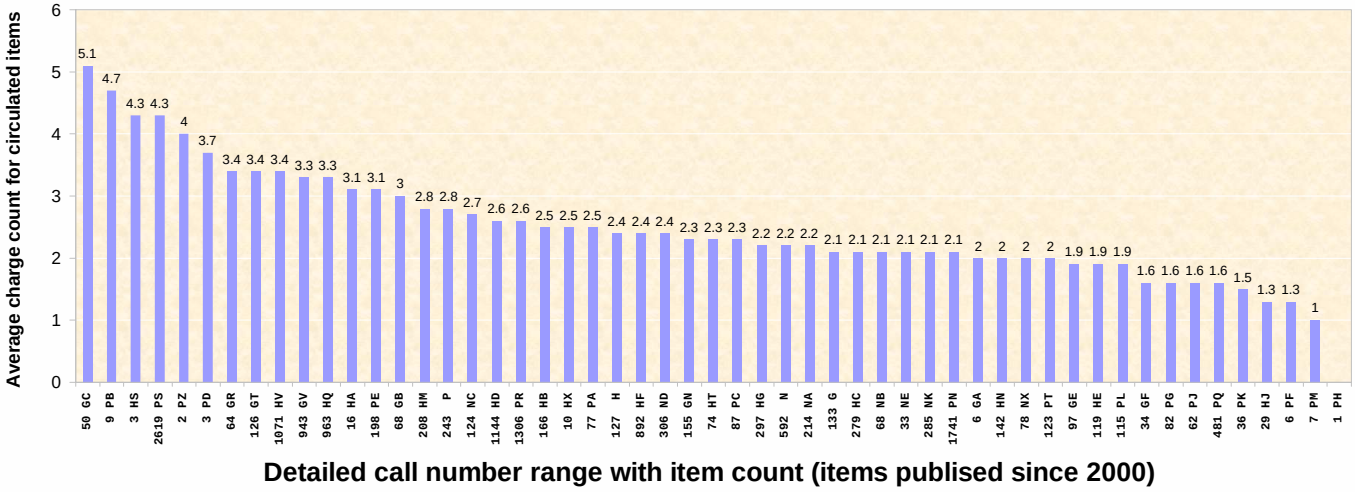


Based on **Graph 9**, the GA section has a low circulation rate as well as a low displaced rate. From the beginning, the collection size for this section was small, having only 224 items altogether. There were only 6 items owned by Booth Library which were published since 2000. Only one of them was circulated twice within the last three years. It may be difficult to tell if low circulation in the section was due to lack of availability of materials or lack of need among users.

The H section has a low circulation rate as well as low displaced rate based on **Graph 9**. However, 60% of recently-acquired books in the H section (78 out of 127) have been circulated, on average, 2.4 charges. The HA section also had a low circulation record but a medium displaced rate based on **Graph 9**. There were only 16 recently-acquired books in the section and 81% of them were circulated, on average, 3.1 charges. The HS section, identified as high circulation and high displaced rate in **Graph 9,** had only 84 books altogether. Only 3 books were recently acquired for this section, all of which were circulated, on average, 4.3 charges. Table 4 is rearranged by Circulated Item Rate (Col E) in Table 5.

Graph 12 shows average charge count of circulated items (Col J in Table 4) published since 2000 during the last three years in descending order. It becomes clear which sections need more attention for collection development at Booth Library. This information will be very useful to bibliographers who are anxious to know detailed circulation statistics on the materials they purchased. Understanding where the needs are, especially in an era when the buying power of print materials keeps shrinking every year, is a crucial task in the provision of quality library services.

Graph 12. Average charges since summer 2002 for circulated items published since 2000



5. Conclusion

Many existing data have the potential to generate abundant knowledge when properly treated. However, in order to accomplish this, certain skills are needed, which exist in the form of tacit knowledge, stored in specific individuals, and often unknown to others. If an organization is large, it is even more challenging to be aware of all the assets each individual could provide. Different ways of collecting, manipulating, and interpreting data have been discussed in the present paper. If, however, the knowledge created by our research is hidden

on one person's desktop or brain, it is a waste of time, energy, and resources. One of the fundamental goals of Knowledge Management is how we share the knowledge created with as many people as possible.

The rapid development of ways of sharing information has been phenomenal, especially since the World Wide Web was fully formed in the mid 1990s (Gillies, 2001). Emailing revolutionized the way to communicate, saving time as well as paper. A locally centralized location, such as the Intranet, also makes the sharing of information even more efficient. Once information is posted on an Intranet site, people who need the information can visit the site and retrieve the information they need whenever they want. The technologies used to share information are readily available, but how to entice people to use them is ever challenging because human nature is resistant to change. On the other hand, people may not want to share created knowledge for a variety of reasons. It may reveal something that can be hurtful to others or the person who owns the knowledge may not want to share because the knowledge may have potential for power. However, people need to collaborate for knowledge creation. It is apparent that knowledge creation cannot be done by one person; it needs several people's expertise and collaboration among them. It is a good library management to orchestrate the sharing of hidden knowledge and professional expertise, building the strongest team possible within the library organization, and encouraging the interplay which leads to effective knowledge management.

Table 4. Detailed circulation and browse statistics on items published since 2000 in the stacks, G, H, N, and P since summer 2002

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
	Item Count	**Circulated Item Count**	**Browsed Item Count**	**Circ'd or Browsed Item Count**	**Circ'd Item Rate (B / A)**	**Circ'd or Browsed Item Rate (D/A)**	**Charge Count**	**Browse Count**	**Charge Rate by Item Count (G / A)**	**Charge Rate by Circ'd Items (G / B)**
G	133	72	61	85	.54	.64	153	143	1.2	2.1
GA	6	1	2	2	.17	.33	2	7	.3	2.0
GB	68	22	20	29	.32	.43	65	40	1.0	3.0
GC	50	33	27	38	.66	.76	167	83	3.3	5.1
GE	97	54	50	64	.56	.66	104	127	1.1	1.9
GF	34	16	11	19	.47	.56	25	33	.7	1.6
GN	155	100	79	110	.65	.71	230	192	1.5	2.3
GR	64	36	30	40	.56	.63	121	66	1.9	3.4
GT	126	88	81	101	.70	.80	296	270	2.3	3.4
GV	943	678	561	747	.72	.79	2267	1648	2.4	3.3
H	127	78	83	94	.61	.74	185	270	1.5	2.4
HA	16	13	14	15	.81	.94	40	42	2.5	3.1
HB	166	97	83	108	.58	.65	247	230	1.5	2.5
HC	279	153	121	177	.55	.63	324	295	1.2	2.1
HD	1144	670	509	754	.59	.66	1747	1439	1.5	2.6
HE	119	40	47	58	.34	.49	75	108	.6	1.9
HF	892	514	477	608	.58	.68	1221	1221	1.4	2.4
HG	297	125	119	160	.42	.54	276	293	.9	2.2
HJ	29	7	13	15	.24	.52	9	15	.3	1.3
HM	208	146	112	154	.70	.74	403	387	1.9	2.8
HN	142	80	65	90	.56	.63	162	174	1.1	2.0
HQ	963	684	562	751	.71	.78	2255	1821	2.3	3.3
HS	3	3	2	3	1.00	1.00	13	5	4.3	4.3
HT	117	74	55	80	.63	.68	171	163	1.5	2.3
HV	1071	765	598	831	.71	.78	2563	1623	2.4	3.4
HX	10	6	7	8	.60	.80	15	9	1.5	2.5
N	592	323	435	477	.55	.81	708	1369	1.2	2.2
NA	214	134	173	184	.63	.86	290	522	1.4	2.2
NB	68	29	48	52	.43	.76	62	150	.9	2.1
NC	124	84	87	99	.68	.80	227	274	1.8	2.7
ND	306	155	243	257	.51	.84	377	669	1.2	2.4
NE	33	16	25	26	.48	.79	34	57	1.0	2.1
NK	285	169	171	214	.59	.75	350	469	1.2	2.1
NX	78	40	38	49	.51	.63	79	122	1.0	2.0
P	243	159	134	174	.65	.72	438	429	1.8	2.8
PA	77	46	34	50	.60	.65	116	77	1.5	2.5
PB	9	3	4	4	.33	.44	14	29	1.6	4.7
PC	87	54	47	59	.62	.68	122	139	1.4	2.3
PD	3	3	2	3	1.00	1.00	11	4	3.7	3.7
PE	198	151	142	162	.76	.82	474	552	2.4	3.1
PF	6	3	2	3	.50	.50	4	5	.7	1.3
PG	82	29	27	36	.35	.44	47	65	.6	1.6
PH	1	0		0	.00	.00	0	0	.0	
PJ	62	37	27	41	.60	.66	60	57	1.0	1.6
PK	36	12	10	15	.33	.42	18	20	.5	1.5
PL	115	54	54	71	.47	.62	104	123	.9	1.9
PM	7	1	1	1	.14	.14	1	2	.1	1.0
PN	1741	891	1197	1336	.51	.77	1908	2887	1.1	2.1
PQ	481	171	291	313	.36	.65	280	575	.6	1.6
PR	1306	752	811	977	.58	.75	1980	2044	1.5	2.6
PS	2619	1702	1486	1905	.65	.73	7293	5348	2.8	4.3
PT	123	43	43	59	.35	.48	86	86	.7	2.0
PZ	2	2	1	2	1.00	1.00	8	3	4.0	4.0
Total	**16157**	**9618**	**9322**	**11710**	**.60**	**.72**	**28227**	**26781**	**1.7**	**2.9**

Table 5. Detailed circulation and browse statistics on items published since 2000 in the stacks, G, H, N, and P since summer 2002 (Arranged by Circulated Item Rate – Col E)

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
	Item Count	**Circulated Item Count**	**Browsed Item Count**	**Circ'd or Browsed Item Count**	**Circ'd Item Rate (B / A)**	**Circ'd or Browsed Item Rate (D/A)**	**Charge Count**	**Browse Count**	**Charge Rate by Item Count (G / A)**	**Charge Rate by Circ'd Item (G / B)**
HS	3	3	2	3	1.00	1.00	13	5	4.3	4.3
PD	3	3	2	3	1.00	1.00	11	4	3.7	3.7
PZ	2	2	1	2	1.00	1.00	8	3	4.0	4.0
HA	16	13	14	15	.81	.94	40	42	2.5	3.1
PE	198	151	142	162	.76	.82	474	552	2.4	3.1
GV	943	678	561	747	.72	.79	2267	1648	2.4	3.3
HQ	963	684	562	751	.71	.78	2255	1821	2.3	3.3
HV	1071	765	598	831	.71	.78	2563	1623	2.4	3.4
GT	126	88	81	101	.70	.80	296	270	2.3	3.4
HM	208	146	112	154	.70	.74	403	387	1.9	2.8
NC	124	84	87	99	.68	.80	227	274	1.8	2.7
GC	50	33	27	38	.66	.76	167	83	3.3	5.1
GN	155	100	79	110	.65	.71	230	192	1.5	2.3
P	243	159	134	174	.65	.72	438	429	1.8	2.8
PS	2619	1702	1486	1905	.65	.73	7293	5348	2.8	4.3
HT	117	74	55	80	.63	.68	171	163	1.5	2.3
NA	214	134	173	184	.63	.86	290	522	1.4	2.2
PC	87	54	47	59	.62	.68	122	139	1.4	2.3
H	127	78	83	94	.61	.74	185	270	1.5	2.4
HX	10	6	7	8	.60	.80	15	9	1.5	2.5
PA	77	46	34	50	.60	.65	116	77	1.5	2.5
PJ	62	37	27	41	.60	.66	60	57	1.0	1.6
HD	1144	670	509	754	.59	.66	1747	1439	1.5	2.6
NK	285	169	171	214	.59	.75	350	469	1.2	2.1
HB	166	97	83	108	.58	.65	247	230	1.5	2.5
HF	892	514	477	608	.58	.68	1221	1221	1.4	2.4
PR	1306	752	811	977	.58	.75	1980	2044	1.5	2.6
GE	97	54	50	64	.56	.66	104	127	1.1	1.9
GR	64	36	30	40	.56	.63	121	66	1.9	3.4
HN	142	80	65	90	.56	.63	162	174	1.1	2.0
HC	279	153	121	177	.55	.63	324	295	1.2	2.1
N	592	323	435	477	.55	.81	708	1369	1.2	2.2
G	133	72	61	85	.54	.64	153	143	1.2	2.1
ND	306	155	243	257	.51	.84	377	669	1.2	2.4
NX	78	40	38	49	.51	.63	79	122	1.0	2.0
PN	1741	891	1197	1336	.51	.77	1908	2887	1.1	2.1
PF	6	3	2	3	.50	.50	4	5	.7	1.3
NE	33	16	25	26	.48	.79	34	57	1.0	2.1
GF	34	16	11	19	.47	.56	25	33	.7	1.6
PL	115	54	54	71	.47	.62	104	123	.9	1.9
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HG	297	125	119	160	.42	.54	276	293	.9	2.2
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PG	82	29	27	36	.35	.44	47	65	.6	1.6
PT	123	43	43	59	.35	.48	86	86	.7	2.0
HE	119	40	47	58	.34	.49	75	108	.6	1.9
PB	9	3	4	4	.33	.44	14	29	1.6	4.7
PK	36	12	10	15	.33	.42	18	20	.5	1.5
GB	68	22	20	29	.32	.43	65	40	1.0	3.0
HJ	29	7	13	15	.24	.52	9	15	.3	1.3
GA	6	1	2	2	.17	.33	2	7	.3	2.0
PM	7	1	1	1	.14	.14	1	2	.1	1.0
PH	1	0	0	0	.00	.00	0	0	.0	
Total	**16157**	**9618**	**9322**	**11710**	**.60**	**.72**	**28227**	**26781**	**1.7**	**2.9**

Appendix 1. Booth Library Satisfaction Survey Form

EASTERN ILLINOIS UNIVERSITY SURVEY – QUESTIONNAIRE FORM

IMPORTANT DIRECTIONS FOR MARKING ANSWERS

USE No. 2 PENCIL ONLY

- Do NOT USE PENS.
- Make heavy blank marks that completely fill circle.
- Erase clearly any answer you change.
- Make no stray marks.

GENERAL DIRECTIONS

BOOTH LIBRARY
Patron Satisfaction Survey
Spring 2004

Instructions: Please answer the following questions regarding services, resources, and facilities at Booth Library.

Rating Scale: Question 1 through 11
Y = yes
N = no

CODES

A	B	C	D	E	F	G	H	I
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

	Y	N
1. I have used the library's book collection.	○	○
2. I have used the library's periodicals collection (journals, newspapers and magazines).	○	○
3. I have used the library's media collection (DVDs, videos, CDs).	○	○
4. I have used the library's interlibrary loan services.	○	○
5. I have used the library's photocopying facilities.	○	○
6. I have used study areas in the library.	○	○
7. I have used the library's computers.	○	○
8. I have used the Booth Library website.	○	○
9. I have used the online catalog ILLINET Online.	○	○
10. I have used the library's electronic resources (indexes, full text databases, etc.)	○	○
11. I have received instruction in the use of Booth Library.	○	○

Rating Scale: Questions 12 through 25

SD = Strongly disagree
D = Disagree
N = I neither agree nor disagree
A = Agree
SA = Strongly agree

	SD	D	N	A	SA
12. I am satisfied with the library's book collection.	○	○	○	○	○
13. I am satisfied with the library's periodicals collection (journals, newspapers, & magazines).	○	○	○	○	○
14. I am satisfied with the library's media collection (DVDs, videos, CDs).	○	○	○	○	○
15. I am satisfied with interlibrary loan services.	○	○	○	○	○
17. I am satisfied with study areas in the library.	○	○	○	○	○
18. I am satisfied with library hours.	○	○	○	○	○
	○	○	○	○	○

Continued on back ☞

Rating Scale: Questions 12 through 25

SD = Strongly disagree
D = Disagree
N = I neither agree or disagree
A = Agree
SA = Strongly agree

	SD	D	N	A	SA
19. I am satisfied with the availability of computers in the library.	○	○	○	○	○
20. I ma satisfied with the booth library website.	○	○	○	○	○
21. I am satisfied with the online catalog ILLINET Online.	○	○	○	○	○
22. I am satisfied with the library's electronic resources. (indexes, full text databases, etc.)	○	○	○	○	○
23. I am satisfied with the helpfulness of the library staff.	○	○	○	○	○
24. I am satisfied with the instruction provided by the library.	○	○	○	○	○
25. Overall, I am satisfied with Booth Library's services.	○	○	○	○	○
26. With of the following best describes you: 1) undergraduate student 2 graduate student 3) faculty 4) staff 5) other	1 ○	2 ○	3 ○	4 ○	5 ○
27. If you are an undergraduate student, are you: 1) freshman 2) sophomore 3) junior 4) senior 5) other	○	○	○	○	○
28. How frequently do you use Booth Library service 1) at least once a day 2) at least once a week 3) at least once a semester 4) at least once a year 5) never	○	○	○	○	○
THANK YOU FOR COMPLETEING OUR SERVEY. PLEASE SHARE YOUR COMMENTS AND SUGGESTIONS ABOUT HOW WE CAN IMPROVE LIBRRAY SERVICES IN THE BLANK SPACE BELOW					
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○

References

Atkins, S. (1996). Mining automated systems for collection management. *Library Administration & Management, 10* (1), 16-19.

Chou, S.W., & He, M.Y. (2004). Knowledge management: the distinctive roles of knowledge assets in facilitating knowledge creation. *Journal of Information Science, 30* (2), 146-164.

Collier, D., Mahoney, J., & Seawright, J. (2004). Claiming too much: warnings about selection bias. In H. E. Brady, & D. Collier. (Eds.), *Rethinking social inquiry: diverse tools, shared standards.* (pp. 85-102). Lanham, Md: Rowman & Littlefield.

Conte, C. (January 31, 2006). Expert exodus. *Governing Magazine,* Retrieved April 4, 2006, from Lexis-Nexis Academic Universe database.

Davenport, T. (2005). *Thinking for a living: how to get better performance results from knowledge workers*. Boston, MA: Harvard Business School Press.

Gates, B. (November 28, 2005). The new road ahead; How 'intelligent agents' and mind-mappers are taking our information democracy to the next stage. *Newsweek International,* p. 84. Retrieved April 4, 2006, from Expanded Academic ASAP Plus database. (Article A141872232).

Gillies, J. (2001). Whence the web? *The OECD Observer, 224* (Jan), 67-70. Retrieved on March 5, 2006, from WilsonSelectPlus database.

Nonaka, I. (1991). The knowledge-creating company. *Harvard Business Review, 69* (6), 96-104.

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and leadership: A unified model of dynamic knowledge creation. *Long range planning, 33*(1), 5-34.

Owrang O., M. M. (2006). Discovering Implicit Knowledge from Data Warehouse. In E. Coakes, & S. Clarke. (Eds.), *Encyclopedia of Communities of Practice in Information and Knowledge Management*. (pp. 131-137). Hershey, PA: Idea Group.

Wagner-Döbler, R. (2004). Tacit knowledge, knowledge management, library science – No bridge between? In H. C. Hobohm (Ed.), *Knowledge management: Libraries and librarians taking up the challenge*. (pp. 39-46). München, Germany: IFLA.

Wright, A. (2006, January 13). Libraries as places to linger and mingle. *Christian Science Monitor,* p. 9.