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# The Right Book on the Right Shelf: Missing and Misshelved Books-- How Barcode Scanning Inventories Can Solve the Patrons' Dilemma

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**The Right Book on the Right Shelf:**

**Missing and Miss-shelved Books:**

**The Patrons Dilemma and**

**How Barcode Scanning Inventories Can Solve the Problem**

**Abstract:**

After over thirty years of failing to conduct a comprehensive inventory of the book collection at a large liberal arts library, our patrons complained that they could not find one in five books. Study of the problem indicated that in fact 20% of our books were either missing or miss-shelved. This article discusses the investigation of the problem and the impact after five years of conducting an annual inventory by using hand-held devices to gather barcodes and interface these with our catalog records to find the missing and miss-shelved books. The missing book rate dropped from 5.6% to less than one half percent. The miss-shelved book rate dropped steadily every year from 11.6% to 3.1%. The number of books reported as missing by our patrons dropped 90%.

The Humanities, Social Science and Education Library at Purdue University had just been renovated; every table, desk and chair was brand new and specifically designed. The new layout was successful; the library looked beautiful, and users loved it. They came in droves to meet in our break out rooms, use our new computers, and study in our carrels. However, when they went to the shelves to find books listed in our online catalog, they complained that many books were not on the shelf. We encouraged them to fill out missing book forms and one staff member spent hours looking for these books. However, the problem continued and got worse.

The Humanities, Social Science and Education Library is the largest library at Purdue with over 500,000 circulating books. As the major liberal arts library on campus the collection is heavily used. Although there are eleven other libraries on campus, about

half of the total circulation of the system comes from The Humanities, Social Science and Education Library. So it is important for our users to be able to find the books they need. Despite users' complaints, the staff initially denied that we had a miss-shelved book problem. Denial is the normal response to bad news, so this was not surprising. They defended the situation saying that all large libraries have some miss-shelving and a major shelf-reading project had just been completed after we opened, so the books could not be out of order. In addition since our searchers found two out of three books reported missing, they claimed the users just did not know how to locate a book by call number. However, the complaints continued, until finally a professor brought the issue to the Library Committee which is chaired by the Dean of Libraries and reports to the University Senate.

I was given the job of investigating the problem. Why would users have trouble finding books, if in fact our books were correctly shelved? Was there some other problem causing this dilemma? The first step was to check the literature to see how other libraries had solved similar problems. The second step was to determine the cause of the problem and then plan a solution. My investigation found that our users' perception was true, 20% of our books could not be found by the average user. Here's how I investigated the problem and what the causes were.

**Lessons from other libraries:**

Our users identified the problem as one of miss-shelved books. One solution to this is to do a complete inventory of the books, comparing each book to the shelf list

catalog record in the catalog system. We had not completed an inventory in over thirty years, but during that time the methodology had changed considerable.

Barbara Pinzelik, a Purdue public service librarian, had written an article chronicling the inventory and loss monitoring projects from the past.(Pinzelik, 1984) In 1959 our last full inventory was conducted with a loss rate of .65% of the 200,000 volumes. In 1974 an availability survey was conducted which indicated an 80% availability of books that patrons were looking for and a projected 2.3% loss rate. In 1979 the collection had grown to 600,000 volumes and the loss rate based on a sampling was 2%. This was followed up in 1980 with a search of all the new acquisitions. The assumption was that the loss rate would be higher for newer books. The rate was 1.5%. Pinzelik's work predated online catalogs and computers, so I searched for articles on using computer programs to inventory libraries.

Conducting a barcode scanning inventory is not a new idea. Libraries have been using this method since books have been barcoded, although the equipment and software has improved over the years. The concept was discussed as early as the mid 1980's. Roy Chang's article discussed what is needed to do an automated shelf-reading and inventory-project in libraries.(Chang, 1988) In 1984 and 1987 the University of Waterloo inventoried their collection of 574,824 volumes using portable scanners and an inventory management program, LPPORT, to generate the reports. The loss rate of their circulating collection was 2.76%. 44% of the missing items were found to be miss-shelved. The author concludes "that portable barcodes scanners can provide a convenient and efficient means of performing collection inventory, thereby opening up opportunities for stock

control in large libraries that have hitherto not been possible by reason of the cost and cumbersome nature of manual procedures."(Emery, 1990, page 9)

In 1987 Hofstra University's Axinn Library used their smart barcoding project as an inventory method.(Freese, 1989) Like Purdue Libraries, they had not done an inventory in 20 years. Of the 350,000 smart barcodes generated, 25,745 barcodes were left over at the end of the project, despite efforts to locate these in the checked out files, on reserve or in storage; a loss rate of over 7%. As a result of this first inventory using smart barcodes, Hofstra's Axinn Library purchased an electronic barcode reader/scanner and began periodic inventories by comparing the barcodes with their online catalog. In a more recent article, Linda Emick provides a step-by-step account of a barcode inventory in a small college collection. (Emick, 2005) She emphasized the advantages of cleaning up the orphan barcodes and floating bibs. One of the most recent articles is Lois Green's article on the various options available for capturing the barcodes using cordless hand-held barcode scanners, PDAs, and laptops with attached barcode scanners.(Green, 2008) This is an excellent article for its analysis of the equipment available today and technical specifications.

**Possible causes:**

Based on our awareness of our situation and the articles on similar problems, there were three possible causes of the dilemma:

1. The missing books were on the open shelves actually were in our **storage unit**.
2. The missing books were really **missing books**; no amount of searching would find them.

3. The missing books were in fact, as our users thought, **miss-shelved**; they were in the library, on the open shelves, but on the wrong shelf.

*Note to editor: The reviewer suggested adding this information, but I feel it breaks the flow of logic in the article and recommend either dropping this paragraph completely or putting it in a footnote to the sentence above, "Based on our awareness of our situation and the articles on similar problems, there were three possible causes of the dilemma:"*

Purdue Libraries had not converted from Dewey Decimal call numbers to Library of Congress call numbers or done other major collection changes that might have caused the problem. Neither were we barcoding on the fly, so the missing books could not be accounted for by these. A complete smart barcode project had been finished about twenty years prior, so books that were in the catalog at that time all had smart barcodes; books added after that data had new barcodes.

We were very aware of the first possible cause; that books listed as on the open shelves could be in our **storage unit**. Many years ago, as the open shelves became too full for new books, older books were moved to a storage unit. However the card catalog was not corrected. Instead the books were checked out to storage. Users assumed that if a book was not on the shelf it might be checked out so they asked to have the book recalled or held after it was returned. The first place the staff checked was the circulation file, found that it was in storage, retrieved it and notified the user that it was available. Most users just thought we were very efficient. This system worked fairly well for years. Problems really started when the card catalog was converted to an online catalog. Users assumed that the computer was right, that the location indicated in the online catalog was correct, that the book was not checked out and therefore assumed it was miss-shelved. This irritated them, and they complained that the books were miss-shelved.

We were less aware of the **missing book** problem. I suspected this might be part of the problem because the Humanities, Social Science and Education Library had not been inventoried in nearly twenty-five years. This was a cost-saving decision; inventories are time consuming and therefore expensive to do. The logic was that users would ask for the books they could not find. If we then determined that it was lost, the book was then withdrawn. If a book was in the catalog, but no one asked for it, it was not causing any user problems. This assumes that users will come and report all books that they search for and do not find. Frequently they do not report them, but just find something else on the subject that will do. Over the course of years, these missing books languished in the catalog and were part of the problem.

**Miss-shelving** seemed to be the lesser possible cause of the problem because we had completed a manual shelf reading project about a year before. The fact that our super sleuth staff member found so many of the reported missing books also seemed to indicate that this might not be the problem. However, since this was our users' perception, we wanted to investigate the extent of the miss-shelving in the library.

### **Investigating the extent of each possible cause:**

We knew that the books in the **storage unit** were at least part of the problem, but we are on track with a solution already. Over the previous year we had begun systematically reviewing every title in our storage unit. This review was more than an inventory and included withdrawing titles no longer needed and correcting the catalog record of those retained so the holdings and locations codes were correct. The project was about one third complete, so we decided to continue since within a year the project

would be completed. We did consider a "blitz" barcode project to reach a quicker solution to correct the location code in the catalog, but decided instead to do the more thorough weeding and record correction project.

We knew we had some unbarcoded books in our catalog, but since we had recently completed a barcoding project, I suspected that many of them were, in fact, missing books. In other words, we had the same problem that was described at Hofstra University; many **missing books** were still listed in the catalog. To investigate this, we ran a query of our online system looking for books that were unbarcoded and finding about 30,000 unbarcoded records. We then had students checked the shelves for 900 of these volumes; they found only 220, indicating that possibly 75%, or 22,500, of these unbarcoded books were actually missing books. Our book collection is approximately 500,000 volumes. If 22,500 were missing that indicates nearly 5%, or one book in 20, will never be found. To further test this idea that the problem was, at least in part, a **missing book** problem, we had student assistants scan 2,770 barcodes from different sections of the library. We used a Symbol CS1504 hand-held scanner. These barcodes were then compared to our online catalog records. We are using Voyager Library System and our technical staff developed the program to compare the barcodes to the Voyager Oracle database using Microsoft Access queries and code. This is a standard method to query Voyager databases. The program compares the gathered barcodes to the barcodes in the item status (to determine that the book is not checked out) and the item location (to determine that the book is in the general collection, not in references or periodicals or on reserve) and from this comparison generates reports on the books missing from the call number range, the books out of order, and a third list of books that should not be in the

general collection. These also are miss-shelved books, such as books from the reference collection or from another library on campus. This comparison indicated that 11% of the books in the sample were not on the shelf or checked out. Some of these missing books were included with the books in our storage unit, but about 90% of them were barcoded books, whereas most of the books in storage were unbarcoded. Projecting from this sample to our whole collection, we anticipated we had about 45,000 missing books. Based on this study, we realized we had a serious missing book problem: one in ten books listed in the catalog was never going to be found by the patron or the staff member because it was a lost book.

The final investigation was to determine if we also had a **miss-shelving** problem. Two studies were done to investigate this: a manual check of about 6,000 volumes and the bar-code scan study of about 3,000 volumes. The manual check indicated that 9.26 % of the books were miss-shelved, however most were on the right shelf, just not exactly in the right place. The bar-code scan study, which was done using the barcodes captured for the missing book study mentioned above, showed higher miss-shelving results: 12.6% were miss-shelved. Based on this we concluded we did have a miss-shelving problem: one in ten books was miss-shelved.

Coupling the missing book statistic with the miss-shelving statistic and the storage location problem, we in fact had a situation where one book in five was not on the shelf where the catalog indicated it should be. The cause of the problem was more complicated than our users understood, but they certainly knew that they could not find a large number of the books they wanted.

**Recommended solution:**

1. Complete the inventory of all books in storage and correct the location codes for these.
2. Annually, using hand-held scanners, capture barcodes for all books. Teams of two students can gather about 1,000 barcodes per hour. These barcodes were then downloaded to a personal computer and, using a Microsoft *Access* program, compared to our online catalog. Three reports were generated:
  - Missing books that were then tagged in the catalog as "item status missing" and withdrawn if not found within six to twelve months.
  - Miss-shelved books that were then reshelved correctly.
  - Books in the wrong location. These were retrieved and sent to their correct location, such as the Undergraduate Library or reference.

**First bar-code scan inventory:**

The first barcode scanning project was a huge undertaking. Besides the normal problems of learning how the scanners and the computer program worked, the sheer number of miss-shelved and missing books was over whelming. To ensure that we did not withdraw books that would turn up later in the inventory, we compiled lists of thousands of barcodes, all the barcodes for each Dewey area: 000's, 100's, etc. We then reran the missing book reports. After manually searching for these books, using the list of all the barcodes of the missing books we had our information technical staff globally suppressed these records from the OPAC view. The final statistic on the number of - shelved books was slightly less than we projected: 11.6% compared to the anticipated 12.6%. The number of missing books totaled 25,404, which was considerably lower than

the anticipated number of 45,000. Our missing book rate was only about 6%. Miss-shelved books can be reshelved, but missing books are long term loss since we did not have the funds to replace them. The project was so huge that we held a celebration and had local news coverage at the end. However, once we finished the first round, the project became part of the normal routine tasks. Student assistants scan every morning; one staff member then runs the reports creating the list of miss-shelved books and missing books. During each cycle the miss-shelvings are corrected, missing books are withdrawn, and any other problems found are corrected.

### **Five years later:**

We have now completed five annual inventories by scanning the bar-codes and comparing them to the catalog. The table below indicates just what the miss-shelved rate and missing rates were each year. We are averaging a loss rate of about one half of one percent and a miss-shelved rate of less than 5%. The miss-shelved rate is dropping slightly each year, partially because the shelves are in better order leading to less disorder and partially because of an effort to discourage users from reshelving by posting signs and placing book carts in the book stack areas. However, we believe that if we stopped the barcode scan inventory, the miss-shelved rate would creep up to 10 to 11% in a year or two.

### **Scan Statistics:**

	<b>Number Scanned*</b>	<b>Number Missing</b>	<b>Percentage Missing</b>	<b>Number Miss-shelved</b>	<b>Percentage Miss-shelved</b>
1 <sup>st</sup>	455,493	25,404	5.6%	52,800	11.6%
2 <sup>nd</sup>	458,783	1,724	0.4%	29,342	6.4%

3rd	484,793	1,542	0.5%	19,517	5.8%
4 <sup>th</sup>	457,962	1,558	0.3%	21,205	4.6%
5 <sup>th</sup>	455,535	853	.2%	14,002	3.1%

\* The book collection is approximately 500,000 volumes. The number of scanned barcodes is always lower because of the number of books in circulation.

### Patrons' Reports of Missing Books:

Another measure of the success of the scan/inventory is the significant drop in the number of missing books reported by our patrons. The table above indicates the actual number of missing books each year. The table below shows the number of missing book *forms* turned in by our users. Five years ago the number of books reported missing was nearly 3,000 titles. This last fiscal year the number was 249 titles; a 90% drop. This drop started with the first scan inventory and has continued to improve each year. Interesting, the percentage of books reported missing that the staff can find within a few days remains very stable.

### Number of Books Reported by Patrons as Missing

Year	Missing	Found	TOTAL	Percentage Found
2003/04	1076	1850	2926	63%
2004/05	522	1062	1584	67%
2005/06	183	409	592	69%
2006/07	157	270	427	63%
2007/08	78	171	249	69%

**Conclusion:**

The drawbacks to not doing inventories, whether electronic as described in this article or manually by comparing call numbers on the shelf, is that slowly but steadily the books become out of order. This can happen because users remove books and unintentionally replace them in the wrong order, or because shelving staff make mistakes. The first consequence of this is that the users are frustrated at the shelf and soon develop a poor opinion of the library staff's ability to organize the collection. A later consequence, when missing books are not withdrawn or suppressed from the public catalog, is that users feel that the catalog does not accurately represent what the library owns. Then their opinion of the library staff's ability to manage the library drops.

To keep an active collection of books in order it is essential to do annual or regular inventories. Our users expect the books listed in the catalog to be on the right shelf. Today inventories are much easier than they were before books were barcoded and catalog records were maintained in databases. Using hand-held scanners, student assistants can efficiently collect barcodes, which can be compared to the online catalog. Lists of missing and miss-shelved books can be produced within minutes. The gathering of barcodes takes less time than manual shelf reading and running the reports takes about one hour a day. With a collection of over 500,000 books, we are able to scan our entire collection in about ten months. Using this procedure we have completely turned around our miss-shelving and missing book problem. Users have even forgotten that in the past they complained about this; they can find the right book on the right shelf.

Performing regular inventories by scanning barcodes and comparing them with the online catalog records is well worth the time and effort. It is part of the broader collection maintenance responsibility that libraries have, and during these lean economic times when we are doing less collection building, we have the opportunity to do more collection maintenance.

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