

Washington County Cooperative Library Services Library Materials Handling and Collection Management Study

Recommendations

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Table of Contents

EXECUTIVE SUMMARY	3
BACKGROUND.....	5
RECOMMENDATIONS	7
<i>Introduction</i>	7
<i>Recommendations in Implementation Order</i>	8
1. Set-up optimized sort area inside sort center for sorting mixed taskets and remove routing labels and rubber bands at sort warehouse.....	8
Photo 1: Optimized sorting bins	9
2. Reduce number of days items can wait on holds shelf from 10 to 7 and conduct patron education program on managing your holds queue.	10
3. Place plastic label-holders on the outside of taskets and use slip-in labels to indicate destination.	11
4. Replace current 3 vehicle fleet with 2 truck fleet and standardize routes	12
5. Modify routing sequences in Polaris to increase opportunities for on-route deliveries.....	13
6. Create primary and secondary routing sequences in Polaris to reduce number of taskets needing to be unloaded at the sort center.	14
7. Move courier operations to larger space and equip with put-to-light semi-automated central sorting system to provide for tasket-level batch check-in for libraries.....	14
Photo 2: Pigeon-hole slots in put-to-light system	15
8. Implement Tigard-style workflow and workstation configuration in back room.....	20
Figure 1: Diagram showing Tigard back room workflow	21
9. Establish centralized technical services and collection management team and use expanded courier site for additional centralized services; standardize more policies system-wide.	21
10. Implement RFID system-wide to reduce materials handling workload related to check-in and check-out as well as central sort, and to provide a standardized security system for WCCLS, and to make all self-service features easier for patrons to use.	23
11. Establish program promoting consistent self check-out program system-wide	24
12. Establish security standards based on a cost-benefit analysis justifying expenditures.....	25
13. Introduce automated check-in machines that feed into library sorters at all libraries	26
CONCLUSION.....	28

Executive Summary

In order to continue to provide excellent service, Washington County Cooperative Library System contracted with Lori Bowen Ayre (Principal Consultant, The Galecia Group) to assist them in responding to the workload associated with materials and collection management issues, and interlibrary delivery volume. Circulation and interlibrary delivery volume has steadily increased in the past years and WCCLS sought solutions that would provide immediate relief and to provide a vision of long term changes that would position WCCLS and member libraries in an optimal position for continuing to serve their communities effectively.

After visiting each WCCLS library and gathering data from systems staff, technical services and circulation, and conducting research, the Consultant provides numerous recommendations that will build on the exemplary services being provided in each library and suggests that establishing a more cohesive identity as an interdependent system is a critical component of preparing WCCLS for future. The recommendation seek to move member libraries in the direction of a state-of-the-art library system that increases each library's ability to provide personal service to their patrons while reducing the materials handling workload faced by library staff.

The recommendations include suggestions for optimizing the shared, integrated library system (Polaris) and using it to reduce unnecessary materials movement. Some of these settings will require monitoring and evaluation to ascertain their effectiveness. The changes to Polaris rely on the recommendation that the courier delivery routes be standardized (same routes each day). In addition, the courier service, now operated with two vans and a truck, should be converted to a two-truck system for maximum efficiency and for ergonomic purposes. In addition, recommendations have been provided for optimizing the current manual sort system by instituting a pigeon hole sort system.

Taking a more long term view, Consultant recommends the current sort facility be relocated to a location that can house two trucks and a more sophisticated sort operation so that individual sorting can be taken over by courier staff thus relieving library staff from this task. Making this change (in combination with implementing a batch tasket (tote) check-in system) will free up 120 hours per day in library staff time and free up 300 square feet in many of the libraries (where sorting taskets are currently placed).

Moving the courier operation to a larger location will provide several other opportunities for improving WCCLS services which could be centralized and housed there. Technical services, Outreach, and ILL all rely on the courier service and a larger open space would provide an excellent opportunity to optimize the work areas for each of these departments. In addition, centralizing much of the technical services function rather than operating 14 selections, acquisitions, collections management

and receiving teams will also yield considerable savings while providing libraries the opportunity to develop their collection as a single system. Given that approximately 45% of items checked out have first been placed on hold suggests that almost half of all circulations are done online rather than browsing. In other words, collection management must address the whole collection (online and browsing customers), and not just each individual library's collection.

Following these recommendations, Consultant recommends WCCLS implement RFID (radio-frequency ID tags) to reduce materials handling and circulation functions system-wide. RFID-enabled workflow which eliminates the need for bar code scanners ensures that current staffing levels will be adequate even if check-in volume increases another 25% or more.

After standardizing on RFID, WCCLS libraries are optimally positioned to roll-out an effective self-service program and implement a cost-effective security system. Self-service is very popular with patrons when implemented correctly. Key components of a key self-service implementation program have been provided. One benefit of RFID is that it is used for circulation and tracking of material (like the bar code) and it can also be used for security (like an electro-magnetic strip). Evaluating the security needs system-wide (based on an assessment of loss rate) can be accomplished with an RFID system. Once an assessment has been made about what items require security, only then should a system be rolled out system-wide. The security system must address the security needs of each library and work even as items move between libraries to fill holds.

Finally, the long term recommendation is for all libraries to move in the direction of automated self check-in with in-library sorters to further optimize materials handling processes and reduce staff workload so staff can be re-deployed to customer-facing tasks, and to improve service to patrons.

Background

This report provides preliminary recommendations and a summary of findings related to materials handling and collection management at Washington County Cooperative Library Service (WCCLS).

Lori Bowen Ayre, Principal Consultant at The Galecia Group, was hired by WCCLS to address the following:

- Identify solutions for addressing the shortage of space in the libraries and at the central sort warehouse:
- Identify ways to reduce or eliminate activities that cause injuries associated with the manual materials handling workload, both repetitive motion and handling the weight of deliveries
- Identify new services and/or technologies that would improve turnaround, help staff effectively deal with the increasing flow of material between libraries, and ensure County residents continue to benefit from a rich collection that is efficiently shared among all member libraries:
- Identify ways to improve central delivery and sorting operations, optimize the use of warehouse space, and optimize materials handling workflow at each library. The following technologies should be evaluated:
 - automated materials handling
 - increasing self-service options
 - adding centralized storage for member libraries
 - providing central storage of certain types of materials (ex: holiday books, multiple back copies of popular materials, etc.)
 - centralizing shared services (e.g. technical services)
 - optimizing manual workflows
- Suggest approaches for gradually introducing automated materials handling (AMH) solutions in the libraries taking into account library volume, space issues, Polaris compatibility and providing information about the range of automation options available from simple to complex
- Compare the costs and benefits of RFID vs. bar code systems

In order to evaluate the issues and provide recommendations, Consultant spent several days visiting each of the libraries, talking with neighborhood and regional library staff, meeting with delivery staff, technical services staff, systems staff, and administration. In addition, numerous documents, charts, manuals, spreadsheets, and other documentation have been provided by the WCCLS and libraries. These have all been reviewed by Consultant.

A Findings Report was submitted to WCCLS and the results of those findings were discussed with WCCLS stakeholders. Consultant reviewed the feedback and made minor revisions to the Findings Report based on the feedback and they have been

attached to this report as Appendix 1. The next phase of the project called for evaluating numerous options for WCCLS consideration. This research was conducted and a detailed outline of options in several areas was provided to WCCLS are attached as Appendices 3, 5 and 8.

The options were reviewed by some WCCLS staff and members. Consultant met with many WCCLS members at the Public Library Association Annual Conference in Portland and was able to discuss the various options in more detail. Consultant led a tour of AMH (automated materials handling) vendors to see the range of products available.

This Preliminary Recommendations report takes into account WCCLS staff and member feedback and provides WCCLS another opportunity to review the recommendations before they are finalized and presented to the WCCLS Executive Board in May, 2010.

Recommendations

Introduction

Identifying appropriate materials handling solutions requires making sure that the recommendations fit the library system in terms of cost, space restrictions, and capacity building. A sorter that can't fit into a small library space is useless. Automation that enables the library to handle 10x their current volume -- when only 10%-15% annual increases are expected -- is overkill.

The solutions must also tackle the pain points head on. In the case of WCCLS, the pain points for the libraries are the shortage of backroom space for handling incoming and outgoing courier deliveries and processing returns. Couriers face the challenge of keeping up with the increasing interlibrary delivery volume while operating out of a small warehouse space. Both couriers and library staff are also concerned about the ergonomics associated with their materials handling tasks.

The backroom space problems vary from library to library. Some libraries such as Beaverton and Hillsboro have very large backrooms while others like North Plains, Garden Home and Banks have something more akin to a back office than a backroom. Regardless of the size, all the libraries are filled to capacity (or beyond) after receiving their daily courier delivery. The small libraries receive fewer taskets (the containers used to transfer library items between libraries) but since they have nowhere to put them, even a small delivery creates big problems. The larger libraries get so many taskets that their large backroom spaces are quickly crowded with taskets, people and book carts – all involved in processing the day's delivery. In order to address the problem of not enough space, especially when it comes to interlibrary delivery, the proposed solution must ensure that both the large and the small libraries benefit.

The problem of increasing interlibrary delivery volume is a testament to the popularity of the WCCLS “holds” service. Patrons love to place holds on items and have them delivered to whatever library they choose. It is an extremely popular service and its use continues to increase. The holds service is at least one of the reasons that circulation and interlibrary delivery volume has increased 15-17% annually for the last two years. However, it also increases the work for library staff sending material out as well as receiving material; and, it places a heavy burden on the courier staff moving the material between libraries.

The more people, bins, taskets and carts used for staging material, the less efficient all materials handling tasks become. Therefore, to address the space shortage issue and to reduce the amount of staging that occurs, it is important to address how returns are handled as well. A solution must be found that makes it easier, faster, and less space-intensive for libraries to get their courier deliveries unpacked and ready to shelve, and to get their outgoing deliveries staged and ready for pick-up. For returned material,

the goal is to quickly get material to the point where it is ready to be shelved and to reduce the number of person-hours spent unpacking, unloading, and checking in items.

Identifying technologies that eliminate or automate steps such as check-in, check-out, put-into-transit, and sort-to-delivery-taskset go far in eliminating unnecessary staging of material. Reducing the number of items sitting in tasksets, bookdrop bins, and on shelving carts also eliminates wait points in the workflow thereby speeding up the turnaround time for material. In addition to the staff benefits, these changes improve service to library patrons who have access to library resources more of the time and get their requested items faster.

Where and how the couriers operate has a large impact on library operations too. Some of the materials handling work done in each of the libraries could be done more efficiently by a central sorting operation. Therefore, identifying the optimal division of labor for WCCLS - as a system - requires evaluating the costs and benefits of different approaches and finding the best balance.

Recommendations in Implementation Order

The following recommendations, if implemented in the order indicated, will immediately address the pain points at WCCLS libraries and the courier operation and put WCCLS in position to handle the expected increases in circulation and interlibrary delivery volume.

1. Set-up optimized sort area inside sort center for sorting mixed tasksets and remove routing labels and rubber bands at sort warehouse.

Dealing with the routing labels and rubber bands is one of the most frustrating aspects of materials handling for the library staff. Many of them use a large amount of their backroom floor space for presort tasksets just so they can avoid the hassle and time associated with filling out a routing slip and putting a rubber band around the item. Couriers estimate that as much as 75% of all material is presorted. This means that 25% of all items require rubber bands and routing slips (approximately 2700¹ items daily).

It is particularly frustrating to receive, via delivery, a bunch of rubber-banded items with routing slips when the library makes such an effort to avoid them.

A better approach would be to have the couriers remove the rubber bands and routing slips when they sort the mixed tasksets. The rubber bands could then be returned to

¹ That's 25% of 10,636 items (which is approximately how many items are delivered per day based on FY09-10 delivery estimates.)

the libraries that use them (and possibly the routing slips) and the libraries that don't use them wouldn't have to deal with them.

The couriers sort approximately 2700 items a day from the mixed taskets. Most of these items are rubber-banded together in bundles of 2-3. It is likely that the sort speed of the couriers is somewhere between 300-400 bundles per person-hour (PPH) (depending on how many items you believe are generally bundled together). Manual sorting systems, when set up appropriately, can be as high as 600 PPH so there is room for improvement.

Photo 1: Optimized sorting bins



Luckily, there is a low-tech way to improve the sort speed of the courier operation. Rather than taking each item from a mixed tasket directly over to one of the stacks of taskets, items are sorted out of taskets into a smaller group of taskets that are all within reach. Each tasket is associated with a location. As the taskets fill up, they are carried over to the stack.

An example of an optimized sorting bins arrangement is provided in [Photo 1: Optimized sorting bins](#). For WCCLS, taskets could be used instead of bins. Instead of a straight row of bins stacked three-four high (like this photo), a better configuration would be to stack taskets two or three high and arrange them in a semi-circle around the sorter. This way the sorter would not have to move around to sort.

Another person, the unloader, would swap out full taskets with empties and take care of the staging of taskets for loading into the trucks.

With an optimized sort operation, three sort staff should be able to sort each shift's delivery (morning and afternoon shift) in less than an hour.² That would leave enough time to add the job of removing the slips and rubber bands as well.

2. Reduce number of days items can wait on holds shelf from 10 to 7 and conduct patron education program on managing your holds queue.

When an item becomes available that a patron has requested, it is routed to the library they've defined as the pick-up location. Once it arrives at the pick-up location, it is scanned by staff to log it into the pick-up library. Within 24 hours, an email goes to the patron advising them that their item is available. Many patrons receive e-mail notification (44%). A few patrons still get notification mailed to them (2%), and the rest receive phone notification. Libraries are gradually moving all patrons with a valid e-mail address over to e-mail notification.³ Until very recently, patrons had 10 days to pick-up their hold from the day the notification is sent. After that time, the hold is declared "unclaimed" and it is sent back or forwarded to the next patron in the holds queue.

In the Findings Report, Consultant demonstrated that there is an "unusable resource cost" (see Findings Report, Table 17) associated with material that is unusable because it is either en route to fill a hold, waiting on a holds shelf for pick-up, or on its way back home. An unclaimed hold item has potentially spent 13 days in an unusable status because it is either in a truck or waiting on a shelf for one designated patron. The annual "unusable resources cost" is \$54,662. Because these items are not available for browsing or for filling, they are essentially costing the library money because the resource is unavailable throughout this process.

In addition to the cost associated with not having these items available, libraries may be incurring other costs as well. For example, libraries may be purchasing more copies of titles than necessary to accommodate the long wait list for popular items -- even as copies sit on holds shelf, only to be unclaimed.

² If 2700 items need to be sorted per day and they sort twice a day, that's 1650 items per shift. Three people sorting should be able to sort 1800 items/hour (at 600 PPH) which is less than 60 minutes.

³ If WCCLS wasn't already in the process of moving every patron over to e-mail notification of holds, this would have been strongly recommended. Presumably, if someone is able to access the on-line holds system, they are in a position to have an e-mail address. To the extent that some patrons require assistance setting up a free email account, library staff should be empowered to provide assistance. Moving to 100% e-mail notification for holds will save the libraries money and time, and it makes it easier to shorten notification periods.

Allowing patrons less time to pick-up items they have requested could reduce the “unusable resources cost,” and shorten waiting lists for popular items. Reducing the period that items can sit on the holds shelf, waiting for pick-up, to a week would reduce the “unusable resource cost” by \$12,000 and result in more items circulating to more patrons. Based on the Findings Report, WCCLS immediately implemented the change from ten days to seven days, as recommended here.

One of the reasons so many items go unclaimed (approximately 10% per WCCLS systems staff) is because patrons do not know how to manage their holds queues. Conducting a campaign to teach patrons how to use their patron account options to manage their wish list items and their holds could reduce the number of items that are requested before the patrons are ready to use them. For example, patrons have the option to save items to a “title list” as a way to keep track of items they are interested in *at some point*. Using the title list until the person is ready to read or listen to the item is a useful feature that many patrons are probably not using. Similarly, items in the hold list can be switched to “inactive status.” This is a way for patrons to maintain their place in the holds queue without having to get something delivered for them before they are ready.

Conducting a system-wide campaign about how to manage holds including screen casts, YouTube videos, FYI e-mails, and posters (with QR⁴ codes that link to the online resources) could reduce delivery volume and reduce the amount of material sitting idle on holds shelves. WCCLS is strongly urged to undertake a system-wide, multi-faceted training program for patrons (along with providing support for setting up e-mail notification).

3. Place plastic label-holders on the outside of taskets and use slip-in labels to indicate destination.

Taskets, when loaded with material weigh 25-45 pounds. Anything that can reduce the number of times that taskets need to be lifted reduces the chances of repetitive stress injuries to the courier staff. One small change that could dramatically reduce the number of times courier drivers and sorters lift up taskets is to put the labels on the outside of the taskets instead of setting them inside the taskets on top of library material.

The labels now in use are large and laminated. This is good for protecting the label and making sure they are easy to see...except that you can't see them when they are inside the tasket. Opting for a smaller label that can be protected by a permanently

⁴ QR (Quick Response) Codes are two-dimensional bar codes which can be read by cell phone cameras. They can store URLs (which will be launched in the smart phone's browser, or contact information (which can be uploaded to one 's contacts.)

affixed plastic cover⁵ would be easier for couriers to see so they could more easily stack the right taskets together and they wouldn't have to lift up one or more tasket to see what is in the taskets underneath.

4. Replace current 3 vehicle fleet with 2 truck fleet and standardize routes

The fleet, composed of one truck and two vans, is not adequate for the current delivery volume. They are consistently filled to a capacity that makes it difficult to move taskets in and out. Two of the vehicles don't have enough space for most of the routes (see Summary of Findings: Table 5: Delivery Courier Schedule Showing Vehicle Utilization.) All of the vehicles have wheel wells that take up space inside the storage compartment and make it awkward for couriers to move material in and out and to organize stacks. One van holds only 30 taskets comfortably and the other 50. Once more taskets are loaded, it becomes extremely difficult for drivers to load and unload material at each library. Even the largest truck is smaller than ideal. The maximum number of taskets by weight is 125 but realistically only 80-100 can be put in the truck and extracted without some difficulty. As a result of the fleet's capacity limitations, the routes have been broken out into 14 different routes instead of establishing a standard set of routes for servicing all locations. Even though some locations don't get deliveries seven days a week, a standard route system that visits each library in the same order everyday will ensure that the routing sequences can be developed to support the physical routes.

Toward this end, a route analysis has been performed and a more efficient four-route system has been defined that can be run using two 16' box trucks instead of the current fleet of three vehicles. Each truck should be equipped with a rear lift and straps for securing the taskets. Each route takes 3.25-5.25 hours to run so would require an additional FTE driver. Each vehicle would be used for a morning run and an afternoon run. The routes recommended take into account the current delivery volume plus assume another 17% increase next year and provide time for drivers to sort, as well as perform other administrative duties. The annual cost of the two-truck courier operation recommended, at the projected 2010 levels, will save almost \$10,000 over the cost required to operate with the existing fleet. In 2011 (when another 17% increase is projected) this plan will save over \$20,000 over current costs. (see Appendix 2: Transportation Analysis for more details.)

Moving to two box trucks with a true capacity of 150 taskets (no wheel wells in the way or weight limit to prevent loading 150 taskets) and a standard routing system creates opportunities for reducing delivery volume and reducing turnaround times.

⁵ Examples of labels that would probably work with the WCCLS taskets are available here: <http://vistamation.com/products/bins/bin-buddystrade-label-holders/>. Some trial and error may be required to find a label that fits in the right place and can be adequately secured to the tasket.

Each truck is large enough to organize the load for easy deliveries. Taskets picked up at the beginning of the route can be easily identified and delivered down route or on the next route. This raises the possibility of same day service for some libraries.

There are ergonomic benefits as well. Trucks that allow couriers to stand throughout the loading and unloading process and which eliminate the need to move around individual taskets or shift stacks around reduce the ergonomic stress of delivery on the drivers. The trucks can be configured such that each library's taskets have a designated area inside the truck that is clearly marked. As items are wheeled into the back of the truck, they are parked in their place. When one or two taskets are picked up, they can easily be placed on the right stack without moving anything around or lifting taskets to see where things are supposed to go. Delivery becomes a simple matter of wheeling stacks of 5 taskets in and out of the libraries with the hand-truck.

Another component of optimizing delivery and reducing turnaround time for all libraries is the loading zone provided by each library. Some libraries have designated loading zones and loading docks that are used by the couriers. Other libraries are not as easy to access for couriers carrying 200 pounds of material in and out. Each delivery, once optimized, should take approximately 15 minutes. Designating a place that the couriers can park the truck for 15 minutes – even if it temporarily inconveniences some patrons⁶ -- will provide ergonomic benefits to couriers and reduce the overall time needed to move material around the system.

5. Modify routing sequences in Polaris to increase opportunities for on-route deliveries

Two factors affect how material moves around the system: the routing sequences in Polaris and material availability. WCCLS systems staff have configured the routing sequences to ensure requests are fairly distributed and to complement the routes established by the courier staff. This approach makes perfect sense except that the routes are not the same every day.

Under the 14 route system, two libraries may be on the same route one day but on another day they are not. As a result, it is impossible to configure the routing sequences such that they are coordinated with delivery schedules each day. For example, Cornelius is on a weekday route with Forest Grove, Banks and North Plains yet the first library on Cornelius' routing sequence is Shute Park. It is only on Sundays that Cornelius is on a route with Shute Park. Thus, the delivery schedule and the routing sequences are in agreement on Sundays but the rest of the week, they are not in agreement.

⁶ Perhaps designating the area with cones and a friendly sign that lets patrons know that the delivery contains items they have requested will reduce the temporary irritation of not being able to use a book drop this one time, or having to park slightly farther away.

In order to take advantage of the new optimized routes, the existing routing sequences need to be modified to increase the likelihood that items picked up along the route can be delivered that same day. By keeping the primary flow of material within each truck's route, more material could be delivered the same day or delivered the next day (without having to remove it from the truck).

6. Create primary and secondary routing sequences in Polaris to reduce number of taskets needing to be unloaded at the sort center.

Another feature of Polaris that can be utilized to further optimize the routing of materials is to establish a primary and secondary routing sequence that matches the routes. Primary routing sequences control the group of libraries from which items will be requested. Only when all libraries in a library's primary routing sequence have failed to fill a request will the request transfer over to the secondary route. Defining libraries that are serviced by the same vehicle as being on the same "primary route" will ensure that as many items as possible can stay on the trucks for same day or next day delivery.

Because materials movement is also affected by availability, it is unclear how much of an effect this change could have on materials movement. It is possible that the combination of library collections servicing each route is not conducive to this approach. Therefore, this recommendation should be pilot tested and closely monitored to ensure it is having the desired effect.

7. Move courier operations to larger space and equip with put-to-light semi-automated central sorting system to provide for tasket-level batch check-in for libraries.

The current courier warehouse space isn't big enough to fit more than one truck inside. In addition, when a truck is parked inside, there is barely enough space to sort taskets. Sorting taskets, as implemented today, refers to pulling pre-sorted taskets out of each truck or van and stacking them with other presorted taskets along the warehouse wall. Approximately 75% of the taskets are presorted meaning all items inside them have been presorted by library staff for one particular destination. No sorting of individual items is required.

Mixed taskets require sorting of individual items. The relatively small number of mixed taskets are placed in a stack at the end of the truck and then sorted, item by item (or bundle by bundle) to the presorted taskets along the wall. Sorting the presorted taskets and mixed bundles takes approximately four person hours per day.

With enough space (at least three times the size of the current courier sorting space), a put-to-light system could be installed that would enable the courier staff (with additional hires) to drive both routes defined above, plus sort all items (not just taskets) each day and result in significant savings in library materials handling time. Using a central sort operation enables the courier team to deliver separate Holds and Returns Taskets to

Photo 2: Pigeon-hole slots in put-to-light system



each library plus provides tasket-level batch check-in capability. This can be accomplished with fully automated approaches (no manual sorting of material) or using a semi-automated approach. The recommendation is to pursue a semi-automated approach called “put-to-light” because of the lower capital investment required while still providing this same benefits to library staff. The costs and benefits of the various approaches (including those not described below) are outlined in Appendix 3: Central Sort Options.

How the Put-To-Light System Works

The put-to-light system is composed of a server that connects to Polaris (via the SIP2 protocol) and 35 “pigeon-hole” slots with indicator lights above each slot. The slots are where the items are placed as they are sorted. The person doing the sorting removes items from the taskets, scans the bar code and then places the item in the slot that lights up (they “put” the item “to” the “light”.) On the back side of the slots is a person doing the offloading. The offloader’s job is to remove stacks of material from each slot and place them in an appropriate tasket. When a tasket is full, the offloader scans the tasket’s bar code to close that manifest, places a label on the tasket (e.g. Beaverton HOLDS) and stages the tasket with others going to the same destination.

Another person is generally in charge of loading the trucks as the stacks of taskets grow and ensuring that each truck is loaded according to the predefined tasket arrangement optimized for efficient unloading along the route.

To handle the 12,500 items per day expected to move through the delivery system next year⁷, eighteen person-hours per day would be needed to ensure that all items

⁷ Deliveries volume in FY08-09 were 9,000 and were expected to increase by 17% in FY09-10 so another increase of 17% is assumed for FY10-11 resulting in 12,500 daily.

could be sorted each day. This would require adding approximately three new FTE positions to the courier operation for the purpose of sorting.

The process of receiving delivery for libraries involves taking their Holds Taskets (which would be grouped separately from Returns) to a Holds check-in station equipped with a receipt printer. They scan the tasket which results in all the items in the tasket getting checked in and the holds slips printed out.⁸ Each holds slip has to be matched to the item before the items can be placed on the holds shelf but no individual items would need to be scanned.

The Returns Taskets can be taken to any check-in station and processed. Scanning the bar code on the tasket, checks in all the items in the tasket one-at-a time but in an automated batch process. The items would be unloaded to shelving carts, media verified, and shelved.

On the outbound delivery side, libraries will no longer need to sort items into taskets or put routing slips and rubber bands on any items. All material will be sorted at the sort center.

Space and Time Savings and Cost

Once tasket-level check-in is implemented by means of a central sort system, the interlibrary deliveries will be checked in and ready for shelving in significantly less time than they are now. Based on the library's own survey data (provided for this report), each library spends anywhere from 1.5 hours (North Plains) to 24.5 hours (Hillsboro) per day processing taskets. Based on current delivery volume, this comes to an average of 36 minutes per tasket.⁹ With tasket-level check-in, each tasket will take no more than two minutes on average¹⁰ to check-in because it is as simple as scanning a single bar code to check-in all 40 items.

Eliminating the need to presort will save space at the libraries. Libraries that presort to all libraries use approximately 408 square feet (14 taskets at 14" x 20.5"). However, most libraries send out 15 or fewer taskets per day which requires only

⁸ The batch check-in feature is a custom software application that would be provided by the vendor providing the central sort system (whether it is a put-to-light or fully automated system). It does not exist in Polaris today.

⁹ Even though the data reported by libraries when applied to current delivery volumes indicated an average of 36 minutes to process a tasket, the pay back periods were based on 30 minutes per taskets in order to ensure that the estimates were of savings erred on the conservative side.

¹⁰ Some taskets will take as little as 30 seconds to check in because no additional work is required after checking in the batch except to load them onto a shelving cart. With or without batch check-in, media will still need to be verified before check-in. Taskets containing holds should therefore be kept separate from other material not requiring verification.

three stacks or 24 square feet. Therefore, at these libraries, eliminating the need to presort material could recover over 300 square feet of usable space.

Because of the potential benefit of same day deliveries, libraries might still choose to do some presorting. Staff at each library would have to decide for themselves which items to drop into the generic tasket (for central sorting) and which items¹¹ they would like to presort for same day delivery along the route.

The cost for the put-to-light system recommended is approximately \$175,000 (see Appendix 4: Put-to-Light System). Under this system, tasket check-in time will be reduced to approximately 2 minutes per tasket from as much as 108 minutes per tasket (see Summary of Findings: [Table 12: Tasket Check-in Times, Workspaces and A-V Handling.](#)) Even if we assume libraries spend 30 minutes per tasket today (which is still 6 minutes less than the average), the amount of staff time saved (system-wide) is almost 121 hours per day.

Using library staffing costs based on the average cost of a check-in clerk and assuming taskets take 30 minutes (on average) per tasket to check-in, we can project a savings of over \$600,000 in library materials handling staff costs using a central sort system that provides for tasket level check-in.

The library staff savings have been calculated as follows:

Cost of checking in taskets today:

$$\begin{aligned} & 261 \text{ taskets per day} \\ & \quad \times 30 \text{ minutes per tasket (average system-wide was 36 minutes)} \\ & \quad \quad \times 356 \text{ days per year} \\ & \quad \quad \quad \times \$13.87/\text{hour} \\ & \quad \quad \quad = \$644,000 \text{ per year} \end{aligned}$$

Cost of checking in taskets at libraries using tasket level batch check-in:

$$\begin{aligned} & 261 \text{ taskets per day} \\ & \quad \times 2 \text{ minutes per tasket (very high estimate)} \\ & \quad \quad \times 356 \text{ days per year} \\ & \quad \quad \quad \times \$13.87/\text{hour} \\ & \quad \quad \quad = \$43,000 \text{ per year} \end{aligned}$$

Savings in library materials handling time: $\$644,000 - \$43,000 = \$601,000$

¹¹ One scenario is that libraries only presort items being sent down route to fill a Hold. That would keep the amount of presorting to a minimum while improving the Holds turnaround time for patrons.

Put another way, eliminating item level check-in of interlibrary delivery items ensures that current library staffing levels are adequate even if volume increases as much as 10x over current levels.¹²

A central sort system that provides for tasket level check-in can be implemented in a number of ways. The cheapest way to provide this functionality is probably a semi-automated system like the one described. A fully automated solution would use the ILS to determine the sort location (via SIP2, just like the put-to-light system described), but it would also do all of the sorting. Each item would be taken to a conveyor and dropped into a tasket. Depending on the vendor used to provide a full-automated solution, a central sorter with 35 discharges would cost at least twice the cost of the put-to-light system (\$350,000 versus \$175,000). Therefore, the put-to-light system has been recommended.

Using library staffing costs based on the average cost of a check-in clerk and the additional courier sorting staff required (also based on check-in clerk wages), we can project a savings of \$500,000 in total (libraries and courier) staffing costs with this system (over the current operation).

The total library and courier staff cost savings have been calculated as follows:

Additional cost of four FTE at courier for sorting:

$$\begin{aligned} & \text{Hourly wage of sorter at } \$13.87 \\ & \quad \times 35 \text{ hour work week} \\ & \quad \quad \times 52 \text{ weeks per year} \\ & \quad \quad \quad \times 4 \text{ FTE needed} \\ & \quad \quad \quad = \$101,000 \end{aligned}$$

$$\begin{aligned} & \text{Savings in library materials handling costs of } \$601,000 \\ & \quad - \$101,000 \text{ in additional courier staffing costs} \\ & \quad = \$500,000 \text{ in system-wide staffing costs saved} \end{aligned}$$

Although two 35 slot put-to-light systems could be operated in tandem, the recommendation (and the above calculations) assume that a single 35-slot put-to-light system is adequate to handle the sorting requirements of all WCCLS delivery. Delivery volume may well increase by another 17% in 2010-11. If it does, approximately 12,500 items will be handled by couriers. However, because of many of the recommendations included above, it is unlikely that 12,500 items will require sorting. With optimized routes that are well coordinated with the Polaris routing sequences, some percentage of material will be delivered along the route and this will reduce overall delivery volume. Other recommendations related to holds notification will also reduce delivery volume (or ensure it does not increase as fast as it would otherwise).

¹² 10x the capacity is based on the premise that a tasket check-in takes 2 minutes whereas checking in each individual item in a tasket takes at least 10x that (libraries reported 36 minutes per tasket, on average)

Items delivered along the route (same day delivery) will not pass through the couriers at all (reducing the courier sort staff workload) and therefore will not have a tasket manifest. In other words, the same day deliveries won't be batch check-in-able. Therefore, the benefits to staff will be reduced (more check-ins required) but the benefits to patrons will increase (faster response time). While it may be possible to allow for tasket manifesting as part of each library's outbound delivery process, it is not recommended because the effort of library staff doing so saves the equivalent amount of library time saved on the receiving side. In other words, the effort is "a push."

Because it is so difficult to anticipate how many items will be sorted at courier and how many will be delivered the same day along the route (thus precluding the need to sort them at courier), the staffing levels required for the put-to-light system are based on the highest likely sort requirements (e.g. assuming delivery volume increases another 17% next year) which is 12,500 items per day. The put-to-light system has a throughput of 710 items per person hour. Therefore, four FTE have been allocated for handling the sort volume for each day using one put-to-light system.

At the point that two put-to-light systems are required to handle the day's delivery volume, it is probably time to consider a fully automated sorting solution. Therefore, it is important that all of the recommendations that will reduce overall delivery volume and decrease the amount of material to be sorted by courier staff are implemented ahead of moving to an automated or semi-automated central sort system.

Staff Savings and Volunteers

While it is true that many libraries use volunteers for check-in, that doesn't mean that they won't save staff costs after implementing a tasket-level check-in system. Libraries that rely on volunteers for tasket check-in commit certain staff to managing those volunteers, scheduling them, training them and supervising them. Generally the supervisors of volunteers are higher paid employees than the check-in clerk wage used in the above equation. Therefore, the costs saved based on these employees' time could be significant.

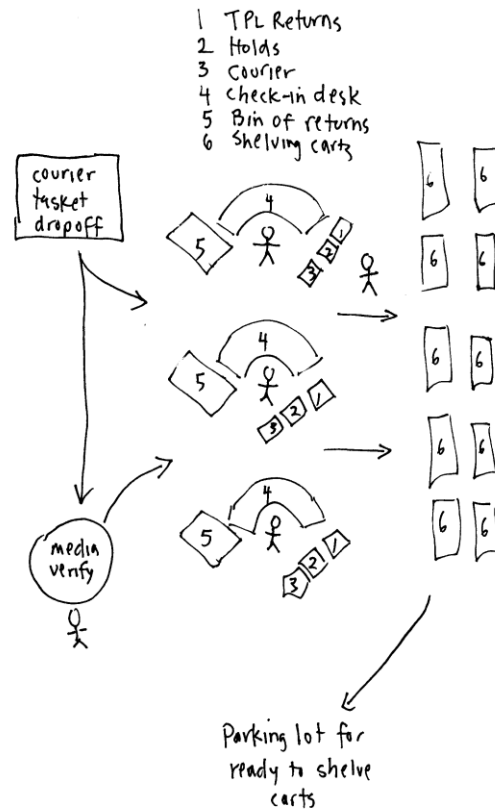
Libraries that use volunteers for tasket check-in also need more space and equipment to support those volunteers. More people require more places to work which means more desks, more scanners, and more carts. These all cost money that other libraries don't have to spend. Also, with more people and carts in these small spaces, it is impossible to be as efficient as one can be when optimized spaces are provided for workers, aisles are kept clear, and workflows are clearly defined. Moving to a tasket-level check-in system will reduce the need for equipment and furniture and so many volunteers in the backroom. Ideally, the volunteers in these libraries can be re-assigned to shelving tasks, which will further reduce work space issues and improve turnaround time for patrons.

8. Implement Tigard-style workflow and workstation configuration in back room

Some businesses bring in Six Sigma or Lean experts to advise them in effective workflow procedures. WCCLS is lucky to have a team at Tigard that has implemented such an efficient backroom workflow that you might suspect they had outside experts set it up for them. Some of the features of their backroom that other libraries would benefit from replicating are the following:

- 1) Have a designated workstation for checking media (doing this at one workstation allows for a more streamlined setup and workflow at each check-in station)
- 2) Standardize on the book carts to be used by check-in clerks and label them all the same. Book carts should be one-sided and narrow enough for clerks to reach all locations. Returns book carts should be color-coded differently from Holds book carts.
- 3) Use wrap-around workstations for check-in clerks so they have plenty of space on the desktop for scanning each item and desensitizing it, stacking items, and keyboarding. Workstation surfaces should be height-adjustable.
- 4) One person should offload check-in carts and place items on the shelving carts.
- 5) Shelving carts should be adjacent to check-in area.
- 6) No one except the offloader should be between the check-in clerks and the shelving carts.
- 7) The work should flow in one direction from courier and bookdrop staging to media verify to check-in clerk to offloader to shelving cart to parking spot for full shelving carts. See [Figure 1: Diagram showing Tigard back room workflow](#).
- 8) Work flows for other processes should not collide with each other (e.g. couriers should not have to pass through people who are moving material from check-in areas to shelving carts to get to their staging area).
- 9) Aisles, staging areas, and cart placement locations should be labeled and used only for their intended purpose.
- 10) Clearly visible time stamps should be used as a control mechanism to ensure that everything is processed within the agreed upon time constraints.

Figure 1: Diagram showing Tigard back room workflow



9. Establish centralized technical services and collection management team and use expanded courier site for additional centralized services; standardize more policies system-wide.

Currently, interlibrary loan (ILL) shipping is handled by couriers. Material being sent outside of WCCLS is packaged and shipped out via USPS or other ground courier. Rather than equipping all 14 libraries with an ILL workstation, shipping labels, shipping boxes, a printer, and a scale, one work area is dedicated to this task. Centralizing the operation of this service saves libraries money in floor space, supplies and time.

This same common sense approach to service consolidation can be applied to other services currently being provided by each library such as acquisitions, purchasing, receiving, cataloging and processing. Processing of new material, in particular, is very space intensive because of the supplies that are necessary (tape, various labels, cutting tools, large tables).

Centralizing all of these technical services functions would save each library a considerable amount of space and create an opportunity to design a new space

optimized for this purpose. While some libraries have work spaces that work well for this purpose (e.g. Hillsboro and Tigard), most of the other libraries do not have work areas that do not suit the work done in technical services.

Another benefit of centralizing technical services, including selections, is to address the need of the library collection. While each individual member is responsible for their own collection, there is also a need to manage the WCCLS collection as a whole. Because of the way patrons use the collection, the ownership of any particular title is decreasingly important. Patrons generally place holds on titles, not on individual copies and whether the item comes from their local library or one of the other member libraries is of little concern. To the online patron, there is one collection yet the overall WCCLS collection is not managed as its own entity.

Instead, each library has local staff responsible for managing their local collection and determining what items can be shared (“holdable”) and what cannot (non-“holdables”). Defining items that are non-holdable helps ensure that walk-in patrons will find something they are excited to find. There are other ways to accomplish the same goal. Some libraries declare certain titles “Hot Titles” or part of their “Your Lucky Day” or “Staff Picks” collections. These items are displayed prominently and ensure that browsing customers will have plenty to choose from. It also provides a way to manage parts of the collection in a more granular yet systematic fashion.

Rather than allowing each library to work through the issues of “what to hold back” and “what to share,” it would be beneficial for all libraries to work out a shared approach to managing their in-library collections and their shared collection and then rolling out a consistent, equitable plan. Using common language (e.g. Hot Titles) to promote in-library material helps the patrons that use more than one library. It also allows the libraries to share in marketing collateral.

A central collection management team can be used to coordinate the needs of individual libraries and the system as a whole. The team ensures that each library is taking responsibility for their own walk-in customers while sharing responsibility for on-line patrons. After a centralized collection management team is in place, options such as floating collections can be pilot tested.

The primary benefit of centralizing receiving, cataloging and processing -- and locating this operation in the courier warehouse space -- is primarily the ability to eliminate duplicate work, use more optimized spaces suited for the work, and to leverage the availability of the delivery system for distributing the new material out to the libraries. Rather than having an additional stop for picking up new material (e.g. if technical services was centralized but not housed at the same location as courier), the workflow from technical services and cataloging to courier can be made seamless. In addition, new material can be processed and checked in at the courier warehouse for immediate delivery to the patron waiting for it (rather than first going to the owning library). This will ensure that wait-listed items get out to the patron as quickly as possible thereby reducing long wait lists even faster.

10. Implement RFID system-wide to reduce materials handling workload related to check-in and check-out as well as central sort, and to provide a standardized security system for WCCLS, and to make all self-service features easier for patrons to use.

Optimizing handling of delivery is just one aspect of the work load. To reduce the workload associated with patron returns, it is important to find a way to speed up handling of items dropped in book drops and check-ins at the service desks. RFID (radio frequency identification) tags provide a way to speed up almost every circulation transaction handled by either staff or patrons themselves.

With RFID tags, stacks of 5-6 items can be checked in (or out) all at once without even lifting up the items (they can be slid over a reader mounted on the underside of a desk). In addition, RFID tags can be used in place of security strips. Turning security on and off happens automatically during check-in (or check-out) without requiring the extra step of sliding each item across the EM (electro-magnetic) sensitizer (the system currently employed by several libraries for security.)

The put-to-light central sort system is also improved with RFID. Staff doing the sorting no longer need to scan each bar code with a wand. Instead items can be slid past an RFID reader on a low cost gravity roller conveyor to trigger the process of communicating with Polaris. This will reduce the number of times each item needs to be grasped by a member of the courier/sort team.

Cost and Savings with RFID

The cost of implementing RFID at WCCLS is approximately \$1.1 million dollars (see Appendix 5: RFID Implementation Estimates.) With RFID, staff will be able to process check-ins at least 25% faster because so many items can be checked in at once. While RFID vendors may say as many as 10 items can be checked in at once, it is more reasonable to assume 5-6 items can be placed on a counter and accurately read by the RFID reader without interfering with one another. In other words, implementing RFID ensures that WCCLS can handle check-in volume increases of as much as 25% without having to increase staffing levels.

Moving to RFID will save WCCLS approximately \$300,000 per year in staff materials handling time.

The savings in material handling costs is calculated as follows:

Current cost of processing returns system-wide (based on survey data provided by libraries):

238 hours per day (all libraries) spent on bookdrop check-in
x 356 days open per year
x \$13.87 per hour
= \$1,175,175

Projected cost of processing returns with RFID:

178 hours per day
x 356 days open per year
x \$13.87 per hour
= \$ 878,914

In terms of planning the RFID implementation, it is important that WCCLS libraries plan their conversion as a system. Sorting, self check-in, self-check-out and all staff circulation functions all rely on the data written on the tag. Therefore, WCCLS will have to plan how best to use them. While many early adopters have opted to use RFID tags simply as glorified bar codes, the opportunities for significant improvements in workflow can only be reaped when RFID technology is more thoroughly exploited. How to truly take advantage of this technology will become more apparent once a data model profile has been established for U.S. library applications. U.S. data model standards are near completion for HF tags, but they have not yet been finalized. For this reason it is important to work with an RFID vendor who is closely tracking developments related to the library applications and RFID standards. In addition, WCCLS is strongly encouraged to also follow developments with UHF tags which also show promise for library applications (but these tags are not the subject of the forthcoming data model standards).

11. Establish program promoting consistent self check-out program system-wide

Across the WCCLS system, several models of 3M self-check machines are used as well as the Polaris ExpressCheck system. Some libraries offer no self check-out option. It is difficult for patrons to learn the rules at each of the libraries because of disparate approaches to check-out. Circulation policies also differ to some extent; as do media and holds management. Rather than learn the local rules and equipment, patrons are likely to go to the service desk to handle even the most basic transactions when they aren't in their home library.

Self-service options such as self check-in and self check-out are easier for patrons to use when they are RFID-enabled because it doesn't matter how items are oriented when they are passed by the tag reader (versus bar codes which must first be found on the item, and then properly aligned under the bar code reader). After WCCLS has

RFID-enabled the collection, it is an ideal time to establish a consistent approach to self check-out and self check-in.

Most patrons prefer to use the self check-out machines if they work for all materials because it is faster than standing in line. Kids love them because they are fun and they can do it themselves. Some library staff don't understand that a good self-service program is key to providing much better, more personalized service to their patrons.

With a robust self check-out program, all the patrons who want to get in and out fast can do so. The people who want to visit a bit or have more complicated circulation or account matters to discuss don't have to feel rushed when they go to the service desk for help because there isn't the long line of impatient patrons who just want to grab their holds and go. Staff can be more relaxed with each customer because there is less pressure to hurry. It's a win-win service.

The key to making self-service work is that everything needs to be check-out-able at the self check-out machines. If someone has to go to the circulation desk to get their holds, self check-out doesn't work. If certain types of materials cannot be read by the self check machine, self check-out doesn't work. If circulation staff act like the machines are there to punish patrons or take away their jobs, self check-out doesn't work. If the machines are not placed properly in the library without enough space to set things down with a stool for the kids....self check-out probably isn't going to work.

For self check-out to be successful, you need a strong program supporting the implementation. The program should include selection of consistent equipment, consistent policies and practices, thorough testing of all material to ensure that everything can be checked out easily, appealing and positive signage, convenient placement of equipment near the exits and holds pick-up areas, and support from all staff.

12. Establish security standards based on a cost-benefit analysis justifying expenditures.

One of the benefits of using RFID is the fact that it can be used to identify as well as secure library material.

Various security systems are in use including DVD locks, Kwik cases, and Alpha security cases for media plus 3M security gates and Sentry security gates. Some libraries use no security systems or separate media from the display cases (terribly time-consuming), or shelve holds behind the service desk to keep them safe.

The security issue is complicated. Even with a system-wide RFID implementation, material is only secure if security gates or lockable cases are used. Since some libraries do not use any security system, it may be difficult to convert everyone over to the same system. However, it would be worthwhile to address security as a

system-wide issue rather than continue to roll-out incompatible approaches to security which undermines the ultimate goal.

Many of the libraries do not seem to experience losses sufficient to justify any kind of security system. It would be prudent for WCCLS to perform a cost-benefit analysis of system-wide approaches to security to ensure that the cost of implementing the system is justified by the cost of losses. This requires tracking material that is being stolen which in turn requires an inventory protocol. Without RFID, inventorying the collection would be prohibitive. Even with RFID, it is a very big project to undertake.

After determining “what” and “how much” is being stolen, the appropriate security system can be identified. Finally, the cost of implementing the right security system against the cost of the losses (or replacing lost material) can be compared against the cost of securing it.

Even though each library is responsible for its own collection, there is so much movement of material between the libraries that it is important to establish system-wide security standards that are based on data. Using that data, WCCLS should provide recommendations and technical specifications that will provide libraries with a path toward implementing security that is compatible with other libraries and which protects material throughout its lifecycle.

13. Introduce automated check-in machines that feed into library sorters at all libraries

The best way to reduce materials handling workload in any library system is to introduce automated check-in with sortation because automated check-in has the potential to not simply reduce material handling work, it *eliminates* much of the materials handling burden on staff. To do so, automated check-in must be equipped with a sorter that can sort to at least two locations so that items that require additional handling can be separated from items that can be returned directly to the shelves. Such a system allows patrons to return their own items (via the automated check-in system) at which point they are immediately checked in and routed to one of the sort discharges.

The benefit to patrons is that their returns come off their account immediately so they can borrow back up to their limit immediately. Automated check-in systems can be equipped to provide receipts, which patrons also appreciate, so they can begin their browsing -- confident that they have returned their items on time and have an up-to-date account.

The benefit to staff is where automated check-in really shines. Once a patron checks in their item, all items that need to go back on the shelves (e.g. they don't trigger a new hold and they don't need media checked) can be returned to the shelves immediately. The only staff that need to touch these items are shelving clerks.

The automated check-in units can be internal or external but to be the most efficient, they should be configured to feed the material directly into the backroom where staff can process it immediately.

One of the options evaluated to address the WCCLS materials handling issues was to place automated check-in and sorters at each library. In order to evaluate the cost effectiveness of the various solutions recommended here, it was important to estimate the size of sorter needed based on each library's circulation and delivery volume.

The analysis considered first-time check-ins per hour which were based on annual check-in plus average number of taskets processed daily divided by hours open each year. Using these numbers, it was possible to estimate how many staff induction units, public check-in stations, and discharges would be needed. These are the main components that drive the cost of the sorter.

Depending on the vendor used and how many discharges, staff induction points, and automated check-ins are configured at each library, the cost could be as low as \$2 million and as high as \$3.3 million dollars. Because of the very high cost of implementing this solution and the longer payback period, this approach was not recommended ahead of the RFID implementation. RFID is a cheaper solution (\$1.1 million) than implementing AMH systems at each library, and RFID will immediately reduce materials handling workload throughout the system.

That said, every library is encouraged to seriously consider this type of AMH technology in their long term planning because of the enormous benefits to staff, the convenience for patrons, and the ability to double the number of check-ins that the library could handle without increasing staffing levels.

In terms of implementation of an AMH system, WCCLS is encouraged to seek a single automated materials handling vendor to provide the central sort system, self check-in systems, and library sorters. Automated materials handling equipment requires support and maintenance. These support and maintenance costs can be significantly reduced if they are put under a single contract. Training local staff to operate and maintain the equipment, and ensuring spare parts are available is also much easier and cheaper with a single AMH vendor.

See Appendix 6: Evaluation of Sorters and Automated Self Check-in at Every Library for library-specific detail about sorter configurations recommended, estimated cost, and improved returns-handling capacity with the recommended sorter. These estimates have been developed based on Lyngsoe ROM (rough order of magnitude) pricing (see Appendix 7: AMH ROM Pricing).

Conclusion

WCCLS provides excellent service to an expanding community. The community is expanding and the numbers of patrons using the library system are growing. These patrons have high expectations of their libraries. In order to continue its practice of effectively serving the wide range of users in Washington County, it will be necessary for the member libraries to work more closely together. While each library retains its own individuality, the libraries can function much more effectively and efficiently if they also operate like a system.

The integrated library system (Polaris) and courier service is used by all of the libraries and several recommendations have been included in this report for optimizing the operation of each of these systems and ensuring they complement one another. These changes to Polaris in combination with the recommended route and courier changes will reduce delivery volume, or at the very least, slow the rate of increase.

Expanding the size of the courier warehouse space, introducing a central sort system with batch level tasket check-in, and adding sort staff will eliminate much of the sorting done in libraries and free up over 120 hours per day in library staff time. Libraries will also recover as much as 300 square feet of floor space in their back rooms just by eliminating the presort taskets.

Centralizing technical services reduces every library's costs, and allows for more efficient workflow and better collection management system-wide. Implementing RFID will make every circulation transaction an easier one, for both patrons and staff, while establishing a good starting point for rolling out a successful self-service program and effective security system.

Moving to RFID serves to streamline all circulation and self-service operations. It will increase the capacity of existing staffing levels to handle a greater volume of material because multiple items can be read at once (without handling a bar code scanner). In addition, once implemented, RFID provides an excellent foundation for rolling out a consistent, and effective self-service program that will be popular with patrons and staff alike.

Establishing a security system based on RFID is also much more straight-forward and cost effective with RFID but planning for a security system that protects material in the owning libraries and throughout their travels between libraries requires planning. It is also important to determine how much should be spent on securing material. This can only be done with a thoroughly evaluation of loss rate. This in turn requires inventorying the collection to evaluate the loss rate. An RFID-based collection can

be inventoried much more easily allowing for an evaluation of WCCLS security requirements.

Finally, WCCLS libraries are encouraged to move toward self check-in systems with in-library sorters. Self check-in systems, like other self-service options, are very popular with customers when implemented correctly. Self check-in units with library sorters also do away with a considerable amount of materials handling that is really much better performed with automation than with humans. Automated sorting is faster, more accurate, and never suffers from repetitive stress injuries. Freeing up staff from back room operations and moving them out into public spaces ensures that the library's greatest assets are available to patrons who, increasingly, value their libraries for the personal attention they receive there.