RFID Backgrounder for Library Workers

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Radio Frequency Identification (RFID) tags, like bar codes, are used to identify individual books, CDs, DVDs and other circulating items. RFID tags can contain more information than a bar code, which is limited to a single sequence of numbers. RFID tags communicate via radio signals, whereas bar codes operate optically. Bar codes require a reader to be held up to the bar code tag -- line-of-sight -- whereas an RFID tag does not require line-of-sight. If the reader is close enough to the item, the RFID tag could even be read inside patrons' book bags as they leave the library.

How Library RFID Systems Work

An RFID system consists of tags, readers, programming stations and the various interfaces involved in communicating or linking with other systems.

Tags

RFID tags are small radio receivers with microchips and internal antennas. Library applications use high frequency tags (13.56 MHz) with a read range of approximately one meter. The microchip on each tag is programmed with unique information about the item which can be directly imported from an integrated library system (ILS) at the tag programming station. It is possible to include many types of information on the tag (such as book title, patron circulation information, date/time stamps), but library RFID tags typically only contain barcode information.

Readers

There are many different types of tag readers or scanners. Typically, the reader is responsible for generating the electrical impulse that causes the tag to be read because the tags used in libraries are usually passive -- they don't have their own source of power. The reader interrogates the tag, which then replies with the information stored on the tag.

Readers can be located at the circulation desk, self-check stations, book drops, sorting machines, exit sensors and in hand-held wands. Some readers store the information captured from the tags (which must be downloaded later) while others capture the information and immediately pass it through to the ILS.

Readers built into the exit sensors check the tag to ensure that the item was checked out. If it was not checked out, the alarm sounds. This process can be handled in one of two ways. Some vendors use a "theft bit" to indicate whether the item was discharged. Others require that the ILS be queried as the patron leaves the library.

Readers placed at the circulation desk and at self-check stations allow staff and patrons to pass stacks of books over the reader which detects all the tags inside the books. It is not necessary for each item to be scanned individually.

Inventory wands act as readers and as portable databases that store shelf lists. Library staff can use the wands to scan all the items on a shelf and detect which items are out of order or missing.

Programming Stations

In order to convert to an RFID system, all library material must be tagged and programmed. Programming, or conversion, stations are used to affix the tags to the items and program them (usually via the existing bar code).

Interfaces

Many RFID systems have a server that collects the information from each of the library's readers. The RFID server then communicates with the circulation system. SIP2 (Standard Interchange Protocol – Version 2) provides the standard for most communications between the ILS and other systems (including RFID systems). All library RFID vendors are SIP2 compliant, but compliance does not ensure smooth communications because some vendors have modified the protocol to suit their needs.

The National Information Standards Organization (NISO) is developing a new protocol to encourage better interoperability between RFID and ILS systems. The new standard, Z39.83-2002 or NCIP (National Circulation Interchange Protocol) has not yet been implemented by library RFID vendors.

Benefits

Libraries are moving to RFID systems in place of (or sometimes supplemental to) their bar code systems because of the streamlined workflows that become possible. Some have found that inventory-related tasks can be done in a fraction of the time with RFID. Many use inventory wands are used to locate lost books and to find misshelved or missing items.

RFID-based circulation systems can process many more books in a shorter period of time with little or no staff intervention. Self-check systems have become very popular with both patrons and staff, and RFID self-check systems allow patrons to check-in or check-out several books at a time. RFID-enabled self-check systems reduce the number of staff needed at the circulation desk. Because the readers do not require line-of-site, multiple items can be read simultaneously by passing a stack of books near the reader. Some say that the RFID self-check systems are easier to use than their optically-based counterparts, making it easer for patrons to serve themselves.

For archivists handling sensitive materials, the ability to inventory items without handling them is another benefit of RFID.

And while it has net yet been proven, some librarians believe RFID systems will reduce repetitive stress injuries associated with checking out books using barcode systems.

Costs

The implementation cost of RFID can be high. Each circulated item must have its own tag. The tags cost anywhere from $.50-$1.50 each.   Plain tags used in books range from 50 cents to 70 cents. Customized tags containing the library logo are more expensive. The

costs go up when tags are placed on other media such as CDs, DVDs and tapes ($1 to $1.50).

For items in existing collections (retrospective conversion), each tag must be programmed. This can take months to accomplish and often involves everyone on staff plus volunteers. For new items, some library vendors offer pre-tagged materials.

New security gates, circulation readers, self-check stations, sorting equipment and inventory wands must be purchased for the RFID system. In addition, the interfaces between the library's integrated library system (ILS) and the RFID system must be configured.

Estimates for implementing an RFID system range from $70,000 to over one million dollars depending on the size of the library. One library reported spending a total of $1.1 million to convert their 500,000 item collection to RFID.

First Generation Library RFID Systems

While RFID technology is not new, the use of RFID tags in libraries is fairly recent. In 2000, the first California library to implement RFID went live with their system. Today, some estimate that 300 libraries are using first generation RFID systems nationwide.

One problem with current RFID systems is lack of interoperability: the RFID tags are unique to each vendor and cannot be read by other vendor's RFID equipment. Therefore, once a library installs their tags, they are generally "married" to the vendor that supplied the RFID system. Furthermore, lack of standardization among vendors complicates (or at least does not streamline) resource sharing such as interlibrary loan, requiring loaned items to be manually managed through their resource sharing workflow.

Multi-media materials continue to cause problems for RFID systems because the metal on CDs and DVDs interferes with the readers. Vendors and libraries are experimenting with solutions to this problem but some libraries do not use their RFID system for multi-media materials which can be among the most frequently circulated items in the library.

Current RFID tags can be vulnerable to unauthorized scanners reading the information stored on the tags. For this reason, most RFID tags used in libraries contain a minimal amount of information - essentially the same information stored on the bar code. But even if the tag contains nothing more than a bar code, there are privacy concerns related to the fact that the tags can be read surreptitiously. Theoretically, this would allow a person to be tracked by reading the tag in multiple locations; however, this is unlikely since appropriate readers are not readily available nor are they installed in enough places to be effectively used to track someone's movements.

The fact that data on the tag is not encrypted is another cause for concern. Even though most library RFID tags only contain a bar code number, these numbers are associated with specific library items. It would be possible to build up a database (even without access to the ILS) of numbers (bar code or RFID tag numbers) and items associated with that number. Then, a reader could be used to identify specific items people are carrying out of the library. Another reason to encrypt the data on the tag is to prevent the tags from being used to spread viruses.

Deciding If and When to Choose RFID

Each library must evaluate whether RFID is the right decision for their library and if so, determine when the timing is right. RFID technology is very much in flux. It is likely that next generation systems will be less vulnerable to misuse, will be more interoperable with other library systems and will work better with library materials (like CDs, DVDs, and perhaps even journals) and are likely to provide features we cannot even imagine today (storing book circulation histories, library location information, bibliographic data that patrons can access).

Self check and sorting systems provide many advantages -- whether they are RFID or bar code based. It may be that your library would benefit from these technologies and doesn't yet need to make the very expensive move to RFID. It is still too early to know all the benefits and costs associated with RFID. Studies are only now underway that will provide solid data about the likely return on investment (ROI), and verify that RFID systems reduce RSI injuries to library workers.