CIRCULATION, SELF-CHECK AND MATERIALS SECURITY AT BERKELEY PUBLIC LIBRARY

PAST PRESENT FUTURE

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EXECUTIVE SUMMARY

The circulation of materials is one of the primary functions of a library. It entails a number of different user and staff activities, from the check-out of items to their eventual return to the shelf. Circulation of materials from public libraries has shown a steady increase over the last decades in spite of the increased use of electronic materials by the public. To mitigate the impact of this increased activity on staff and public time, the library community has deployed technologies that allow libraries to provide increased service without an equivalent increase in staff. Two decades ago, cards and microfiche-based systems were replaced by a combination of barcodes (for item circulation) and electromagnetic strips (for security system detection). Today, RFID technology, which provides both item circulation and security system detection, is the solution of choice for libraries making circulation technology purchases.

BPL has increased its service level over the recent decades by making use of the new technologies: the online catalog; internet access for patrons, including free WiFi in the library; online access to newspapers, magazines and journals; and circulation and security technologies. This document provides information about the circulation and security technologies used in the past and currently. It also gives an indication of potentially useful technologies that could benefit the BPL community in the near future.

More importantly, however, the document provides data that shows that BPL is indeed providing a significant increase in customer service without a related increase in staff. Staff is the greatest expense that a public library has, and adding a new staff member generally means taking on one full FTE of salary and benefits cost. As reported to the California State Library, in fiscal year 2007-2008, 76% of BPL's total operating expenses went to salaries and benefits. This is comparable to neighboring libraries: in Oakland the percentage was 79% for that same period; in San Francisco it was 74%. [1] Given the current budget situation, funding to satisfy rising patron demand solely with additional staff hours is unavailable. Yet, the poor economic climate means that the demand on public libraries is increasing. Consequently, as with many other institutions today, the efficiencies that can be achieved through a combination of staff and appropriate use of technology are the key to meeting the public's service demands efficiently and effectively.

Some BPL Key Facts:

> Total circulation FY 2009-2010: ~2 million
>
> Increase in circulation 1989-2009: 118%
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> Increase in circulation 2005-2009: 31%
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> Circulation per capita FY2009: 18.2
>
> Circulation per hour open FY 2009: 140 items
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> Percent of circulation that is media: 40%
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> Number of items in transit between branches per day: 5,000 average
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> Percent increase in holds, 2008-2010: 49%

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[1] Figures for Berkeley Public Library are taken from the reports prepared for the California State Library Statistics project, the most recent of which are available at http://www.library.ca.gov/lds/librarystats.html

BPL Compared to California Average

In nearly every area where service can be measured, the Berkeley Public Library can be shown to be a leader in the state of California. It has a highly active user base (circulation per capita and visits per capita), and the library responds to that demand in its provision of materials for those users (materials expenditures per capita and total items available per capita).
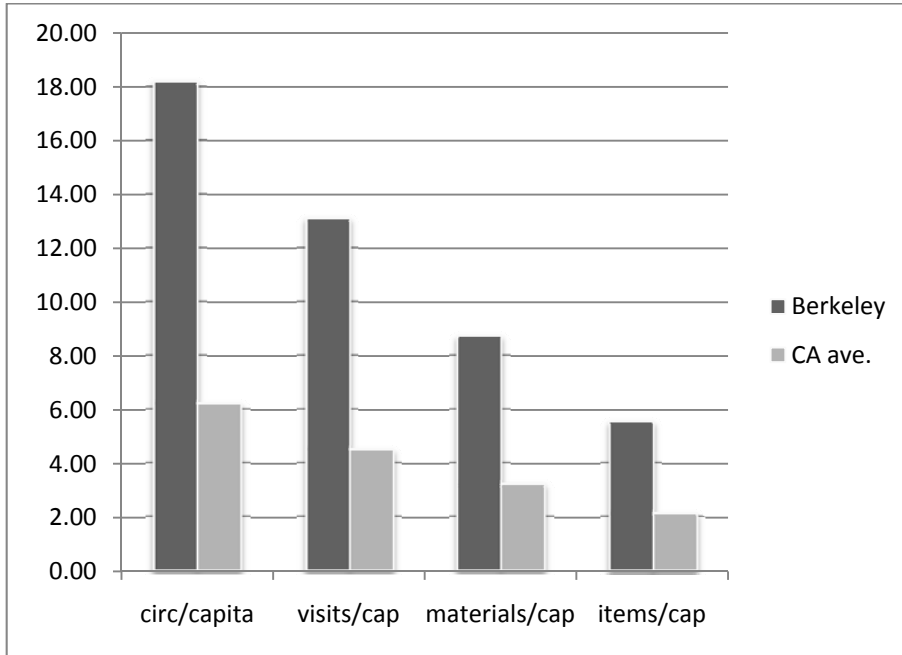
CIRCULATION AND SECURITY

While it is common to focus on checking out materials to patrons, the circulation activity is a multi-function cycle of activities:

1.   Checking out of materials
2.   Providing security for materials that have not been checked out
3.   Checking in of materials returned
4.   Collection of fines and fees
5.   Entry and management of patron accounts
6.   Selection of returned materials based on extant patron holds, and fulfillment of those holds
7.   Re-securing checked-in items
8.   Re-shelving of items
9.   Management of overdue, lost and damaged materials.

The most staff-intensive activities are those numbered 3-9. These account for a majority of the staff time dedicated to the circulation function.

Circulation department staff also provides face-to-face patron services at the circulation desk, the information desk and the paging desk of the Central library. At branches, with fewer staff, circulation level staff are an important part of the patron interaction in a variety of functions.

Securing of library materials has as its goal the prevention of theft without negatively impacting the user experience. Most users should be almost unaware that security measures are in place, and ideally will only be aware of the security gates if they should exit with materials that for some reason were not properly checked out. This means that the system should avoid false alarms. Some materials are more difficult to secure. This is primarily because all automated security to date uses some form of electromagnetic frequency technology; any items with a high metal content, from CDs and DVDs to books with metallic covers, interfere with this type of security. To date, this is a problem that technology has not resolved. Depending on their size, budgets, and amount of media circulation, libraries can choose to keep media in a guarded area, to use a vending-machine type of media dispenser, use barcodes (which require all cases to be opened manually for circulation functions), or use RFID in combination with locking cases. None of these is ideal from a patron point of view because it is always more difficult to check out media than non-media materials. In spite of this, media circulation at libraries is high and continues to grow.

## THE GROWTH IN CIRCULATION AT BPL

Circulating materials to library users is a key activity of all public libraries. Berkeley Public Library is an especially active circulating library, appearing in the top 20 of libraries in California in circulation per capita.[1] Using the statistics available to us, which range from 1987-2009, circulation at BPL has more than doubled in that time, from 894,754 in 1987 to

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1   California State Library. Library Development Services Bureau. California Library Statistics 2010; fiscal year from 2008-2009. Sacramento, California State Library, 2010. p. 12
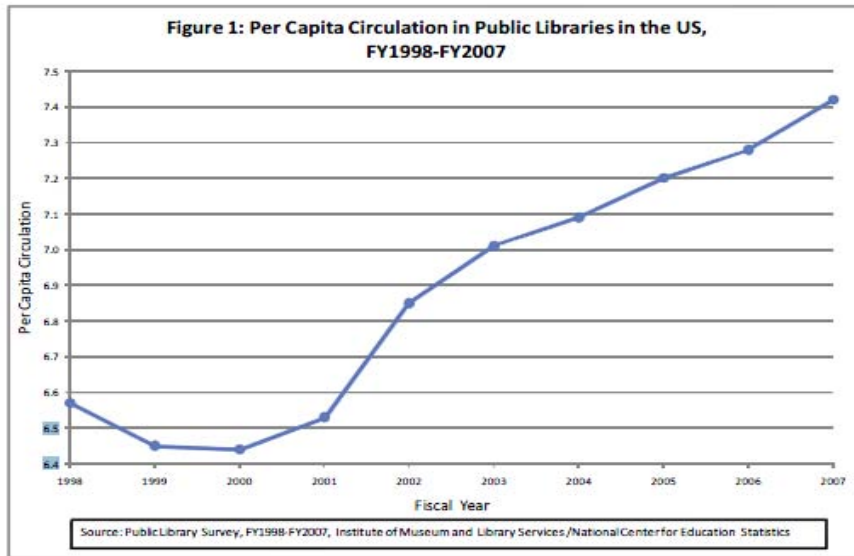
1,951,032 in 2009, and is expected to exceed two million in fiscal year 2009-2010. Today BPL circulates about **2.3 items for every minute that it is open**. [2]
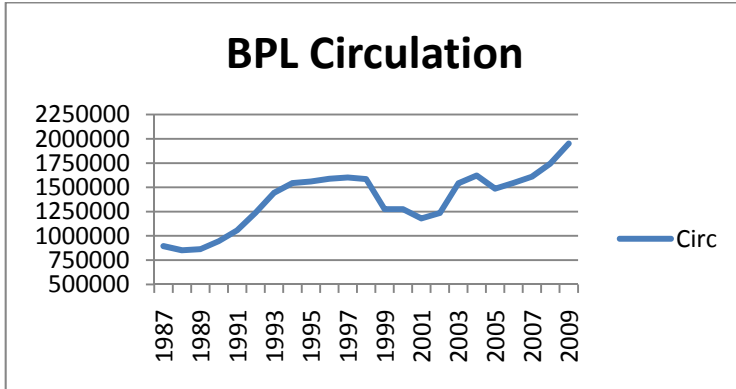
BPL Circulation

FIGURE 1 - BPL CIRCULATION OVER TIME

Note that the drop in circulation from 1999 to 2002 corresponds to the time of the renovation of the Central library. Some of the collection was in storage, and the Central library was providing service from a temporary location in downtown Berkeley. This will be reflected in all of the charts that follow.

Public libraries in the United States are seeing an increase in circulation, as this chart from the National Center for Educational Statistics shows:[3]


Figure 1: Per Capita Circulation in Public Libraries in the US, FY1998-FY2007

Source: Public Library Survey, FY1998-FY2007, Institute of Museum and Library Services/National Center for Education Statistics

FIGURE 2 - GROWTH IN CIRCULATION PER CAPITA

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[2] Figures for Berkeley Public Library are taken from the reports prepared for the California State Library Statistics project, the most recent of which are available at http://www.library.ca.gov/lds/librarystats.html

[3] Henderson, E., et al. (2009). Public Libraries Survey: Fiscal Year 2007 (IMLS-2009–PLS-02). Institute of Museum and Library Services. Washington, DC. p. 6

Berkeley's figures vary due to the Central library closure, but still show growth over time:
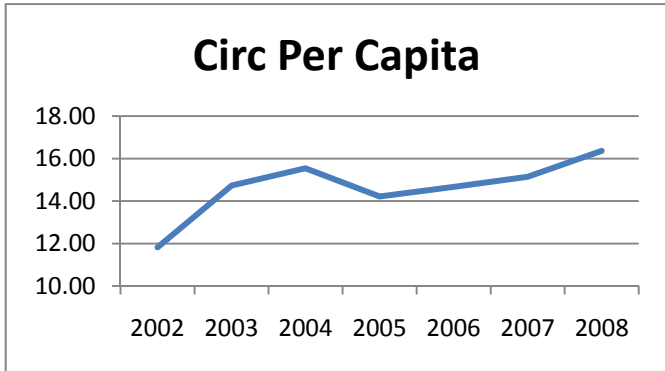
**FIGURE 3 - BERKELEY CIRCULATION PER CAPITA**

In particular, BPL's circulation has grown even though the library has had to reduce its hours. The figures for circulation per hour open indicate how dramatic this rise in use has been. Note that the downturn in circulation for years 1999 to 2002 coincide with the renovation of the Central Library and its relocation to a temporary space in downtown Berkeley.
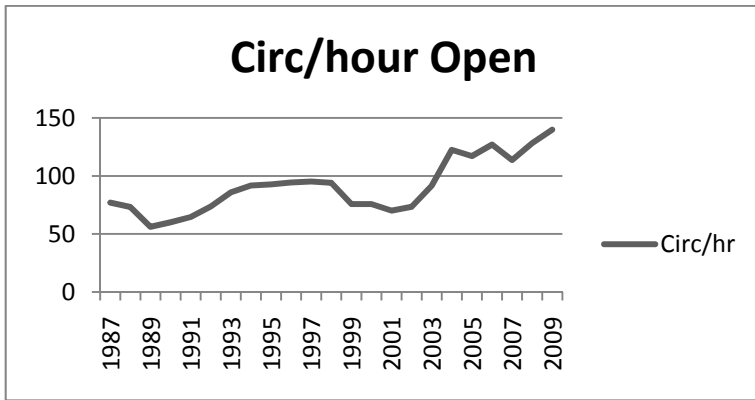

FIGURE 4 - CIRCULATION PER HOURS OPEN

The impact of increased public use of the library on staff cannot be underestimated, especially when public use grows at a rate greater than staffing capacity. Figure 5 shows that circulation per hour has grown even while both circulation department staff and overall staff FTE have declined.
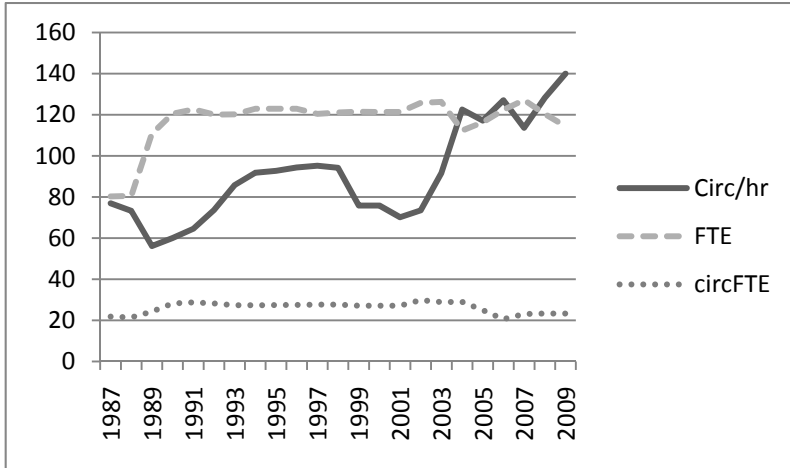
FIGURE 5 - CIRCULATION PER HOUR COMPARED TO FTE

Other circulation-related activities, such as placing holds, have undergone a similar increase in recent years. The number of holds being placed has grown significantly since users have been able to place holds on items on the shelf at any location through the library's online catalog[4]. Items with holds requests against them must be retrieved by staff from shelves or identified during the check-in process. The requested items get a printed label, and are placed on the holds shelf or transported to the requested location by the Library's delivery staff. The items' locations on the shelves are recorded in the circulation system, and staff generate daily reports on items on the holds shelf that have not been picked up and checked out by the specified date. Those items are then removed from the shelf and either readied for the next requestor or returned to the shelves if there are no additional holds on the item.
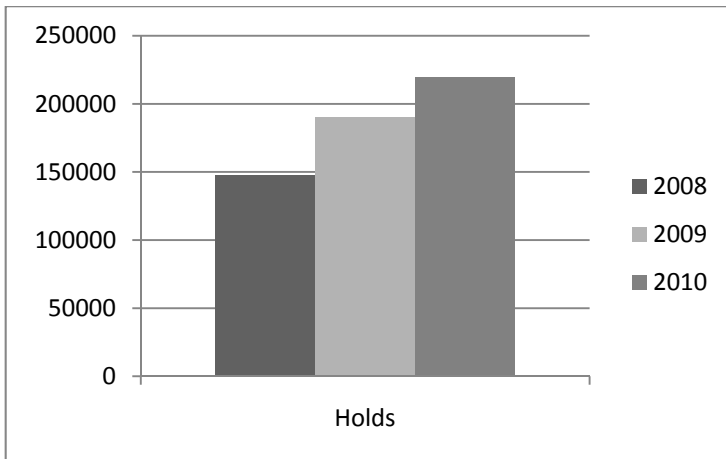
FIGURE 6 - HOLDS PER YEAR AT BPL

Holds is a labor-intensive staff activity, but is clearly providing a highly popular service to library users. From fiscal year 2008 to fiscal year 2010, **holds** have increased almost 50%. Since patrons can specify the branch at which they would like

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[4]   Before 2005 only items that were "checked-out" could be placed on hold, and patrons could only pick up holds at the "owning location".

to pick up their items, holds also contribute to the movement of items between branches. On average, five thousand items are in transit between branches on any given day.

In August 2006, BPL joined Link+, a union catalog of libraries in California and Nevada. Link+ facilitates the sharing of materials among the member libraries, allowing patrons to directly request materials from any member library. This service in effect makes BPL's collection richer and more extensive as patrons are able to borrow materials not owned directly by the Library. As the chart below shows, Berkeley patrons make a great deal of use of this service, with roughly a 90% growth in usage over the past two years. BPL also lends books to other member libraries through this system. Link+ materials for BPL patrons are held behind the circulation desk and must be checked out by staff since they are not part of the local catalog. The workflow for processing Link+ items is similar to the workflow for holds and involves pulling items from the shelves, preparing them for delivery and preparing delivered items for local pickup.
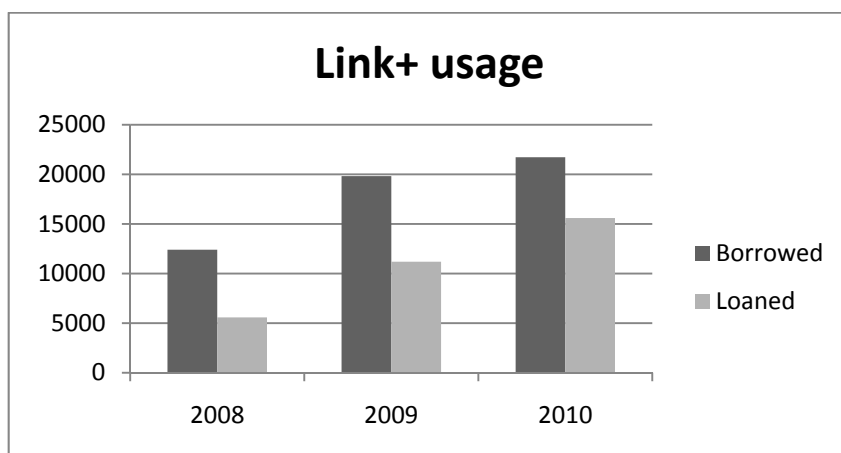

FIGURE 7 - LINK+ USAGE

TECHNOLOGY OF CHECK-IN/CHECK-OUT AND SECURITY AT BPL

Some aspects of the circulation cycle lend themselves to technology solutions. The record-keeping function, connecting the borrower to the item borrowed and monitoring due dates, is one that has gone through a number of different technology iterations. Securing the library collection has also had a technology component for at least two decades.

THE IBM-CARD ERA

In the 1980's, book circulation at BPL was performed only by staff and was done with the use of a "Recordak" machine. This machine had a built-in camera that was used by staff at the circulation desk to photograph the patron's library card (containing the name and address of the patron) next to an IBM perforated card with a sequential number. A card in each book being checked out was removed by the staff member and placed under the camera and the library card, book card and IBM card were photographed together. The book card and IBM card were then placed in each book with the IBM card being placed on top of the book card. Once the roll of film in the Recordak machine was filled it was removed from the machine and sent out to a company that converted the film into a roll of microfilm. After checking out the materials, the staff person passed them through a desensitizer which deactivated the EM strip used for the security function and allowed the user to pass through the gates. Security at that time made use of electromagnetic (EM) strips that were placed in library materials. These strips were activated in materials in the library, and the active strips would cause the

library's gates to sound an alarm. When items were returned, the staff person removed the IBM card from the book and items were then passed across a re-sensitizer to reactivate the EM strip.

Because there were no computerized circulation records, there was an Overdues Unit in the circulation department that was responsible for manually processing overdue items and notifying patrons of their overdue material. To process overdue items, a staff person would sit in front of a microfilm machine and review each dated roll of film along with the IBM cards from returned items. Items on the film for which no IBM card was present were assumed not returned. The staff person would then type up an overdue slip for each item and the slips were mailed out to the borrowers. At the Circulation Desk, a copy of the overdue slip was placed in to the borrowers' registration files. Once a fine was paid at the circulation desk, the overdue slip would be removed from the registration file. Patrons had to pay their fines and fees in full in order to renew their cards annually.

At that time, media items such as music recordings and cassettes were checked out only in the Art & Music Room and the Media Room. The actual items were stored in a secure area behind the desks in those departments. Patrons handed a staff person a card identifying the item, the staff person retrieved the item and checked it out to the patron. The Recordak system was not used for these materials. Instead there was an alphabetized circulation file usually arranged by due date. An item card with attached slips containing the patron information was put in a circulation file. When media items were returned, staff had to retrieve the item card and check out slip from the file to clear the item.

BARCODES

In summer 1991, the Central library closed for a two week period to add barcodes to all circulating materials. Following completion of the Central library collection, each branch library closed for one week at a time to barcode their collections. Utilizing barcode technology allowed the Berkeley Public Library to circulate material using an online circulation system that kept records of what items patrons had out, their due dates, date of return, and library fines. It also meant that the library no longer needed staff dedicated to manually processing overdues as this was all done by computer. The Overdues Unit staff was reassigned to work on other circulation related tasks.

About a year before going live with barcode circulation, the library began distributing library cards with a barcode that identified the patron in the circulation system. This replaced cards that had the patron's name and address.

The library began checking out material using barcode technology about a week after completion of the Central library collection. Security continued to make use of the electro-magnetic technology that was used in the IBM card era circulation system, where strips in items were de-magnetized at the time of circulation. Figure 1 shows that circulation increased significantly after this date for a number of years, although the reasons for this are not revealed by the data. One hopes that the increased efficiency of the check-out process encouraged the public to make more use of the library.

The library staff found that the barcode reading technology presented some challenges. Reading the barcode requires positioning the item at a particular angle. Light pens proved difficult to use as they required proper wrist movement across the barcode to accurately read the barcode. The library experimented with several types of lightpens and handheld laser guns to read barcodes with varying degrees of success.

The barcode technology did, however, permit the library to install four self-check stations at the Central library after its renovation was completed. The self-check stations read the barcode on the patron's library card; then the patron passed each book under the barcode reader with the barcode facing the reader. The machine checked out the book and at the

same time desensitized the EM strip using magnetic force emitted by a magnet in the self-check machine. To facilitate self-check, all barcodes were placed on the front cover of library materials.

Self-check was not compatible with the circulation and security used with non-book materials, so all media had to be checked out by staff at the circulation desk. Patrons with a mix of book and non-book media were therefore not likely to use the self-check option. The majority of materials were still being checked out by staff at the circulation desk, as were all materials at the branches since these did not have self-check stations. It is estimated that approximately 5% of materials checked out were done at the self-check stations, leaving 95% of check-out activity still being performed by staff.

RENOVATION OF THE CENTRAL LIBRARY, AND RFID IMPLEMENTATION

The Central library underwent renovation between 1999 and 2002, moving its collection to a temporary location while the work was being done on the building. During that time, circulation dropped 27%. When the building reopened in 2002, circulation began to climb. Between fiscal years 2002 and 2003, circulation increased by nearly 25%, regaining its pre-renovation level in just one year, and continues to increase to this day even though the library has reduced its open hours due to budget constraints.

In 2004, BPL entered into a contract with Checkpoint to provide RFID circulation and security options. Between 2004 and 2005, staff began affixing RFID tags to material and programming the tags. The system went live in 2005 and the circulation department staff immediately realized the benefits of checking out and checking in materials using this new technology.

Library staff reports that checking out and checking in library materials is easier and faster with RFID. The RFID technology provides both circulation control and security control with a single action. Because the staff does not have to lift materials under barcode readers and through desensitizers/re-sensitizers, materials are processed more quickly.[5] The movements required while handling items for check out and check in with RFID are clearly more ergonomic than the barcode system; the precise movements needed for barcode reading are not required and circulation department staff report fewer repetitive movement problems from using this technology.

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[5] During a webinar entitled "The Power and Pitfalls of RFID," one speaker stated that a study showed that check-out of 15 books using RFID took 11 seconds, while check of the same books using barcodes took 45 seconds. Considering that BPL staff check out 35% of all books and check-in 100%, based on these figures RFID saves 5,419 hours of staff time in one year.
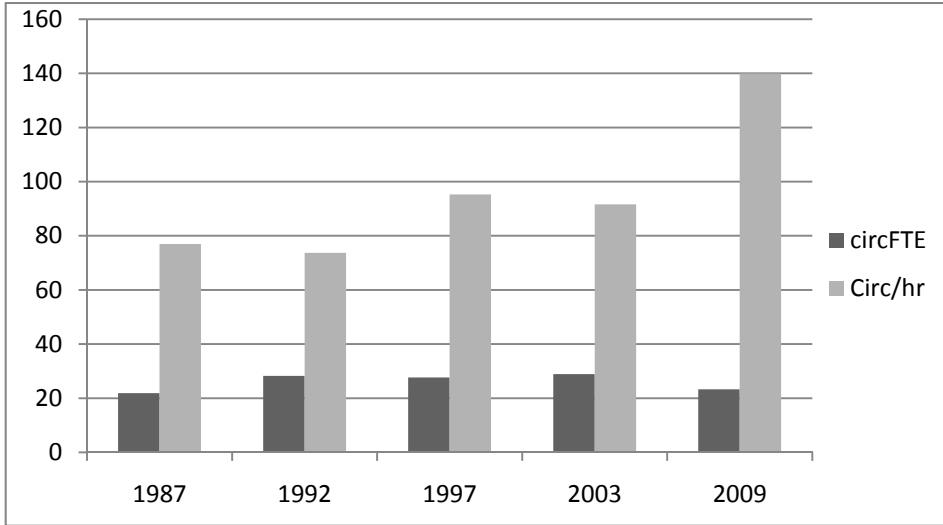
FIGURE 8 - CIRCULATION DEPARTMENT STAFFING AND CIRCULATION PER HOUR

Some staff burden is lifted due to patron self-check, which is estimated to be about 65% of all check-out transactions. As circulation increases, however, more staff time is needed to check in, transport, and re-shelve items. The increase in self-check allows staff to focus on the functions that cannot be performed by patrons, as well as to provide more public service.
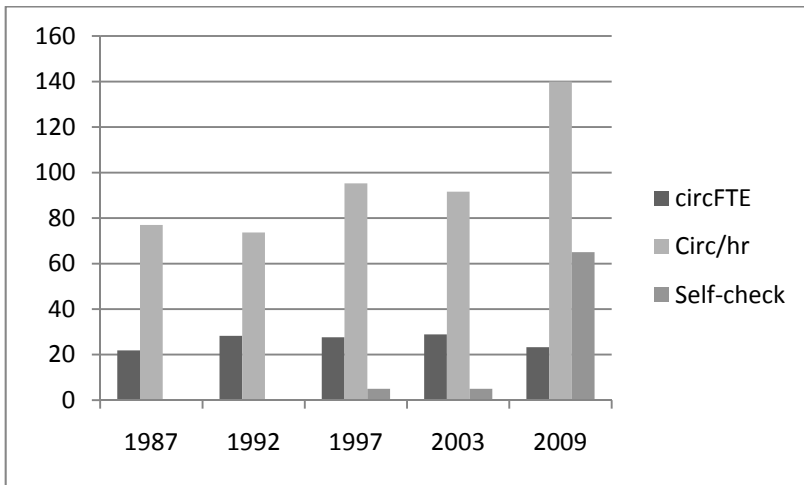
FIGURE 9 - CIRCULATION, STAFF, AND SELF-CHECK

Checkpoint's RFID system has proven not to be 100% error-free when performing self-check functions. Bad tags and programming errors at times prevent items from checking out properly at the self check machines. The main problem with checking out CDs and DVDs is related to the devices used to unlock the security cases that the items are in. However, since the maintenance contract with 3M was executed, technical support for these devices, as well as the system as a whole, has been prompt and satisfactory. BPL continues to follow the development of self-check technology for media, and will be carefully examining the media self-check options of all the vendors being considered for a replacement system.

Despite the problems with checking out media material at the self-check machines, the efficiencies obtained with the current system have allowed the library to provide more service without increasing staff. Self-check of media has a significant impact on BPL's circulation and accounts for nearly 40% of BPL's overall circulation. To maintain this level of circulation using the degree of staff efficiency that was obtained with barcode and EM strip technology just prior to the conversion to RFID, BPL would need to employ approximately double the number of circulation department staff, based on our analysis. [6]

CIRCULATION AND SECURITY FUTURE AT BPL

MOVING AWAY FROM 3M CHECKPOINT

BPL originally contracted with CheckPoint systems, a library service company, for its RFID solution hardware and software. In 2008, 3M Library Systems became the exclusive reseller and maintenance provider for the CheckPoint RFID-based Circulation, Self Check, and Materials Security System by acquiring Checkpoint. Because 3M has chosen not to sign the required City of Berkeley Nuclear Free Zone Disclosure Form, BPL is exploring contracting with a different company for its circulation and security technology via the RFP process. Under ideal circumstances, BPL would be able to keep its current technology and engage a new vendor for maintenance and continued development of the existing system. However, the CheckPoint system is proprietary to that company and cannot be maintained by another vendor. BPL is therefore constrained to move to a new technology vendor. There is an up-side to this, however, because the technology offered by vendors today has become more standardized as the market for library RFID solutions has improved. Using standards-based technology will give the library opportunities to engage with new vendors or upgrade technologies as needed while using the same tags. Although the transition to a new system will not be effortless, the resulting technology will be more compatible with hardware and software with which it must interact in the course of providing service to patrons and to the library.

Although many libraries continue to use the older technology of barcodes and EM strips, increasingly, as the need for new systems arise, libraries are choosing to transition to RFID for circulation and security. We have identified 40 public libraries throughout the state of California currently using or in the process of implementing RFID for Self-Check, Circulation and Security. This includes a range of libraries from small city libraries like the two branch Ontario City Library to large library systems such as San Bernardino County Public Library which covers 20,000 square miles of service area and has 524,060 registered library users[7]. In the greater Bay Area, the Peninsula Library System (PLS), a consortium of 35 public and community college libraries, recently decided to migrate to RFID and is in the planning stages of that project. (See Appendix)

BRANCH PROJECTS, MEASURE FF

Library renovations and improvements can result in an increased use of the renovated facility. This trend is visible in Figure 4, where library circulation rises sharply after the completion of the renovation of the Berkeley Central library building. In 2011, renovation of branch libraries will begin. As each branch re-opens, the library is likely to see an increase in use of the improved facility. Because so few staff are on hand at any given hour at the smaller branches, there is little if

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[6] In 2003, circulation was about 3.17 per staff hour; in 2009 that figure was 6.0 circulation per staff hour.

[7] State of CA Library Statistics 2008 - 2009: http://www.library.ca.gov/lds/docs/StatsPub10.pdf

any room to shift staff to meet needs. It will be imperative that staff efficiency can be maintained, and preferably increased, as the branches re-open.

Branch renovations are also a time when it is most cost-effective to install any new equipment. Space will be designed for the expected equipment. Designing new spaces for aging equipment that will need to be replaced later will result in greater costs in the future and less than ideal space utilization. If the library anticipates that a new circulation and security solution will be needed in the near term, it would be optimal to take advantage of the timing of the branch renovations.

AUTOMATED MATERIALS HANDLING (AMH)

One of the main benefits of RFID goes beyond the functions of checking out and in materials that are currently in use at BPL: RFID is the preferred technology for use with automated materials handling systems. These systems read the RFID tag of an item being returned to the library, check in the item automatically, reset its security bit, and then sort the items into separate bins based on criteria set by the library. In a multi-branch library system where items can be returned at any facility, sorting items based on their destination is a time-consuming task. Although it has only 5 locations, the exchange of materials between library branches is very high*:* on any given day, 5,000 items are in transit between BPL sites.

The ability to check in and sort materials automatically would save many hours of staff time, and would facilitate returning items to shelf more quickly, as well as moving holds to the location preferred by the requester. This technology responds to the largest bottleneck in the circulation function, which is checking in, sorting, and re-shelving of materials.

PRIVACY

Berkeley Public Library is serious about its legal, professional, and moral obligations to protect the confidentiality of its users. (Although the term "privacy" is most commonly used, the obligation to secure data relating to patron activity is more correctly expressed by the term "confidentiality.") The library recently undertook a data audit to inventory all patron-related information stored in electronic and in paper files. As a result of that process, the library created a privacy policy[8] and has developed and conducted staff training on patron privacy. BPL is confident that its practices cohere to California state law[9] and recommended professional practice.[10]

The Library is aware that there are privacy concerns relating to the use of RFID. Both the American Library Association[11] and the National Information Standards Organization[12] provide best practices for the use of RFID in libraries that include, among other things, privacy principles and practices. This includes encoding only the item's individual and randomized inventory number on the RFID tag, which is the minimum needed to circulate the item. This number does not reveal any

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[8] http://berkeleypubliclibrary.org/about_the_library/privacy_policy.php

[9] California. Code. Sections 6254 and 6267.

[10] American Library Association. ALA Policy on Confidentiality of Library Records
http://www.ala.org/alaorg/policymanual/libserve.html

[11] American Library Association. ALA Resolution on Radio Frequency Identification (RFID) Technology and Privacy Principles. http://www.ala.org/Template.cfm?Section=ifresolutions&Template=/ContentManagement /ContentDisplay.cfm&ContentID=85331

[12] National Information Standards Organization. RFID in Libraries (RP-6-2008) Final.
http://www.niso.org/apps/group_public/download.php/116/RP-6-2008.pdf

information relating to the identity of the content of the item, and is only available to library staff with secure sign-on to the library system. No patron information carried on the RFID tag. By encouraging the use of self-check, RFID allows patrons to check out materials privately, eliminating the possible embarrassment of having staff members view their selections.

BPL currently follows these recommended practices, and has since the inception of its RFID use six years ago. The library will continue to monitor developments in the area of RFID and privacy. It is worth noting that although thousands of libraries world-wide are making use of RFID technology, and some countries have decided to standardize on RFID for all of their libraries,[13] our research reveals no reports of anyone obtaining patron information through RFID technology.

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[13] Danish Agency for Libraries and Media. RFID in Libraries. http://biblstandard.dk/rfid/

APPENDIX: CALIFORNIA LIBRARIES WITH RFID

The following is a partial list of California libraries that have implemented or are in the process of implementing RFID for circulation and security.

Alameda City Free	Libramation
Alhambra	Checkpoint
Atherton	Libramation
Belmont	Libramation
Berkeley	Checkpoint
Brisbane	Libramation
Burlingame	Libramation
Carlsbad City	ITG
City of Orange	ITG
Daly City	Libramation
East Palo Alto	Libramation
Foster City	Libramation
Fresno County Public	TechLogic
Half Moon Bay	Libramation
Long Beach	ITG
Menlo Park	Libramation
Mountain View	Libramation
Ontario City	ITG
Orange County Public Library	Envisionware
Oxnard Public	Bibliotheca
Rancho Cucamonga	ITG
Redding	ITG
Redwood City	Libramation
Riverside County Public Library	Envisionware
Sacramento Public	Envisionware
San Bernardino County	ITG
San Bruno	Libramation
San Carlos	Libramation
San Diego County	Envisionware

San Mateo City	Libramation
Santa Clara City	Checkpoint
Santa Clara County	Bibliotheca
Sonoma County Library	Envisionware
South San Francisco	Libramation
Sunnyvale	Bibliotheca
Sutter County Library	ITG
Temecula Public Library	ITG
West Palm Beach	3M
Woodside	Libramation
Yolo County	Envisionware