



automated materials handling

an introduction

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what is automated materials handling (AMH)?

Automated Materials Handling (AMH) is an all-encompassing term for any automation or transportation system that reduces or eliminates the need for humans to handle and sort items as they are returned to the library. In addition to the improved handling, AMH systems will also automatically identify each item (by barcode or RFID), check it back into the ILS/LMS and, if appropriate, activate the relevant EM or RFID security – making it shelf ready.

The combination of these powerful functions make AMH one of the most positive significant changes that a library can make in terms of automating workflows and bringing substantial benefits to both staff and users – along with a very persuasive Return On Investment (ROI).

The additional advantage of an AMH system is that most can be tailored to almost any environment, with the size, shape, speed and overall functionality all completely configurable. This flexibility is delivered through the use of modules that sit together to form a complete system, the most common modules being:



User induction point

This is where the user interacts with AMH to return their items. It will always have some form of slot to feed returned items into and may have a touch-screen, lights and a receipt printer. User induction points are designed for either internal use, usually within an entrance/lobby area, or weather-proofed for external use on an outside wall for walkups or a drive-thru to offer a genuinely 24/7 option.



Staff induction point

With similar functionality to the user induction point, it allows staff to return items quickly and efficiently. The staff unit is usually supplied with a screen, full keyboard and a mouse in order to allow staff to handle a wide range of activities, including back-dating user returns (if required) or hold-slip printing.



Conveyance

Upon return at an induction point, the items need to be moved either into a sort point (see below) or onto the next sorter module - this is the job of the conveyor. Some systems have modules that can move items at high speed horizontally as well as vertically in order to accommodate different floor levels. For turns, the conveyance modules are generally available in multiples of 7.5 degrees, which allows the sorter to convey items around corners or 'snake' intelligently around a room to maximize the available space.



Sorters

Sorters are, as the name indicates, designed to take a single item and direct (or sort) it into a specific sort point. Typically, each module can sort in any direction going into a final sort bin, or to an adjoining sorter for more processing. The sort modules can be configured to provide unlimited destinations, restricted only by the space available.



Sort points (bins, carts or totes)

Sort points are the final destination for a sorted item on an AMH system, having been passed there by a sorter module. There are a variety of sort point types that range from a standard bin, wheeled carts, vertical stacking carts and standard plastic tote containers. Each sort point is completely configurable to receive sorted items by location, genre, media type or however the library wishes to sort. In addition, most AMH systems are able to determine when a sort point is full and can therefore alert staff of the need to either empty the receptacle or replace it with an unfilled one.

Why do libraries need AMH?

In figures, released publically by Palo Alto City Library (US) in 2009, they found:

- | Only **126,000 items** were checked-out by staff (due to successful RFID implementation that included self-checkout kiosks)
- | A staggering **1,032,000** items were checked-in by staff
- | An additional **942,000** items were scanned by staff via deliveries received between libraries or 3rd parties.
- | Equals **almost 2 million** items scanned and handled by staff that year
- | That's **5,500 items a day** or **550 per hour** (based on typical opening hours)

Consider for a moment the thousands of libraries worldwide that have deployed self-service to improve the speed and convenience of issuing loans to their users. The benefits of self-service is well stated, and the ROI is proven and clear with this technology. However, once materials come back into the library, it is considerably more labor-intensive for library staff to check and return an item than to issue it! Yet, this return process is often neglected and the burden still placed on the existing manual processes. When libraries are considering their workflow options, AMH is often excluded from the conversation as it is immediately ruled out as being too expensive, not relevant for the library, difficult to maintain, takes up too much space or too cumbersome.

The key to understanding AMH technology is to break down the functionality into digestible chunks to identify how this transformational system can radically improve the day-to-day operation of the library and realize how it can become as fundamental a solution for item return as self-service is for item check out.

Every AMH installation can offer significant benefits to the staff and the library:

Allows staff to be deployed into customer-facing roles

Having trained librarians sitting behind a desk returning items is a poor use of their skills and expertise. AMH frees up their time to engage with users and pay greater attention to those with more complex needs.

Improved staff wellbeing

AMH significantly reduces the routine, repetitive tasks of carrying, bending and stretching associated with manual item sortation, and the job becomes much less physical for staff.

Items are back on shelves quicker

AMH is proven to substantially decrease the time between an item being returned and its availability for the next user to borrow, which increases the circulation and number of loans per item. Barrington Library (IL, US) can get its "hot" items back to a shelf in 30 minutes and all its other items in just two hours!

Increases item throughput and circulation numbers

Getting items back on the shelf quicker has a direct and proven impact on circulation figures, especially items that are trending or popular. Having stock available for loan will improve overall customer satisfaction and have a positive impact on circulation statistics.

Helps manage peak-time processing

For libraries that experience periods of peak usage, for example during academic exams or after holidays and long weekends, AMH has the ability to facilitate an upsurge in returns processing without the need to invest in additional staff.

Improve employee moral

Manually sorting returned items is a repetitive, sometimes dirty and thankless task and is not the best use of librarian or other staff time. By using AMH to eliminate manual sorting, the staff is able to engage in more rewarding and interesting library tasks.

Know where your stock is

Items returned via AMH are immediately checked back into the ILS/LMS. The library knows exactly where the items are and what time/date they were returned, leading to more accurate stock records and a reduction in stock loss.

Takes better care of the items

AMH handles every item with care. And as they are handled fewer times they will last much longer before they need replacing.

Adds some 'wow' factor to the library

Modern libraries are amazing places and AMH can add to the wonder and excitement that a visit to the library can generate. Some libraries have chosen to locate their AMH technology behind windows so that users (especially children) can see how their treasured books are returned and transported to their sort destination.

Even after considering all the reasons for investment in AMH, perhaps the most compelling is the significant transformation that automation can make to the overall staff workflow and efficiencies in the back-room space.

How do users benefit from AMH?

The benefits for users are derived from both the direct experience of interacting with AMH as well as the net result of the transformative effect that AMH has within the library:



Allows users to return items whenever they choose (24/7)

An external induction point encourages timely returns as it allows users to return items at a time most convenient to them.



Reduces (and sometimes eliminates) queuing

AMH notably reduces, and can often completely eliminate, the queue times associated with manual returns at a staff desk or manual drop station.



User accounts are always up-to-date

When an item is returned via AMH, the user account is instantly updated and the item removed from their active loans allowing them to borrow another item straightaway.



Shelves are fuller and restocked more often

From a browsing perspective, AMH gets items back on the shelf quicker, so users are more likely to find a desirable title.



Users have more access to library staff

AMH frees up library staff time to be more engaged with users and value-added services like helping with research, reading programs, or just being available to answer questions.

Implementing an AMH system

Once a library has the following information ...

- | A broad knowledge of the benefits of an AMH solution;
- | A full understanding of the specific library AMH requirements;
- | A justification on the Return on Investment;
- | Budget in place;
- | Supplier/vendor selected ...

... it is time for the next step. Before commencing there are some measures that will make the whole project simpler, more successful and provide the means to evaluate and justify the required investment:

1. Prepare a project team

The most common mistake when implementing any large IT solution is to place the burden of the project on one single person, or worse, pass the entire project over to a third-party. AMH has the potential to revolutionize the item return workflow, but success from day one requires a team to manage the process. This team needs to be unique to the library and include a diverse range of people with the relevant skills, knowledge and experience to handle the project and include:

Project Leader

A project leader with a holistic view of the library and its objectives is critical to project success. The project leader should keep the library objectives firmly in focus throughout the process and be confident enough to prevent project deviations such as last-minute inclusions of functionality that can lead to project slippage, failure to meet specific objectives and budget overspend.

IT specialist

AMH IT requirements, although critical to the operation, are relatively modest and typically replicate those required to integrate a self-service machine. The most basic installation requirement is a cabled connection to the ILS/LMS using SIP or NCIP, which is used to identify and check in items as well as user account validation. Whilst not a complex prerequisite, the speed of the AMH solution should not be compromised by a poor network connection.

Contractor specialist

Most AMH systems are designed so as not to require specialist voltage or electrical connections, but all require standard power and network connection points. There will also be a requirement for at least one hole in a wall for the internal or external induction point. These fundamental elements are generally the responsibility of the library's facilities management department. The project team need to ensure that someone manages the contractors to complete these tasks accurately and on time.

Catalogue / backroom specialist

A member of the staff who fully understands the backroom workflows, return and re-shelving processes is vital to determine the best sorting destinations – required in order to ensure the AMH system will deliver the back office efficiencies expected along with real value to the library and its users.

Customer service specialist

An enhanced user experience is key to any library project, justifying the time and investment. It is important that someone on the team acts as liaison interface with users throughout the project. Initially informing users of what is happening and the benefits it will bring and following go-live they 'hand-hold' the users for the first few weeks. After 3-6 months, they should be responsible for gathering further user feedback. People embrace change more readily when they feel they are informed.

2. Validate the project goals

Prior to selecting a supplier/vendor and commencing the project, there will have been a list of requirements and objectives that the library wanted AMH to be able to achieve. Following the decision to move forward with an AMH solution, these requirements should now be revisited to ensure that: a) They still make sense; b) The AMH system will deliver the objectives; c) If the workflow can be further optimized within the project scope.

Change at this stage is acceptable if there is full project team agreement. Any changes made following project commencement can lead to confusion, misunderstanding and, most importantly, increased costs.



3. Define how to measure success

A critical part of the project is to implement a series of metrics to demonstrate the project success to the team and to those that sign-off the expenditure. These metrics must be specific to the AMH installation and need to be clear, achievable and measurable.

Clear

The metrics should be clearly defined to avoid misinterpretation. For example:

- | A well-defined metric with a clear aim could be: 'to decrease the time it takes for users to return items in the library from x to y'
- | A poorly defined ambiguous metric would be: 'to make our customers happy'

Achievable

A well-defined metric still needs to be realistic and achievable. For example:

- | An achievable metric could be: 'have returned items back onto shelves within 24 hours'
- | An unachievable metric would be: 'have an item back into stock one week following a loan' (this is clearly impossible as it depends how long the users wish to borrow the item for).

Measurable

A metric needs to be quantifiable with defined benchmarks and expectations. For example, to measure the metric: 'to decrease the time it takes for users to return items in the library', you must firstly:

- | Identify the time for a typical return transaction time as processed before AMH, the benchmark.
- | Determine the improvement objective, e.g. decrease the time by half.
- | Identify the time for the same type of return transaction using the AMH solution

If the time has been halved, then the objective has been clearly defined, measured and achieved. More examples of AMH metrics include:

- | Reduce the number of staff that spend time dealing with returned stock
- | Reduce the time taken to return loans to other branch libraries
- | Reduce the number of repetitive strain staff injury claims
- | Reduce the space allocated to book sorting
- | Reduce the time taken for staff to process inter-library loans
- | Increase the overall number of loans returned directly by users
- | Reduce the time taken for staff spend sorting item
- | Increase the loanable lifespan of items by reducing damage
- | Reduce the number of times users have to attend the staff desk
- | Increase the accuracy of stock locations
- | Reduce the overall time taken for a user to return items
- | Increase the number of annual circulations within the library
- | Extend the available times of the day that users can return items
- | Increase overall user satisfaction
- | Reduce the time returned items are available for hold collection
- | Reduce the loss rate of items
- | Reduce the turnaround time to get items back to the shelf

Determining AMH requirements

The configurable nature of AMH means that it is always a unique installation for each library, so at the planning stage it is important to clearly identify the outline requirements and not simply create a shopping list. Core requirements that should be considered would include:



Number of bin (cart/tote) locations

At this stage, it is not necessary to define in detail what each bin will hold, but an idea of a sorting plan will help to determine the number of sort locations that may be required. Consideration should also be given as to how many spare (swap-out) bins will be needed. As a good start, take an assessment of how current manual sorting is achieved today – the number of locations sorted to and the number of wheeled carts that are used to service those locations.



Type of sort location

Consider how your workflow may work – are large-volume bins that hold more items going to work better for your library than vertical stacking carts, which hold less but offer more convenience at the shelf?



Hold-slip labelling

On item return, most AMH systems can automatically print out a hold slip. Staff can apply this before the item is placed on the holds shelf which speeds up the entire holds process.



Need to support both EM and RFID returns

Although the AMH solution must support the current library technology, there should be consideration for future requirements. For example, the library may use barcode/EM today, but is the AMH solution able to read RFID in the future?



Support for batch check-in by staff

AMH can be used to mass return items received from another library, mobile service or a third-party. Is a staff induction point required?



Internal and/or external access

Where will users return items? An internal return point can be installed in the library lobby, but for true 24/7 access, an external (weather-proofed) return point will extend the options for users to return items.



How many user induction points are required?

It is possible to install both internal and external induction points into an AMH system, but how many of each are required? Ask your potential suppliers to give an indication of how many items their induction points can process and then assess the total number of peak returns you receive per hour to understand how many you will need. Remember, you are trying to eliminate queues at this stage.



"Drop and go" functionality for users

Most AMH systems require the user to deposit items one at a time, but more complex systems provide bulk "drop and go" functionality that means several items can be deposited at once, which can improve the user experience.



Consider 'drive through' functionality

For added "drop and go" experience, an external induction point could be installed that is accessible from a car window. This could prove extremely popular with commuters and parents of young children.



Are receipts required?

Do not just assume that receipts are necessary. Receipts are useful for some but not essential so consider the value of offering a confirmation receipt option.



The return of unidentified items

Many AMH systems can reject unidentified items (without a barcode/RFID tag) back to the user. Although this can be a useful security option, it can inconvenience users with genuine items where the barcode/RFID tag has become unreadable. Consider balancing security with user convenience.



What type of interface do you want to offer?

Most induction points are available with three types of basic interface: lights only (no screen), a screen with buttons or a full touch-screen. Each of these options have their own benefits, with full touch-screen giving the most flexibility. You should consider how much interaction you want at the induction point, but do remember that screens allow you to convey instructions to users in a concise fashion – and in multiple languages.

Review the best location for an AMH system

Suppliers/vendors will benefit if early in the process they know the potential AMH system location and the space available so they can plan the solution. There should be consideration if future expansion of the system may be required, utilizing the flexible modular nature of an AMH system. Additionally, if you are considering an external induction point, then consider how users might be protected from the elements while they are using the system.

Leverage expertise

Engage with potential suppliers/vendors early in the process and take advantage of the tools and experience at their disposal.

It is also worthwhile contacting reference customers who already use AMH as they could help revise the requirements list.

Obtaining quotes and selecting a supplier/vendor

With an outline of the AMH requirements the next important stage is to obtain a quotation to align any costs to the Return on Investment calculated.

Depending on the scale of the AMH solution, a formal bid/tender may need to be released. If so, it is important to work with your suppliers/vendors to understand the best way to handle this process.

Each supplier/vendor should be able to produce an outline package that demonstrates how their solution will best fit the AMH requirements, and should at a minimum include:

- | A product overview
- | Features that match against AMH requirements
- | A breakdown of pricing

- | A diagram of how the solution would fit into the dedicated AMH space
- | Options for the installation (probably at least 2-3 designs)
- | AMH case studies - look for specific reference sites close to you
- | References that share your ILS/LMS vendor
- | References with similar circulation volumes as you

Additionally, the best suppliers/vendors will also include:

- | 3D visuals or a representation of the solution
- | Full indicative project plan, defining start and go-live dates
- | Certification and safety compliance documentation
- | Warranty information
- | Profiles of key staff that will be responsible for your system
- | Details of their support and any Service Level Agreements
- | Details of their training and induction program
- | Specific product USPs
- | Training options
- | Future expansion capacity
- | Configuration, reporting and alert options
- | Optional modules that may not have been specified in the requirements

It is also important to check the supplier/vendor experience and capacity to supply the specific AMH requirements.

- | Do they have a dedicated AMH team?
- | Do they design specific requirement solutions?
- | Do they just supply 3rd party solutions?

Tips for a successful implementation

Before placing an order, to ensure an efficient, timely AMH project that will deliver the predicted ROI, consider the following:



Include support, maintenance and a Service Level Agreement (SLA) in your contract

Ensure your supplier/vendor provides ongoing support and maintenance of the AMH system and that there is a suitable SLA protecting the investment. What is the impact on the ROI if the solution does not operate?



Do not 'under specify' to save money

If the library workflow determines that two user induction points will improve staff efficiency, and the ROI is modelled on this, reducing the scope of the project to just one to save on cost will result in a less efficient AMH system that could result in staff continuing to process returns.



Think about future expansion

Consider physical space for potential expansion and plan additional investment into subsequent budget cycles to optimize the benefits of the AMH solution for the future



Ask to see vendor installations similar in scope to your own

Ask for and contact references - ideally it is best to visit them. Other library AMH customers should provide honest opinions of the supplier/vendor, how project implementation was managed and perhaps how they could have done things differently.



Brief the library users

Use signage, videos, emails or flyers to ensure library users know what is happening, when it will be available and how they will benefit. Put their minds at rest regarding any construction work and help them to be ready to use the new AMH system on launch day.



Brief all staff

It is often easy to form a project team who then commence the project without any interaction with other library staff, but it's hugely important that everyone knows what the project is and why it is happening. Before any work commences, pull staff together (including temporary and volunteer staff) to explain how the implementation will help ease their manual workload and offer a better user experience.

Summary

AMH systems offer the potential to deliver significant value to libraries of almost any size and are particularly suited to libraries that have already invested in a self-service solution. The benefits to both staff and users are significant, with value delivered at every stage.

The first step in any evaluation should be to form an understanding of what an AMH is and then speak with libraries (of a similar size) that have already implemented such a solution to validate the savings and improvements that are available.

Allocating an internal project team, comprised of various stakeholders, and then fully defining the requirements and expectations will help ensure that the quotations you receive from your potential vendors/suppliers will deliver the required ROI. Additionally, a well-defined set of objectives, together with clear, achievable and measurable metrics will allow the team to keep the project on track and then retrospectively demonstrate how the implementation met, or often exceeded, the initial plan.

Finally, when selecting a vendor, make sure they can deliver the library's vision. Working with the vendor to understand what the solution will look like, the metrics it will work to and the guarantees they offer in terms of continued performance will ensure the project is a success.



Further reading

Many of the ideas in this paper are covered in much more detail in the following publications, which are recommended for further reading:

Ayre, Lori, "Optimizing Materials Handling on the Cheap: How to Lean your Workflow"
<http://galecia.com/presentations/2014/optimizing-materials-handling-cheap-how-lean-your-workflow>

Ayre, Lori, "Materials Handling Automation to Reduce Operating Costs"
<http://galecia.com/presentations/2012/materials-handling-automation-reduce-operating-costs>

Ayre, Lori, "The Skinny on RFID and Automated Materials Handling in Libraries"
<http://galecia.com/presentations/2014/skinny-rfid-and-automated-materials-handling-libraries>

Johnson County Library, "Comprehensive Library Master Plan, May 2015"
https://www.jocolibrary.org/sites/default/files/CLMP_report_2015_05_27_final_medium.pdf

Palo Alto City Library, "Analysis, Evaluation and Recommendations for Materials Handling System and RFID at Palo Alto City Library"
<http://www.cityofpaloalto.org/civicax/filebank/documents/16529>



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