

Learning Management System (LMS) Feasibility Study

Findings and Recommendations

Prepared by Carson Block Consulting Inc.
<http://www.carsonblock.com>



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1. Introduction

This report contains the findings and recommendations of the Learning Management System (LMS) feasibility study, conducted for METRO between January and July 2022 by Carson Block Consulting.

The study indicates that a collaborative LMS hosted and supported by METRO is feasible, and would require additional METRO resources and collaboration from member library systems.

The results of this research and conversations with key stakeholders at METRO and at its member library systems are provided in the Key Findings section across key topical areas:

- LMS Landscape & Options (section 3.1)
- Technology (section 3.2)
- METRO's Technology Capacity (section 3.3)
- Content and Workflows (section 3.4)
- Content Platforms (section 3.5)
- Partner Library Collaboration (section 3.6)
- Functional Requirements (section 3.7)
- Funding & Fee Model (section 4.2)

A preliminary version of this report was reviewed by the METRO Leadership Team and their feedback is reflected in this final report.



1.1 Summary Findings and Recommendations

Summary:

- Technology is the convening element of this potential project, but the true heart and soul is the collaboration of partner libraries to address digital equity challenges by delivering library programs and services directly to the homes of people in the NYC area.
- METRO is technically capable of hosting a shared platform for the delivery of library programs and services, including but not limited to training and online learning opportunities-
- METRO has the ability to scale to add the development and hosting of a new platform to its services
- METRO has the ability to convene a collaborative partnership of libraries for this potential project
- Core technology systems used by partner library systems are compatible in key areas: staff access and patron access
- All partner libraries see value in a shared LMS or similar software service
- Some partner libraries are currently positioned to immediately collaborate in a shared LMS or similar software service
- Recommendation: Create a shared prototype using a phased approach
 - Phase 0: Build a proof-of-concept platform based on currently-identified criteria
 - Phase 1: Pilot a shared prototype with library system partners who are able and willing to participate in collaborative learning opportunities for library patrons
 - Phase 2: Expand to other partner users
 - Phase 3: Offer to clients beyond NYC

While evaluating the feasibility and sustainability of a potential new LMS service and the technologies necessary to support it was the convening element of this study, what our team identified was broader and bigger than simply a technology. The true heart and soul of this effort is the intention of collaborating partner libraries to address digital equity challenges by delivering library programs and services directly to the homes of people in the NYC area. During the pandemic, staff have pivoted from in-person training and teaching to the online tools available to them, which has worked in some ways, but not all. Those experiences gave the library staff we met with a stronger understanding of their needs in delivering online learning, resulting in the functional requirements outlined later in this report. But the fact remains that the tech in this case is secondary to the need. All recognize the potential value of a shared tool or service to help them more easily craft and deliver online learning, but the specific LMS products or adjacent technologies that will be needed to meet these needs is less critical to them than the intention and purpose of engaging patrons with learning content.

But to address technology specifically, the outcomes of this study confirm that METRO is technically capable of hosting a shared platform for the delivery of library programs and services, including but not



limited to training, classes, and other online learning opportunities. METRO has the ability to scale its operations in order to add the development and hosting of a new platform, with new funding for the project and staffing to develop and support it. And, finally, the core technologies used by partner library systems are compatible in key functional areas for integrating staff access and patron access to a new LMS product or service.

The need for a supported, shared LMS service was validated by member libraries. There is a clear path for libraries to integrate such a service with the technologies they use now. And perhaps most importantly, there is a willingness and interest in collaboratively creating, using, and governing such a product or service. Our recommendation, then, is for METRO to convene a group of staff and leadership from interested library system partners to carry forward the work of creating a shared prototype LMS platform using a phased approach. While we expect this group will make the work their own and modify our recommendations as needed, we've identified the following potential project phases as a guide:

- Phase 0: Build a proof-of-concept platform based on currently-identified criteria
- Phase 1: Pilot a shared prototype with library system partners who are able and willing to participate in collaborative learning opportunities for library patrons
- Phase 2: Expand to other partner users
- Phase 3: Offer to clients beyond NYC

These phases are designed to serve several functions as part of the process, including designing, building, and testing technology frameworks; exploring areas of training content applicable to the diverse communities served by member libraries; practicing cross-institutional collaboration and development of new workflows for training; and, finally, to build upon lessons learned to scale the learning community formed through phases 1 and 2 into broader impact in the NYC area, and then beyond.

1.2 Terminology

Throughout this report, and depending on the context of each section, several terms have been used to refer to either a technology platform (e.g. "Learning Management System" or "LMS") or a possible means for METRO to lead a collaboration of partner libraries (e.g. "Collaborative", "Consortium", "shared", etc.) that would be created to design, build, and share learning opportunities with members of the public. The authors of this report have endeavored to standardize terminology as much as possible. Given the dynamic nature of this report assessing the feasibility of a potential LMS platform and a possible collaborative consortium that does not yet exist, careful readers may spot different, yet similar, terms being used interchangeably.



A section defining the many acronyms used throughout this report is included as **Appendix B: Acronym Glossary**.

1.3 Scope of Work

- Explore the feasibility and sustainability of a publicly-facing Learning Management System (LMS) that would be hosted and supported by Metropolitan New York Library Council (METRO) and shared among member libraries:
 - Brooklyn Public Library
 - The New York Public Library
 - Queens Public Library
 - Westchester Library System
- The LMS would be used to deliver online training, classes, and other learning opportunities
- Using the NYS Digital Equity Portal and other internal analytical tools, libraries would be able to target programming to branches, regions, neighborhoods and demographic profiles
- The LMS should quantify and visualize attendance, completion rates, outcomes, and more while respecting anonymity, privacy, and other principles core to the libraries' commitments to their communities

The consultant team's scope of work encompassed exploring the feasibility and sustainability of a publicly-facing Learning Management System (LMS) that would be hosted and supported by the Metropolitan New York Library Council (METRO) and shared among member library systems: Brooklyn Public Library, The New York Public Library, Queens Public Library, and the Westchester Library System. The LMS would be used to deliver online training, classes, and other learning opportunities. Using the NYS Digital Equity Portal and other internal analytical tools, libraries would be able to target programming to branches, regions, neighborhoods and demographic profiles.



1.4 Scope of Work Activities

- Engage in regularly scheduled planning calls and meetings with METRO staff
- In cooperation with METRO staff, conduct a series of interviews and meetings with stakeholders from the four library systems in order to reveal the functional requirements for a public-facing LMS product
- Work with METRO's system architect and technical team to translate functional requirements into an architectural model
- Conduct an environmental scan of all open source LMS products that can be extended and refined to fulfill the requirements and architectural model
- Assess content production and acquisition strategies at individual libraries, across all library systems, and also determine what content is readily available for purchase or licensing and use
- In cooperation with METRO staff, develop a cost model that illustrates the commitment required to make any recommendations sustainable, considering scale, support, and new feature requests

To assess the feasibility and sustainability of a METRO-built, shared LMS, the consulting team sought information about the landscape and features of existing LMS systems, the products that METRO libraries have used to deliver similar content, and the technologies employed by METRO libraries that would interact with any proposed new LMS service or application. Throughout the process, regularly scheduled planning calls and meetings were held with METRO staff to provide continual feedback and reporting on progress, as well as to reset direction as needed.

In cooperation with METRO staff, the consulting team conducted a series of interviews and meetings with stakeholders from the four library systems in order to reveal the functional requirements for a public-facing LMS product. Staff from METRO's Digital Strategy team were interviewed to assess how they operate as a service provider for another METRO product, *Archipelago*, and to understand how they would approach new services like the proposed LMS. Library staff in technical roles were interviewed to inventory the existing systems that would require integration or interaction with the LMS, such as each library's Integrated Library System. Library staff in content, training, and teaching roles were interviewed to assess each library's content production strategies, to understand the tools and services they have used to deliver online learning, and to determine their requirements for a potential shared LMS. In the process, at least fourteen individual interviews were conducted, and through other engagement activities, more than thirty-three individuals at partner library systems and at METRO provided a broad range of technical and feature requirements for the LMS, as well as ideas for powerful collaboration opportunities.

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Separately, the consulting team conducted an environmental scan of all open source LMS products that might be extended and refined to meet the requirements suggested by our interview subjects. The LMS features identified in the environmental scan were useful to compare with the features identified by the staff members we interviewed. All LMS features that intersected were compiled into an initial set of functional application requirements, which are presented in this report.

Content production and acquisition strategies were explored with each partner system and with METRO; findings and recommendations are presented in this report.

Possible cost models were also explored with METRO and are included in this report.



2. Activities and Timeframe

2.1 Chronology

December 2021

- Carson Block Consulting, Inc. was contracted to conduct a feasibility study for a Learning Management System for Metropolitan New York Library Council (METRO)
- Carson contracted Cindy Fisher and Chris Ritzo as subconsultants to assist with the study

January 2022

- Carson began meeting with METRO staff regularly to discuss the status of the project
- Carson, Cindy, and Chris scheduled regular consultant team meetings
- Cindy began research into current open-source learning management systems, as well as researching the essential content types and formats used by many LMS products
- Carson held introductory meetings with stakeholder libraries to introduce the project and detail expectations as participants in the feasibility study
- Chris reached out to METRO and to stakeholder libraries to request documents to review the technology environment, and began his findings and recommendation report based on the documentation

February 2022

- Chris began performing interviews with technology experts within the stakeholder groups
- Cindy began reviewing initial licensing for content production or acquisition policies and performing additional research
- All consultants contributed to questions that should be raised during on-site focus groups

March 2022

- Carson began to build the basic framework for the final deliverable and shared that with METRO for feedback or edits
- All consultants performed additional research on relevant topics

April 2022

- Cindy interviewed stakeholders on their current LMS platforms and assessed how those current platforms fit their current and future needs
- Carson identified preliminary cost factors

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May 2022

- Carson visited all stakeholders in New York City to perform focus groups at each library and discuss needs, desires, and dreams for a possible shared LMS
- Carson provided notes to the other consultants about his findings from site visits, and identified other cost components based on those findings

June 2022

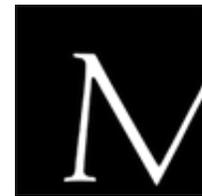
- Carson collected all recommendations and reports from the consultant team and compiled it into a final draft

July 2022

- The consultant team worked with METRO on edits for the final deliverable

August 2022

- The consultant team delivered the final report to METRO



2.2 Partners in the Study

Thank you to the library partners who contributed significant time and energy to this study.

 <p>Primary Contact</p> <ul style="list-style-type: none"> • David Giles - Chief Strategy Officer <p>Other Contacts</p> <ul style="list-style-type: none"> • Cheila Cruz - Technology Training Coordinator • Michael Herzog - Assistant Vice President of IT • Sophie McGrath - Manager, Learning & Development • Melissa Morrone - Supervising Librarian • Kerwin Pilgrim - Director of Adult Learning • Selvon Smith - Chief Technology Officer 	 <p>New York Public Library</p> <p>Primary Contact</p> <ul style="list-style-type: none"> • Dr. Brandy McNeil - Public Services Director <p>Other Contacts</p> <ul style="list-style-type: none"> • Nat Emmanuel - Desktop Engineer • Kasia Kowalska - Associate Director, Service Innovation & Impact • Jason Ledakowich - Senior Product Manager • Steven Mahoney - Associate Director, Adult English Language and Literacy • TJ Woods - Associate Director, Technology Training Programs
 <p>Primary Contacts</p> <ul style="list-style-type: none"> • Fatma Ghailan - Director of Community Learning • Jeff Lambert - Director of Strategic Planning and Operations, Programs and Services Department <p>Other Contacts</p> <ul style="list-style-type: none"> • Jin Bae - Digital Literacy Coordinator • Nick Buron - Chief Librarian • Christopher Carvey - Director of Interactive Customer Experience • Cathy Chen - Assistant Director of Programming and Operations, New Americans Program • Manny Figueroa - Training and Talent Development Manager • Fred Gitner - Assistant Director of New Initiatives and Partnership Liaison, New Americans Program • Bill Goldband - VP for Information Technology 	 <p>westchester LIBRARY SYSTEM Empowering libraries. Empowering communities.</p> <p>Primary Contacts</p> <ul style="list-style-type: none"> • Dana Hysell - Project Relations Specialist • Joe Maurantonio - MLS, Director of Special Projects <p>Other Contacts</p> <ul style="list-style-type: none"> • Terry Kirchner - Executive Director • Allison Midgley - Senior Technology Training Coordinator • Allison Pryor - Technology Trainer



- **Josephine Lew** - Senior Manager of Organizational Assessment
- **Nelson Lu** - Director, Community Library Services, Central Library
- **Gillian Miller** - Coordinator of Early Learning Services
- **Sharon Myrie** - Vice President of Programs and Services
- **Sarah Siddiq** - Blended Learning Coordinator
- **Danielle Walsh** - Instructional Systems Designer and Strategist for Queens Public Library
- **Hong Yao** - Director of Technical Services

2.3 METRO Staff

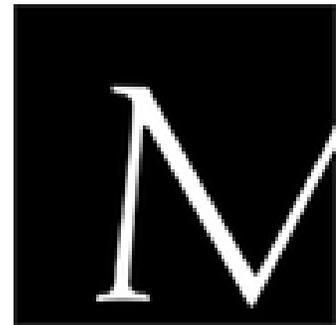
Thank you to METRO staff who contributed significant time and effort to this study.

Primary Contacts

- Kyle Brown - Chief Administrative Officer
- Nate Hill - Executive Director

Other Contacts

- Davis Erin Anderson - Director of Programs and Partnerships
- Allison Lund - Digital Projects and Metadata Librarian
- Diego Pino Navarro - Director of Digital Strategy





3. Key Findings

3.1 LMS Landscape & Options

Summary:

- Our team recommends that METRO form a Learning Consortium. This approach puts the strengths and values of the library community front and center, and is a differentiator.
- There are hundreds of LMS options; our recommended approach is to finalize the pilot use case and use an evaluative framework & tool to choose best options
- Core and general requirements were identified
- Product features & functional requirements will define technology stack and staff capacities
- Products we reviewed/identified include:
 - Niche Academy
 - Drupal
 - Opigno
- Building a new LMS from scratch is not recommended
- Building upon an existing open source LMS is recommended
 - Plus custom development of modules, or
 - Integrations of multiple OSS products that together meet the functional requirements
- Existing open source product(s), integrated together
- Another option that surfaced during partner interviews was the suggestion of making use of a discovery layer to aggregate back of house documentation (curriculum outlines, trainer documentation) for library staff across partner libraries. This tool would complement the pool patron-facing LMS by allowing partner library staff to share resources without having to manage a separate internal LMS portal and associated permissions to access shared training materials. Tools such as [SimplyE](#) or [EPIC](#).

Our initial environmental scan of existing LMS products began by examining the wide range of open source and commercial products and online platforms/services. This market analysis identified many of the most common features of learning management software and services. As our market analysis/environmental scan proceeded, hundreds of products surfaced, some more developed than others. With the initial market scan results in hand, our interviews with METRO Digital Strategy Team members and staff at member library systems had more depth and context. Our conversation with METRO's team identified a few open source LMS products, primarily in the context of their perceived maturity or scalability. Given this team's experience developing custom Drupal modules and associated systems for *Archipelago*, including the significant work involved in the customization of service components and deployment strategies for each individual customer, it was not surprising to learn that,

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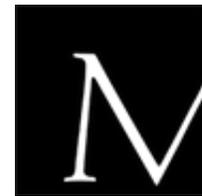


given the choice of using and customizing an existing LMS or developing a new product from scratch, their gut response early in this study (early 2022) leaned toward building a new LMS. We expect that building an entirely new LMS from scratch would be beyond the scope and budget that METRO might consider, and would be ill advised. As outlined in our recommendations below, some custom development may need to occur in order to fulfill the requirements we identified as, for example, add-ons, connectors, or modules to provide specific functionality, or to connect different open source products that, when combined, fulfill a need. This concept is consistent with METRO's development approach with the customization of Drupal modules and other parts of the open source software stack that make up *Archipelago*.

.....
: **Recommendation:** New, custom software development should focus on add-ons, connectors,
: modules, etc., that augment or extend an existing open source LMS, or that connect the LMS to other
: open source software that fulfills one or more requirements.
:

Interviews with staff at METRO partner libraries identified several LMS and other products that had either been used in the past, or were currently or recently used to deliver online learning. These included commercial products like Niche Academy, Salesforce, and Google Classroom, and also some open source software such as Drupal, Opigno, and Moodle. Library staff identified that while some of these products had been used in the past or were currently in use, the idea of a centralized, METRO-provided LMS would be more ideal for several reasons. The costs of well-supported commercial products or services such as Salesforce, Niche Academy, and Google Classroom were a barrier to long term adoption, except in the case of temporary deals for trial periods, or during pandemic lockdown when the fees for some tools were waived (as was the case with Google Classroom). In the case of LMS products like Drupal, Opigno, and Moodle, member libraries had used these in past projects that were grant funded or were otherwise supported initially. However, the primary issues that kept these LMS products from seeing wider use and adoption were related to consistent technical support or that their use was connected to particular projects that then ended. All library staff we interviewed validated the idea that a centrally-managed LMS provided by METRO would be ideal, particularly if its features could simplify their current workflows and tools for course creation and delivery. The features they identified, along with the LMS environmental scan/market analysis, form the basis of the functional requirements outlined in this report.

These interviews not only validated that a METRO-provided and -supported LMS service would be used by libraries, but also identified a path toward success in meeting the need that would rely on the strengths of METRO and its member library systems. Instead of viewing METRO as a software/service provider that delivered the LMS product, METRO should convene a cooperative or consortium of member organizations to scope, build, manage, use, and govern the open source LMS product that they envision. This approach puts the strengths and values of the library community front and center, and would differentiate the initiative in the broader community. Combined with METRO's strong



reputation in developing and supporting *Archipelago*, we recommend that METRO convene a **Learning Consortium** to take the outputs of this study into the next stages of planning and piloting.

Instead of evaluating specific, existing LMS products and services, we focused on producing a strong set of desired requirements, which we recommend that METRO's potential Learning Consortium use to evaluate the best course of action for an initial pilot. Initially, our remit may have included the identification of the top open source LMS products and services, and the evaluation of these products over the requirements identified by METRO and its member libraries. But given the early results of our research into the LMS product landscape, our conversations with library staff, and the identification of a path toward success in any Learning Consortium, it became clear that a deeper evaluation of products would be needed. This work should be pursued by that group.

Collaborating members would need to begin by confirming and prioritizing the features they identified in this study, consider any additional features, and make some key decisions about how an initial pilot should proceed.

We recommend that a technology-focused sub-committee of the consortium be formed to do this initial work. One key decision point concerns system architecture. A shared LMS could be envisioned as a single platform available to all METRO library systems, with shared content across all libraries and patrons. However, some libraries identified a desire for separately branded instances of the LMS product/service. There is the potential for both the single and multi-instance use cases to be supported. For example, one option that surfaced during partner interviews was the suggestion of making use of a discovery layer to aggregate back-of-house documentation (curriculum outlines, trainer documentation, etc.) for library staff across partner libraries. If the LMS provides APIs as outlined in the functional requirements, this tool would complement the patron-facing LMS by allowing partner library staff to access and re-use LMS resources without having to manage a separate internal LMS portal and its associated permissions to access shared training materials.

Additionally, the technical working group could review existing open source LMS products as either complete and comprehensive options or products that would require integrations with other software or custom development to support desired features. To aid this group in these initial tasks, we have provided an [evaluation template](#) which includes all of the functional requirements gathered in this study, grouped by category. This evaluation would

LMS Evaluation Tools							
File Edit View Insert Format Data Tools Extensions Help							
100% View only							
A1	A	B	C	D	E	F	G
1	Overview	The LMS evaluation tools presented in this document may be used to evaluate how multiple LMS and other products compare in fulfilling the functional requirements identified in the feasibility study. The tools provided are examples, with fake scoring values assigned as a demonstration. If the METRO Learning Consortium decides to use this tool, several steps should first be taken to update, add, edit, or clarify the final functional requirements; to update the categories and sub-categories; to assign weights to each category; to select the LMS and/or other products they wish to evaluate; and to update the Scorecard formulas to account for these changes.					
4	Description of Sheets						
5	LMS Functional Requirements	Lists the functional requirements of the LMS by category and sub-category, as identified in the feasibility study. In this template, each requirement is scored using six evaluation categories, which may be weighted in the overall scoring. Overall priority is the first category, and then each product is scored over five other categories, contributing to weighted average score for the requirement. A scoring notes column completes the set of seven columns for each product.					
6	Scorecard	Calculates the overall percentage score for each product, as well as the percent scores within each category. Points scores by category and sub-category are also calculated.					
7	validationLists	Contains lists of items used in other sheets to control input through validation. For example the dropdown scoring lists, category and sub-category names, and weights for each evaluation category.					
10	User Roles Matrix	A separate tool from the requirements scoring, this sheet is intended to aid the Learning Consortium in identifying the desired LMS user roles and permissions to assign for each role. The template has been populated with the roles and permissions by category as identified in the feasibility study.					
12	Recommended Next Steps for Using Evaluation Tools						
13		Review and confirm functional requirements, categories, sub-categories, products to be evaluated, evaluation categories and their weights.					
14		Update validationLists, LMS Functional Requirements, and Scorecard sheets.					
15		Review application functional requirements, and set the priority for each in the LMS Functional Requirements sheet.					
16		Score each product in the LMS Functional Requirements sheet.					
17		Review the results in the Scorecard sheet.					
18		Discuss the desired user roles and permissions by category, update the User Roles Matrix sheet.					
19		Indicate which permissions should be assigned to user roles. This summary will be helpful to developers and also as future documentation.					



inform an initial prototyping and piloting phase, where specific, existing LMS and other open source content delivery products are evaluated and tested, leading to further clarification of requirements.

Recommendation: In summary, we recommend that METRO convene a Learning Consortium or cooperative to carry this work forward. The Learning Consortium should form a technical working group to clarify the requirements outlined in this report to inform an initial prototyping/pilot phase. The technical working group should evaluate the concept of a single LMS platform/service or multi-instance platform, and consider the overall scalability of the application in addition to individual libraries' preferences. The technical working group should then decide which existing, open source LMS should be evaluated, and determine which existing LMS products most comprehensively meet the consortium's requirements. Part of the evaluation should identify product features that would need to be fulfilled internally or externally:

- by third-party software adjacent to the LMS service, and integrated with it
- through existing third-party add-ons or modules
- through new custom developed integrations, add-ons, or modules

And, finally, the technical working group should identify and evaluate the potential for multiple open source products (branded as an LMS or otherwise) that could fulfill the requirements if integrated together.

Recommendation: METRO should convene a Learning Consortium or cooperative to carry this work forward. The consortium should form a technical working group to clarify the requirements outlined in this report to inform an initial prototyping/pilot phase, and identify and evaluate the most likely open source LMS products and/or other softwares that could meet those needs. The evaluation should include whether features/requirements would be fulfilled internally or externally, building an understanding of external dependencies and areas requiring custom development.



3.2 Technology

Summary:

- An essential element of a shared LMS is ease of login access for library patrons and staff
 - *Patron login: Integrated Library System (ILS) or “Library card” account*
 - Partner library systems currently use three (and, as of 2023, four) different Integrated Library Systems, and all use SIP2 protocol for patron SSO access
 - Any LMS should support multiple SIP2 connections via secure SSL tunnels
 - *Staff login: Active Directory*
 - All member systems use Active Directory for staff accounts
 - OpenID or OAuth 2.0 protocols may be used
 - Any LMS should support multiple OpenID/OAuth providers
- Libraries have multiple needs for using, promoting, and reporting on LMS content and patron/staff interaction with an LMS
 - Any LMS needs to provide robust and flexible APIs for reporting, engagement, integration
- Libraries would like options to integrate LMS content into their separate ILS catalogs and/or discovery layers
 - Successful integration depends on both the LMS’s APIs or output formats and each ILS’s APIs or import formats
 - Integration methods include *Items API* (Sierra), and *bib record ingestion* or *batch MARC import* (Evergreen). Possible integration methods for Sirsi-Dynix need to be confirmed.
 - Discovery layer integration for each library system would be performed by each partner library system, much like other current subscription content

Staff from METRO’s Digital Strategy team and technology/IT staff from each of the four METRO library systems were interviewed to identify the core technologies in use as relates to the integration and use of new systems like the proposed LMS. Though the focus in this study is on an open source LMS service, the technical requirements for integration with it would be similar to any other third-party service integration.

Through these interviews, the following core technology needs for the LMS have been identified, within two categories: *Authentication & Authorization* and *Findability, Indexing, and Reporting*:

1. Patron login/authentication and authorization
2. Staff login/authentication and authorization
3. LMS content indexing & findability within ILS and/or discovery layers



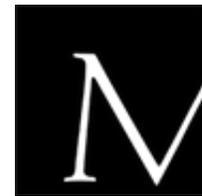
4. LMS reporting output and/or API for tracking learner engagement and content use
5. Reporting integration and/or export to library systems' business data warehouse and other internal or third-party systems

3.2.1 Authentication & Authorization

The table below summarizes member systems' technologies and integration requirements for authentication and authorization, described above in technology needs #1 and #2 :

Table 1: Summary of Authentication & Authorization Requirements for LMS Integration

	Brooklyn	Queens	New York	Westchester
1. Patron login/authentication and authorization				
Integrated Library System	Innovative - Sierra Documentation	Innovative - Virtua Documentation SirsiDynix (Summer 2023)	Innovative - Sierra Documentation	Evergreen Documentation
ILS hosting	On-premises, moving to Vendor hosted July 2022-07 – 2023-06	Vendor hosted	Vendor hosted	Vendor hosted
Patron Account for LMS Authentication	ILS			
Patron Account Authentication Protocol(s)	SIP2			
2. Staff login/authentication and authorization				
Staff Account for LMS Authentication	Azure Active Directory			
Staff Account Authentication Supported Method(s)/ Protocol(s)	OpenID Connect, OAuth 2.0			



The systems listed above describe the required integrations for patrons and staff to authenticate to an LMS and be authorized to access it. Patrons' library card credentials provide a common login that can authenticate to external systems using the SIP2 protocol. Brooklyn Public Library and The New York Public Library both use the same ILS, Sierra, from Innovative. Queens Public Library currently uses the Virtua ILS, also from Innovative, but will begin a migration to SirsiDynix in July 2022 to be completed by June 2023. The Westchester Library System uses the open source Evergreen ILS. All of the ILS systems utilized by these library systems should support the SIP2 protocol. For staff of member systems, the common account they all use for authentication is Azure Active Directory. METRO does not use Active Directory for SSO, but will likely only need local administrator accounts on the LMS service. SSO is not a requirement for METRO staff.

3.2.2 Findability, Indexing, and Reporting Requirements

Additional integration requirements related to findability, indexing, and reporting were also discussed by interviewees, which were described above in technology needs #3 through #5 and are summarized in table 2.

Table 2: Summary of Findability, Indexing, and Reporting Requirements for LMS Integration

	Brooklyn	Queens	New York	Westchester
1. LMS content indexing & findability within ILS and/or discovery layers				
Cataloging or Indexing LMS content within the ILS	Further needs assessment & research needed. <i>Potential options:</i> Importing LMS records in Sierra , Sierra's Items API .	Further research needed. SirsiDynix provides little online documentation. <i>Potential option:</i> Connections with content vendors may support selected LMS.	Further needs assessment & research needed. <i>Potential options:</i> Importing LMS records in Sierra , Sierra's Items API .	Further needs assessment & research needed. <i>Potential options:</i> Periodic bib record ingestion , batch import MARC records
Findability within Discovery Layer(s), i.e. website, search	Member library systems staff developers would integrate LMS content through LMS API calls or periodic flat file export/import.			



2. LMS reporting output and/or API for tracking learner engagement and content use				
	Preferably, any selected LMS should provide an API for course content and learner engagement with that content so that multiple external systems may use it to automatically ingest content records and reports on user engagement. If not an API, then the LMS should provide a reporting interface to construct custom reports and provide automated, periodic export in CSV, JSON or other flat files for other systems to ingest.			
3. Integration and/or export to library systems' business data warehouse and other internal or third-party systems				
Other Integrations Needed by Member Systems	Custom reporting to fulfill/integrate with NY State Dept. of Education Database or reporting site.	Central Business Data Warehouse (SQL integration, API, or flat-file export/import).	Custom reporting to fulfill/integrate with NY State Dept. of Education Database or reporting site.	Central reporting systems and automation were not mentioned, but would be possible with other member systems' requirements mentioned here.

Staff at all four member library systems confirmed that having LMS course titles available in their ILS systems would improve findability. However, this may or may not be possible or feasible, depending on the features of both the ILS systems they use and the capabilities of the future selected/developed LMS. In the overview table above, we list potential options for the ILS products used by member library systems. If appropriate APIs are available within the ILS or scripts provided by the vendor or ILS community, then periodic ingestion of bibliographic or MARC format records into the ILS would be possible, assuming that the LMS can provide compatible output formats. In some cases it may be possible to read records from an LMS provided API, similar to how an ILS “connector” or similar function can support content from third party vendors. In any case, exact technical requirements for this feature will need to be developed after an LMS is selected. The ILS teams at each METRO member library system should also be consulted in the LMS selection process based on their familiarity with each ILS’s capabilities and needs for interacting with third party systems and APIs. To enable the most flexibility for this possible future technical scoping, the selected or developed LMS should include an API that allows authenticated and secure access to LMS content as well as statistics on use of that content by authenticated patrons and staff.

Reporting needs that member library systems have for an LMS are much clearer and feasible. An LMS that is selected or developed should be able to provide either a reporting API to enable direct reports to be pulled by other systems on both the learning content presented in the LMS, as well as statistics on

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learner engagement with the content. Queens Public Library reported their use of a central data warehouse, which could receive reporting data from an LMS like other systems in use by QPL. Other systems may have similar technical requirements which may be uncovered in future stakeholder engagements or in a future LMS requirements-gathering process should METRO proceed with building the LMS. QPL's need could be accomplished using standard database connections (SQL), by using an API should the LMS provide that, or through export of flat files from the LMS imported into the data warehouse.

Staff at two member systems mentioned reporting requirements of the New York State Department of Education, which provides grant funding for ESOL and similar programs. This state DOE system is apparently a pain point for staff who interact with it, requiring them to report manually some of the same information they report on internally. A direct integration with this external system is out of scope for METRO's use case in developing an LMS, but should be mentioned as a related need that the LMS reporting could potentially address, such as a custom LMS report in the format required by the state.

Recommendation: Obtain blank copies of the reports to NYSED that library systems and METRO must submit, and use to determine the potential for fulfilling this need via custom reports from the LMS.

Recommendation: If possible, engage with relevant staff at NYSED to determine whether alternate submission formats are possible (such as CSV or JSON), or whether a sharable roadmap exists for updating the NYSED submission interfaces in the future.



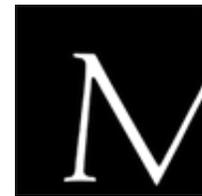
3.3 METRO's Technology Capacity

Summary:

- METRO's Digital Strategy team has the expertise to design and deploy software services
- The LMS or any other new software product/service would be a new, separate project, and would not leverage existing METRO software products
- New staffing and infrastructure services would be required to add an LMS or any other new software product/service.

The Digital Strategy team at METRO is a small, but successful, team that designs, deploys, and supports open source software and services for members and other constituents. The primary product this team manages is [Archipelago](#), an open source digital objects repository and digital asset management server architecture. The METRO Digital Strategy team and the *Archipelago* product have strongly positive reputations in the galleries, libraries, archives, and museums communities (GLAM). While the current METRO team is technically capable of developing and hosting a new shared LMS platform and/or service, this new product will require new staffing, development, and infrastructure.

Perhaps the greatest strength of the METRO Digital Strategy team is a focus on software development that is motivated by the cultural heritage and preservation community's needs first and foremost. In the case of *Archipelago*, rather than fulfilling the needs of the community with "out of the box" software like the Drupal content management system (CMS), the METRO team's leadership took the approach of developing additions and adaptations of the Drupal CMS to directly meet the GLAM community's need for supporting metadata standards in the CMS. It will benefit METRO Digital Strategy to continue this approach when developing a new LMS product/service and recruiting new staff or contractors to build, maintain, and support it.



3.4 Content and Workflows

Summary:

- Libraries are dissatisfied with current online content management workflows, which are remnants of the hard pivot to online learning during the pandemic
- Partner libraries do not have the time, instructional design expertise, or skills and workflows needed to transition online live (synchronous) classes to a repository of online content such as an LMS
- Libraries interpreted the types of content that might be found in the LMS widely, including programming (e.g. educational content for pleasure), training (e.g. skills and/or competency-based learning), and audience or demographic -specific training
- Library staff create the majority and, in many cases, all of their workshop curriculum in house
- Branded library content is used to reinforce the local library's connection to the patron
- As libraries increase in-person offerings, uncertainty remains around which library content will continue to exist in an online format. Libraries were responsive to digital inclusion needs during the COVID-19 pandemic and highlighted the number of ways that libraries need to be more proactive and hyperlocal in their digital equity planning and programming

This section examines how partner libraries select and develop instructional content for patrons. The chart below offers an overview of how each library approaches their own content workflow, while additional detail about the nuances of these workflows is discussed in depth under the chart.

In conversations with staff from each institution, pain points arose when discussing the lifecycle of library-created online instructional content, much of which was the result of the rapid pivot from in-person training to online learning as a result of the pandemic. Library staff selected tools to create, manage, and host content without a long-term maintenance strategy or a data management plan beyond compliance with records retention schedules.

Aware of the lack of strategic approach to the creation and storage of training materials, some libraries have formed or are gestating cross-departmental/cross-division groups to address these workflows. These groups, where they exist, would provide METRO a ready-made starting place for any future shared LMS content workflow discussions.

Recommendation: Libraries that have formalized committees or divisions dedicated to learning could provide useful perspective on governance or workflows for a larger collaborative LMS project.



Table 3: Summary of Content Workflows of Partner Libraries

	METRO	Brooklyn	Queens	New York	Westchester
1. Content Workflows					
Topic generation	Staff decide; Current events; Special Interest Groups (SIGs); Member surveys; Member Advisory Committee	Patron survey; Staff needs, interests, or skills; Committee of staff tech trainers decide; Current events; Grant focus and/or requirement	Patron survey; Staff needs, interests, or skills; Community needs assessment; Grant focus and/or requirement	Patron requests; Staff needs, interests or skills	Staff needs, interests or skills; Member requests
Curriculum development	In-house pedagogical and instructional design expertise Significant investments identifying, recruiting and shaping presentations delivered by top tier speakers, as well as support for non-METRO instructors	In-house curriculum development; some outside partners provide and teach unique curriculum (new digital strategic initiatives may bring in more partners) Instructional design expertise available to develop curriculum Branch staff have freedom to create/teach topics of interest; no defined review process	In-house curriculum development Bring in partners if no one on staff has expertise No defined review process	50% created in-house; 50% outsourced Retains rights from partners for materials if collaborating. Provide branch instructors a template for training; all content must be reviewed internally	In-house curriculum development for member libraries Partners TBD Review process TBD



3.4.1 Topic Generation

All library interviewees mentioned devising training topics based on direct feedback from patrons and staff as well as leveraging their professional awareness of relevant topics and expertise to implement responsive internal staff training and public patron workshops. METRO facilitates Special Interest Groups (SIGs) for their members and these SIGs will organize or request workshops or panels relevant to their group members and the greater METRO membership. Some libraries have internal committees to assist with planning curriculum topics while others have teaching and instructional design expertise throughout the organization. Some libraries implemented public training opportunities as a result of a grant award, either as the focus of the grant or as a byproduct of the needs of staff to successfully implement the grant goals. Others offer training for site-specific available software, as is found in the Brooklyn Public Library's Info Commons.

During the course of our conversations, libraries interpreted the types of content that might be found in the LMS widely. Some mentioned finding painting classes and author talks, while others focused on English as a Second Language (ESL) or programming topics such as Hyper Text Markup Language (HTML). If a shared LMS is pursued, it will be essential to define what type of content might be found or prioritized for inclusion in the LMS. For example, it might be useful to differentiate between programming (e.g. educational content for pleasure) versus training (e.g. skills and/or competency-based learning). This approach may also help library partners understand what they can bring to the table in terms of shared content and where there may be collective strengths or gaps. Additionally, this discussion will help focus the pilot's use case and prototype and allow partner libraries an opportunity to explore the concept of a shared learning platform outside of the expectations of an off-the-shelf LMS-type product.

.....
: **Recommendation:** Recommend convening partner libraries to discuss and define their expectations :
: and needs for types of content to be found in shared LMS. For example, some libraries may focus :
: just on programming (e.g. educational content for pleasure) while others wish it as a training platform :
: to implement and assess skills and/or competency-based learning. :
:.....

3.4.2 Curriculum Development

All library personnel interviewed for the five organizations create the majority -- and in many cases all -- of their workshop curriculum in-house. Specific internal workflows varied greatly by staff expertise and organizational size and structure.

As a small organization, METRO leverages the in-house staff instructional design expertise with the talents of their membership to create workshops and training to meet the needs of their members. METRO staff also spend significant time recruiting, developing, and shaping presentations and

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curriculum for their members that include top-tier national speakers as well as their member base. Given their team's expertise and nimble ability to convene engaging learning opportunities for their membership, they are in a unique position to lead partner libraries in discussions about how to develop a collaborative approach to curriculum development workflows.

Westchester Library System employs an instructional designer to design and teach member library staff on a variety of topics. Workflows for curriculum development such as curriculum review process were not mentioned, potentially due to the small size of their organizations.

Both Brooklyn Public Library and the Queens Public Library take a decentralized approach to training content and development. Both provided examples of department or branch staff identifying a topic central to their patron's needs and developing the content without a formalized approval or review process. Managers are free to nurture the interest and enthusiasm of a Subject Matter Expert on a topic that is both relevant to the library patron and the mission of the library. Brooklyn Public Library described such a workflow: libraries across the borough may all offer a shared basic computer literacy class, but a branch library with staff expertise may also decide to teach a more advanced computer literacy class such as Virtual Private Networks (VPNs). Queens Public Library runs a test of new training classes on staff as a way to assure quality before a public release.

METRO Executive Director Nate Hill sees potential in the decentralized approach for any possible Learning Consortium. "This is a beautiful thing in my opinion, and we want to make sure that software and a Learning Consortium enhances this kind of localized activity, rather than serves as a centralizing and normalizing force."

Localized community needs also played a big part of curriculum development in these two libraries. For example, Brooklyn Public Library offers training curriculum on digital media software, resources specific to the InfoCommons, that other branches do not have.

As the largest of five interviewed institutions, The New York Public Library has a tightly developed and centralized curriculum workflow and content approval process for their TechConnect training program, which focuses on technology training and skills. Tech Connect maintains control over curriculum from outside presenters and asks to see materials ahead of presentation. For training materials created in-house, staff who teach must send curriculum for review to ensure sustainability and continuity in presentation training materials. Branch instructors are provided a template that can be adapted if they have a different idea of the types of content they would like to present, but that must also go through an internal review before it is greenlit.

Given the diversity of approaches to content workflows, there are at least three areas that would benefit from further examination and discussion with partner libraries as the LMS project begins which will help bring into focus the scope of the pilot LMS:



- **Branded content:** During the course of the conversations, Brooklyn Public Library explained that they include images of their equipment and computing environment in their training materials to ensure that learners are being trained on the environment they will encounter. This hyperlocal curriculum raises a larger issue regarding how the LMS will accept or allow for branded content, how member libraries can curate their localized content, and how or if learners will need or want to identify their home library to get more personalized content. From a technical perspective, this may also be resolved during discussions about how many instances of the LMS will be supported. See the Branding section in Functional Requirements (Section 3.7.3) for further discussion.

.....
: **Recommendation:** Any possible METRO Learning Consortium should discuss the place of branded :
: content with the LMS early in the planning process. :
:.....

- **Online vs In-person training topics:** Libraries were responsive to digital inclusion needs during the COVID-19 pandemic and it highlighted the number of ways that libraries need to be more proactive and hyperlocal in their digital equity planning and programming.

All five library institutions are still determining which types of classes to continue providing online while they increase in-person offerings. Physical classes are central to the library’s mission – especially basic technology classes - but the pandemic helped library’s recognize the convenience, accessibility, and value in delivering online classes.

To reach unserved and underserved populations, library workers have long been encouraged to “go beyond the walls of the library” to bring library services to those who experience obstacles accessing them -- often that has meant physically connecting in-person with residents. The COVID-19 pandemic made it unsafe to practice this model while also further disenfranchising those in most need of library services. However, simply delivering online classes via the proposed Learning Management System will not fix the digital equity issues that the COVID-19 pandemic has made so glaring. The partner libraries in the Learning Consortium will need to ensure that any LMS efforts also incorporate and augment increased broadband connectivity for residents. Simply put, how will the libraries assist with or advocate for connectivity that is reliable and affordable?

.....
: **Recommendation:** Project feasibility will be better scoped after discussing each library’s expected :
: institutional emphasis on online learning (versus in-person classes), as in-person and online classes :
: require different tools, skill sets, and staffing models. It may also provide a roadmap for METRO :
:.....



partner libraries to show the direct correlation between library services and digital equity, especially universal broadband access.

- **Online course engagement and enrollment.** During a discussion with Queens Public Library, it was noted that an LMS would help leverage the limitless seating capacity of an online course as opposed to the restrictions of a physical classroom. However, this works best in a self-service model where learners expect very little to no engagement with a course instructor. Potential LMS collaborators should discuss their respective expectations for types of engagement: completely asynchronous without a course instructor; a hybrid approach where instructors may offer “live” aspects of the course such as office hours, discussion boards, or online meetings; or a totally live approach either in a flipped classroom setting or traditional class where students join live meetings together and submit work, etc.

Recommendation: The Learning Consortium should evaluate the needs and expectations around different types of course enrollment and subsequent engagement in online courses. The expectation for course engagement will drive the type and amount of staff support needed to run the online LMS: the higher the level of engagement in a course, the greater the number of instructor and/or staff hours needed to facilitate that engagement.



3.5 Content Platforms

Summary:

- Partner library staff focus current training content on live synchronous offerings, with few exceptions
- Libraries are using many different, often disconnected platforms to share internal and external training content and curriculum sharing
- Each library has some original and some licensed/purchased content. From a technical architecture perspective, this licensed/purchased content presents integration challenges.
- With one exception, most libraries do not have defined workflows for reviewing, updating, or weeding their training materials
- METRO staff have capacity in skills and workflow to lead content processing work, including post-production video work and metadata tagging for discoverability. As with METRO's technology capacity, it is key to note that the LMS or any other new software product/service would be a new, separate project, and new staffing and content services would be required.
- All libraries agree that addressing patron privacy and data confidentiality in an LMS environment should be part of future discussions.
- Human infrastructure, more than IT or content, will determine feasibility of LMS.

The chart below allows for quick comparison of content platforms¹ and processing workflows used in partner libraries. Additional details are below the chart.

¹ Descriptions of content platforms and links are provided in Appendix C.



Table 4: Comparison of Content Platforms

	METRO	Brooklyn	Queens	New York	Westchester ²
1. Content Platforms					
Internal (for PD or library staff to share resources)	Airtable; GoogleDocs	Cornerstone; Airtable	PD: Niche Academy; YouTube; LinkedIn Learning but staff log in as patrons, making it difficult to track staff PD Internal resource sharing: Sharepoint; GoogleClassroom	GSuite for instructors to share curriculum (just for TechConnect)	More research is needed
Repository of recorded content (Y/N)	YouTube, Vimeo, Website	More research is needed	Recording some series-based courses for patrons; likely hosted on GoogleClassroom (need to confirm)	Mostly not recorded as focus is on live synchronous and live help	More research is needed
External (for members/public to access content)	Website	OneDrive; Website	More research is needed	TechConnect Website	More research is needed

² Unlike the other three library systems who provide direct service to patrons, Westchester Library System serves a core audience of library workers at member public libraries. WLS's small but nimble staff have the aptitude and motivation but not the current capacity to provide online training materials at the same scale as the other partner libraries. WLS can be further engaged to better understand what content platforms are being used internally as well as across WLS member libraries.

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Authoring/hosting platforms used	Zoom	Articulate Storyline; Zoom; FacebookLive	Zoom; GoogleClassroom;	Articulate Storyline; YouTube; Eventbrite; Drupal; Zoom	More research is needed
	METRO	Brooklyn	Queens	New York	Westchester
Licensed Content (sampling)	More research is needed	LinkedIn Learning	LinkedIn Learning	Brainfuse LinkedIn Learning Microsoft Learn	More research is needed
Content maintenance and review	More research is needed	No defined workflow	No defined workflow; currently keeping everything to meet records retention and potential to adapt or update later	Contracts with an outside vendor to review and update curriculum throughout the year.	More research is needed
Content processing	Staff expertise in content post-production	N/A because most content is not recorded	N/A because most content is not recorded	N/A because most content is not recorded	More research is needed



3.5.1 Overview of Library Platforms In Use

Brooklyn Public Library, The New York Public Library, Queens Public Library, and Westchester Library System use a variety of platforms to convene learners in live, synchronous training environments. For example, a library might post curriculum materials for learners in a private Google Classroom site while complementary live trainings are held via Zoom. Each library emphasized that the majority of their virtual classes are not being recorded or archived for asynchronous viewing later. Queens Public Library does record some of their series-based classes, but this is not the norm. NYPL uses Articulate Storyline to create asynchronous online learning modules for public online learning that are hosted on the TechConnect website. BPL uses the same tool for internal professional development and compliance training.

More information about specific LMS features and requirements requested by LMS stakeholders can be found in Table 2.

LMS stakeholder libraries do not currently have content or workflows in place for creating and maintaining training content in a public formalized online environment, such as an LMS. This represents a great opportunity to determine tools, workflows, staffing and skills needed to build a library of asynchronous learning. METRO stands out as the one organization that is currently recording and building a library of recorded training content as well as post-production workflows to make content easily accessible for their members.

.....
: **Recommendation:** METRO has the skills and capacity to lead this initiative given staff expertise with :
: post-production online training workflows. Further discussion is provided in the post-production and :
: content maintenance and processing section of this report. :
.....

3.5.2 Internal Library Platforms

As noted in Table 4, row 3, METRO's partner libraries are using many different, often disconnected platforms to share internal training curriculum with one another, as well as to facilitate compliance and professional development for library staff. While this feasibility study focuses on public-facing training content, internally-focused tools and workflows could be used to inform better tool integration and workflows for the shared LMS. For example, where will instructor scripts for shared recorded asynchronous classes live? Will they live on the authoring Library's internal platform (where other outside library members may not be able to have access)? Will they live within the LMS in a separate "training materials" restricted area for library staff? Or will there be a separate, shared site for libraries to upload their teacher materials? This is one of many questions that an implementation team will need to address early on.



The shared LMS could also be an opportunity to finally see all of the training happening within a particular library system, given that some divisions or departments use different methods for sharing training curriculum, resources, and recordings.

3.5.3 External Library Platforms

Table 2, row 5 shows where library-created public training materials and handouts currently live for each library institution. Few libraries have a centralized clearinghouse of all of their training materials available, and most point to licensed database content for asynchronous tutorials and online learning. Others, like Brooklyn Public Library, may offer materials directly to students once they are enrolled in the series-based class, such as their [Adult Education](#) High School Equivalency courses. In this scenario, patrons need to message a generic email address to receive further information about the course, eligibility, and resources.

NYPL's [TechConnect](#) website is the most robust, providing PDF handouts for each of their technology classes, many of which are provided in multiple languages.

An anecdote from Brooklyn Public Library (BPL) offers insight as to perhaps why only NYPL is providing public access to library training materials. BPL shared that at one point they did use their website to publish training resources and handouts related to technology found within the InfoCommons at BPL's Central Library. Other library staff outside of the InfoCommons supported the idea and wanted to contribute their own materials. However, over time the page became disorganized and out of date -- a product of its own success. Had there been a discussion at the beginning of the workflow and management of the published materials, it's possible the materials would still be online.

.....
: **Recommendation:** To leverage pre-existing efforts to their fullest potential for this collaboration, each :
: library should construct an inventory of internal and external platforms currently being used, including :
: the type of assets hosted on these platforms, ownership of these assets, and overall purpose of the :
: assets. :
:.....

3.5.4 Licensed Content

A key differentiator between library systems is the ratio of original content to licensed/purchased content as part of each library's training efforts. Each library has some original and some licensed/purchased content. From a technical architecture perspective, this licensed/purchased content presents integration challenges since there is most often a handoff from the library website to a separate vendor website that is subject to change at the vendor's discretion and can "break" the functionality of the LMS.



Recommendation: Due to the complications of including licensed content on any shared LMS platform, initial development should focus on original content created and owned or licensed³ by each participating library system. However, the platform should be flexible enough to incorporate leased/licensed in the future.

3.5.5 Content Maintenance and Review

NYPL was the only library interviewed that had a formal workflow for systematically reviewing public learning content on a yearly basis to decide whether to weed, update, or keep it. Due to the sheer number of classes and resources that NYPL (specifically TechConnect) offers, they contract with an outside vendor to both create and review content and update it or retire it as needed. Ballpark estimates are that up to half of the materials are created and updated by NYPL, while the other half are created and updated by an outside vendor. Other libraries interviewed acknowledged the need to have such a process, but did not have formal workflows to address it.

As mentioned earlier in the External Content Platforms section, Brooklyn Public Library (BPL) ran into content and review issues after they posted curriculum materials to the InfoCommons website for patrons. Other BPL staff saw the value in open content access and began to add their materials to the site, but as more content was added, staff could not decide who was responsible for managing, reviewing, and updating the content after it had been posted.

Like any physical or digital library, an LMS should be curated to ensure that they are meeting both the hosting organization's learning outcomes and the users' needs. An LMS needs a collection development policy as well as content maintenance and weeding workflows, especially if the LMS will be shared among multiple institutions.

Recommendation: Further discussion from collaborating libraries should identify people, processes, and timelines for reviewing and maintaining LMS content. This concept is expanded in the Shared Governance section.

3.5.6 Content Processing

METRO is the only organization creating repositories of recorded content and they describe a significant and detailed post-production process, including editing for clarity and branding as well as metadata tagging for organization and findability. Other libraries did not address this level of detail for their workshop and training materials, but Queens Public Library and Brooklyn Public Library both mentioned that their Event and Outreach departments do have in-house talent that process videos for Author Talks and other related programs. Consideration of production-values, metadata standards -- as

³ To define how original content may be used and shared, participating libraries may wish to license their content under the appropriate Creative Commons designation. <https://creativecommons.org/>



well as the previously mentioned branding -- should be included as part of a shared governance conversation.

Recommendation: Each library should construct an inventory of internal partners whose skill sets align with the shared LMS project content processing needs in order to leverage pre-existing staff expertise.

3.5.7 Privacy and Confidentiality

Each of the libraries who were interviewed expressed concerns about patron data collection and the professional obligation to protect patron privacy and confidentiality. There were varying degrees of comfort with collecting and using patron data to better meet users' needs, ranging from allowing users to simply opt out (NYPL) to collecting as little data as possible from the outset (Brooklyn Public Library and METRO). Queens Public Library and Westchester Library System did not express strong opinions or approaches. NYPL in particular felt strongly that collecting learning analytics would advance their ability to reach more learners and provide a more reliable and systematic process for assessing their community impact. The American Library Association's Intellectual Freedom Committee provides [Library Privacy Guidelines for Library Management System](#) as a framework. This concept is expanded in the Shared Governance section.

Recommendation: Further discussion from partner libraries should identify institutional and collective privacy and patron data policies.



3.6 Partner Library Collaboration

Summary:

- METRO has the necessary trust and proven capacity to convene a collaborative partnership of libraries in this potential project
- Partner library systems have varying needs for an LMS (e.g. staff training in addition to patron training).
- All partner libraries have a willingness to collaborate, but different areas of priority and needs for collaboration.
- Queens Public Library and Brooklyn Public Library appear to have the closest match of priority needs and readiness for near-term collaboration

As part of the feasibility study, a site visit was performed by the consultant in the New York City area from May 2 through May 6, 2022 for the purpose of convening focus groups from each partner library. The purpose of the visit was to gather a focus group at each library site and explore a number of questions from perspectives of each library partner in confidence. The list of questions is provided in Appendix D of this report.

Prior to the focus group sessions, the consultant team confirmed technical possibilities/compatibilities in key areas, including METRO's technology capacity (with the understanding that any LMS project would require additional resources) and core LMS access requirements for patrons and staff. The consultant team also confirmed METRO's interest in serving as a convening agency for a possible LMS project in other areas, including fostering and leading collaboration among member libraries in the mechanics of creating and offering learning opportunities to patrons, including shared workflows, shared content, and leveraging the strengths of each partner in any possible LMS.

During the focus group conversations, the consultant shared information about key findings in conversations about technology, training content and training workflows, including:

- Findings indicated key compatibility in possible access to a technology-based training platform from library patrons and library staff from all of the four partner systems (BPL, NYPL, QPL and WLS)
- The notion that while technology (and harnessing economies of scale) is key to offering a shared LMS, the **purpose** of a shared LMS would most likely be centered on the positive and equitable impacts to people served by libraries in the diverse communities in and around metropolitan New York
- Findings suggested opportunities for METRO to consider a shared model for any possible LMS scenario could foster inter-library collaboration in key areas beyond technology, including workflows, content, and sharing/leveraging the strengths and best practices of partners

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- Questions from all partners about the governance of any shared LMS, and the privacy, confidentiality, and security model to protect both patrons' personal information and the LMS system itself

The majority of each focus group was devoted to discussion around key areas, including examples of successful and challenging collaboration experiences from each library system; discussion of the greatest needs of each system in any shared LMS; and resources that each felt they could offer as a partner in any possible collaboration.

Time was also given to thoughts about governance for any possible collaboration, including opportunities, dangers/third rails/deal-killers, and the level of work each library may be able to offer in designing and building a possible collaborative LMS project.

Finally, each group shared their visions and dreams about a possible collaboration, including the identification of possible outcomes of a shared LMS platform that would be of the greatest benefit to each partner's library and patrons; and thoughts about the best benefits for all members (libraries and patrons) of a shared LMS.

To encourage members of each group to speak freely, the details of focus group responses will remain confidential. In general, there are three findings to share that influenced the consultant's recommendations for any possible shared LMS:

- Partner library systems have varying needs for an LMS (e.g. staff training in addition to patron training)
- All partner libraries have a willingness to collaborate, but have different areas of priority and needs for collaboration
- Queens PL and Brooklyn PL have the closest match of priority needs and readiness for near-term collaboration



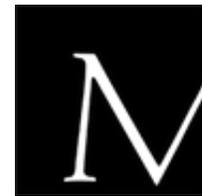
3.7 Functional Requirements

Summary:

- Core technical requirements for a shared LMS service or product include:
 - Cloud-hosted, able to support unlimited users
 - SSO for patron accounts that support multiple SIP2 protocol connections (through SSL tunnel)
 - SSO for staff accounts; supports multiple OpenID/OAuth2 connections
 - Provides robust & flexible APIs for reporting, learner engagement, integration with other systems (SCORM, Tin Can API, SQL, flat file import/export)
 - Mobile friendly, or separate app in addition to web access
 - Separate instances, or content access per library
- Core privacy and confidentiality requirements include:
 - User options to limit degrees of data collection, or blanket opt-out option
 - Patron management of user profile, contact info & preferences, notifications, data sharing with other library systems
 - Patron account and staff account isolation (i.e. patrons can't see other patrons' info unless they explicitly allow it and staff can't see other staff's records)
- Core content requirements include:
 - Support for a wide variety of content types and formats (PDF, Excel, Word, PowerPoint, videos, links to external websites)
 - Multilingual content
 - Support for SCORM-compliant content format
- Core features include:
 - Onboarding for new users, assesses interests, sets privacy & other profile details
 - Guided or suggested content based on interaction with the system or content
 - Supports blended learning, file sharing, assignment submission, student discussion forums
 - Quizzes, surveys, in-class polling, Q&A, collaborative whiteboard
 - Competition between learners, badging certificates to award learners
 - Built-in audio/video/course transcription service
 - Viewer can scrub or scan through audio/video
 - Notification & promotion
 - Patrons receive automated reminders, waiting list updates, or promotion about other content & services related to LMS content they've used before
 - Third party partners can subscribe to available content or upcoming synchronous series
 - Option to schedule/book physical locations related to learning content



- Integrated chat, live video conferencing (nice to have for a more integrated learner experience)
- Retains records of completed courses for users
- Core reporting requirements include:
 - User demographics, single/multi-card users
 - Course registration/completion, data score tracking, attendance (automated where possible)
 - Custom reports with selectable fields, automatic report delivery/scheduling
- Administrative requirements include:
 - Events/classes will need a mix of space limits, waiting list, expiration dates, multiple dates/time/locations, public or private events
 - Batch user registration, role-based permissions



3.7.1 LMS Application Overview/Description

If METRO is charged with developing and hosting a comprehensive Learning Management System (LMS), there are at least two possible forms it would take: a Software as a Service (SaaS) application and/or Platform as a Service (PaaS), to be shared with all of its organizations and constituents.

Initial requirements for any possible SaaS/PaaS LMS were gathered from relevant staff at each of the four METRO member library systems. It is envisioned that these staff and others from METRO organizations and constituents would be convened by METRO as a Learning Consortium, which would inform all initial stages of application development, evaluate the application features in a pilot when ready, and form the basis for ongoing community-based governance of the shared SaaS/PaaS service. The remainder of this section will describe desired initial functional requirements as identified by the staff at METRO and the staff from member library systems who participated in this feasibility study.

Each section begins with a brief narrative description, followed by a bulleted list of requirements with links to relevant documentation or other relevant resources. An [accompanying spreadsheet evaluation tool and scorecard](#) provides a concise listing of the requirements by category. This tool intended to be used for evaluating existing LMS products or as a feature list to guide any new software development.

1	Category	Sub-Category	LMS Requirement	Sub-Requirement	Priority
2	Application Architecture, Hosting & Deployment	Hosting	Hosted on AWS		high
3		Architecture	Deployable as a single application with single frontend		high
4		Architecture	Deployable as a multi-instance service supporting multiple, separately branded frontends with a common backend		TBD
5		Architecture, Deployment	Scalable to support unlimited users, instances and traffic scaling within AWS as needed by demand		high
6		Architecture	Accessible (508 Compliant), adaptive web interface and/or mobile application		
7		Architecture	Ability to define local administrator accounts for deploying, managing, and maintaining the LMS		
8		Account Authentication	SSO for patron accounts using SIP2 protocol via SSL tunnels between each ILS and the LMS application server/service	BPL's ILS: Innovative, Sierra QPL's ILS: SirsiDynix (2023), Innovative, Virtua (2022) NYPL's ILS: Innovative, Sierra WLS's ILS: Evergreen	
9					
10					
11					

3.7.2 Core Requirements

3.7.2.1 Application Architecture, Hosting & Deployment

METRO staff uses Amazon Web Services to host their current open source applications. While the staff building and managing the LMS SaaS/PaaS application would be a new team, and standardizing on the AWS hosting platform may makes sense for ongoing support and management of the METRO suite of applications and services, the most economical and best suited cloud platform for hosting the LMS should be determined in the next project phases. A key decision point in the next project phases should be to determine whether the LMS will be deployed as a single instance service shared among all member library systems, or a multi-instance service for each library system. LMS products that are evaluated may have built in support for multiple instances, similar to the multi-site support found in



Wordpress or the Drupal content management system. Custom development could also build a SaaS service to deploy multiple instances: using APIs from the selected cloud platform, Docker container management, or other means. In either case, the application should be built to scale in the number of users, storage, and traffic, as needed by the demands of use. Finally, the user interfaces of the LMS must be compliant with the US accessibility requirements under Section 508 of the Rehabilitation Act and Section 255 of the Communications Act.

Recommendations:

- LMS should be hosted on with a cloud service provider such as AWS as a SaaS/PaaS service/platform. The specific service should be determined in the next project phases
- The LMS should have the ability to deploy as either:
 - A single application/service/platform
 - Multiple instances of the application/service/platform, from a common database
- Scalable to support unlimited users
- Instances and traffic scaling as needed by demand
- Accessible ([508 Compliant](#)), adaptive web interface and/or mobile application

3.7.2.2 Account Authentication

The LMS would require Single Sign On (SSO) for patron accounts of participating METRO member library systems and for staff accounts at each library system. Patrons' SSO accounts at each library system come from each library's Integrated Library System (ILS), also known as their "library card account." ILS systems typically support the SIP2 protocol, enabling authentication of external systems. SIP2 is not a secure networking protocol on its own, but can be secured between each ILS server and the LMS SaaS/PaaS application/service using SSL tunnels. Brooklyn Public Library and The New York Public Library both use the same ILS – Sierra – from Innovative. Queens Public Library currently uses the Virtua ILS, also from Innovative, but will begin a migration to SirsiDynix in July 2022 to be completed by June 2023. Westchester Library System uses the open source Evergreen ILS. All of the ILS systems should support the SIP2 protocol. A total of four persistent SSL tunnels would be required, one for each ILS. Staff at all member library systems have SSO now via Azure Active Directory. Each system maintains separate Active Directory instances, requiring four OpenID or OAuth2 connections to the LMS for staff SSO, one for each member system. METRO staff would have local administrator accounts on the LMS, perhaps with other roles assigned, but would not have an SSO account on the system like consortium member library staff or their patrons. All authentication must be secured via standard protocols. In particular, scrutiny should be placed on patron authentication to ensure and demonstrate that any patron information retrieved from or exchanged with the ILS via SIP2 SSL tunnel is properly secured. There should be no limit on the number of users who may have accounts on the LMS. Finally, the application should support the creation of local administrator accounts to manage the overall application/service/platform's initial deployments, maintenance, migration, and ongoing



maintenance. The method of implementing local administrator accounts should be discussed and defined by the application developer in collaboration with the Learning Consortium.

Recommendations:

- The LMS service or platform must support secure single sign-on for patrons and staff of METRO and its member library systems
- The LMS service or platform must support SSO for patron accounts and Integrated Library Systems (ILS) using SIP2 protocol via SSL tunnels in concert with each library system's current infrastructure:
 - BPL - Innovative, [Sierra](#)
 - QPL - SirsiDynix (2023), Innovative, Virtua (2022)
 - NYPL- Innovative, [Sierra](#)
 - WLS - Evergreen
- Staff accounts must be authenticated through Azure Active Directory (OpenID Connect, OAuth 2.0)
- An LMS must support access by an unlimited number of users
- The system must have the ability to define local administrator accounts for deploying, managing, and maintaining the LMS

3.7.2.3 Account Authorization

Local administrator accounts will have blanket authorization to all features of the application. For all other users, a base level of role/permission-based authorization for different SSO accounts within the LMS will be defined by two different user groups: patrons and staff. These may be defined easily through the type of authentication being used. Accounts authenticating via SIP2 via SSL would be granted the patron role, and accounts authenticating via OpenID Connect or OAuth2 would be granted the staff role. Additional authorized roles and permissions will need to be defined within the application itself. The METRO Learning Consortium would ultimately define these roles and permissions, and we have provided a [User Roles Matrix tool](#) to aid the consortium in defining them.

Recommendations:

- An LMS should include provisions for local administrator accounts that have blanket authorization to all features of the application (i.e. a DevOps admin)
- Base Patron and Staff roles could be based on the method of authentication
- The LMS should have settings available to define new user roles for staff and/or user accounts, assigning different privileges for accounts assigned to the role. Examples include:
 - Student
 - Teaching assistant



- Course instructor
- Course designer
- Instance admin
- Content admin

3.7.2.4. External Systems Integrations

While the primary purpose of the LMS application/service/platform will be to house and deliver learning content, METRO and its member library systems require the ability to use information from the LMS in multiple other systems and for general reporting outputs. The LMS needs to have robust and flexible features to enable reporting, learner engagement and tracking, findability within discovery layers, and promotion of LMS content. For example, having LMS course titles available in libraries' ILS systems would enable findability within a catalog search. While this study identified the potential technical paths for integrating LMS content within each ILS, further needs assessment and research are needed to confirm these pathways.

To enable the most flexibility, the selected or developed LMS should provide APIs allowing authenticated and secure access to LMS content as well as statistics on use of that content by authenticated patrons and staff. Additionally, the LMS should support the use of third party APIs used by authors of learning content, such as the SCORM API for structuring course content, or the TinCan or Experience API for understanding a learners experience with LMS content.



Recommendations:

- The LMS should support the use of API(s) like:
 - [SCORM API](#)
 - [TinCan API / xAPI / “Experience API”](#)
- The Learning Consortium should work together to determine and/or confirm the need for integrating LMS content into Integrated Library Systems for each library
 - If desired, the consortium should research and confirm the technical methods for LMS and ILS item integration per each library system’s technology. The LMS should be able to:
 - import LMS course titles into Sierra as item records using Sierra’s Items API (BPL, NYPL)
 - export Bib record or MARC record format, and these can be imported into Evergreen (WLS)
 - Further research is needed to confirm possible LMS and ILS content integration methods for Sirsi-Dynix (QPL)
- The Learning Consortium should research the viability and technical underpinnings for indexing within libraries’ Discovery Layers on:
 - Websites
 - Unified Search

3.7.2.5 Security, Privacy, & Confidentiality

Ensuring that the LMS application and server(s) hosting it are secure is a critical requirement aligns with the core values of public libraries. Protecting the privacy of patron information is paramount, at both the systems level and within the application’s features.

Recommendations:

- The application’s hosting environment should be demonstrably secure
- All connections between the LMS application server(s) or service to external servers should also be demonstrably secure. Specific examples include:
 - SSL tunnels between the LMS’s server and each library’s ILS server
 - OpenID Connect, OAuth 2.0 connections to each library’s and METRO’s Active Directory servers
 - API calls to and from the LMS server(s)/service
- The LMS should provide patrons with options to limit degrees of data collection, or provide a blanket opt-out
- Patrons may manage their profile, contact info and preferences, notifications, and data sharing preferences with other library systems



- Patron accounts and staff accounts should be isolated from one another; patrons would not be able to see other patrons' info unless they explicitly allow it and staff can't see other staff's records

3.7.2.6. Administration

DevOps administrators doing the initial configuration and deployment of the LMS should have system administrator level access, but once deployed, a strong administrative user interface will be needed to manage all aspects of different aspects of the LMS and/or each instance day-to-day. Multiple administrator roles might be defined to support different levels of access, for example “instance admin” and “content admin.”

Recommendations:

- Define roles and permission levels for administrator level access:
 - LMS Application/Service Admin
 - Develop op level, non-DevOps role for managing the overall LMS application/service
 - If using a multi-instance SaaS, this role should have the ability to create new instances, assign administrative users to them, and associate groups of users (learners) to new instances
 - This role could include the ability to manage existing and add new authentication methods and connect them to specific instances (if multi-instance)
 - Instance Admin
 - In a multi-instance scenario, this role would allow individuals assigned only to one instance the ability to administer that instance's branding, users, content, etc.
 - Content/Course Admin
 - Create/manage all content and related features
- Define workflows and setting for managing users
 - Create or delete user accounts whether individually or through batch import
- Define workflows and settings for reporting
 - Create and manage all reporting-related features



3.7.3 Branding

Whether a single application/service or a multi-instance SaaS/PaaS product, the LMS should provide the ability to be uniquely branded with custom colors, themes, logos, and related options. In a multi-instance scenario, each instance should be able to be branded individually. These options should be able to be set within the application's user interface (UI), or by editing theme files directly, in order to support staff administrators with varying skill levels with HTML, CSS, etc.

Recommendations:

- Ensure that themes are separated logically from the content and features of the application
 - New themes can be uploaded and available themes may be selected in the UI
 - Application theme can be customized within the UI using a WYSIWYG editor by users with assigned permissions
 - HTML/CSS theme files can be edited directly in the UI using a theme editor UI, for users with assigned permissions and skill levels

3.7.4 Content

The LMS needs to support standard content types such as Text/HTML, PDF, Videos, PowerPoints, and other typical document formats. The service should also support creating and/or importing content using APIs such as SCORM or TinCan API, two eLearning standards that make uploading and migrating LMS content easier as well as providing online and offline learner tracking. Many large LMSs make available extensions like language translations to meet the needs of a diverse student base and population. Given the diverse languages spoken in the New York metropolitan area, this feature would benefit both the learner and the internal workflows and processes of METRO member libraries to easily translate content, or to utilize APIs that support automatic translation. Finally, for media content specifically, the user interfaces that provide audio/video playback should support scanning or "scrubbing" clips back and forth, and should support the inclusion of a caption track or use a captioning/transcription API for accessibility. Live video conferencing for synchronous or hybrid courses is discussed in subsequent sections of this document, but as a type of content, live streamed video and video conferencing should also support automated captioning and transcription.

Recommendations:

- An LMS developed in this process should:
 - Support the use of PDFs, Excel, Powerpoint, videos, links to external web pages for reference
 - Allow users the ability to upload material that was previously created



- Support [SCORM API](#) and SCORM compliant content format
- Support [TinCan API / xAPI / "Experience API"](#)
- Allow content that may be authored natively in multiple languages
- Support automated content translation via an API like, for example, [LibreTranslate](#)
- Utilize a video content player that supports scanning or "scrubbing" backward and forward through a stream
- Uses a built-in audio/video/course captioning or transcription service or API

3.7.4.1 Content Licensing

Initial development of content for the LMS pilot should focus on original content created and owned or licensed by each participating library system. However, the platform should be flexible enough to incorporate leased/licensed in the future.

Recommendations:

- The LMS platform content should include fields indicating its ownership and/or licensing status
- The LMS platform should be flexible enough to incorporate leased/licensed in the future

3.7.4.2 Course Structures & Management

A course will contain different types of standard content as described above, and the structure of courses will need to be flexibly defined and/or filterable to support different instructional pedagogies, learners' experience or skill levels, or the expertise of instructors. Course structure might be understood as a kind of a meta-content type, and, to course designers, could look like a set of course templates that follow a certain learning path. Course administrators or designers will use this meta-content type to define the way each course is structured and also how learners will interact with the course. For example, some courses could be part of an overall certificate or credential program while others might be structured to allow learners to see content related to their self-selected or assessed skill level. Instructors might choose from existing course templates, clone and modify an existing one, or create a new template entirely.



Recommendations:

- Additional course management and administration features that are needed include the ability to:
 - Create, clone, and categorize courses
 - Edit existing course content
 - Publish courses
 - Create and edit course separately from publishing them
 - Set flexible user registration options (individual as well as batch) for enrolling and tracking users within the course editing UI
 - Manage multiple dates, times, and locations for a course
 - Support blended, asynchronous classes
- The following attributes should be noted as well when designing an LMS:
 - Courses can be public or private
 - Courses may have virtual and/or physical space limits
 - Courses may have an automated waiting list if a participant limit is defined
 - Courses may have expiration dates
 - Course attendance is automatically tracked for reporting

3.7.4.3 Course Creation Workflows

LMS courses could be authored by individual instructional designers, or by teams of staff with specified roles. In some organizations where content is authored by groups or teams, an authoring, editing and approval workflow for content is sometimes defined. Some content management systems provide features allowing for a workflow to be defined that formalizes the roles and contributions of different team members as content is written, edited, approved and published.

If desired by the METRO Learning Consortium, the LMS should provide a means of defining course creation and publishing workflows that define different steps in the process. The LMS should allow staff or groups of staff members within a specific role to be assigned specific items. The Course Creation Workflow interfaces should include a queue of outstanding tasks within a workflow and the option to receive notifications upon assignment or reminders about outstanding work to be completed.

Recommendations:

- The LMS should include:
 - A feature allowing definition of Course Creation Workflows, defining the steps required for teams of staff working jointly on different aspects of a course
 - The ability to assign specific staff or groups of staff assigned to a specific role to complete workflow steps



- The ability to set deadlines for completing workflow steps
- An administrative user interface showing current and past content workflows and statuses
- Options to enable notifications related to course creation workflow steps when:
 - New task assigned to an individual or group of staff within a role
 - Course status changes within the workflow
 - For courses actively being developed in a workflow, reminders for staff or groups assigned to content tasks

3.7.4.4 Learner Assessment

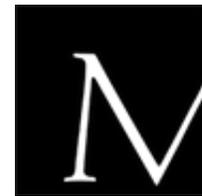
Multiple methods assessing student learning that mirror those found in physical classrooms should be supported within the LMS. Examples include quizzes/tests with various ways to demonstrate learning (multiple choice, matching, etc); essays, ability to upload assignments in various formats including multimedia, and the ability to track and grade course participation through discussion boards.

Recommendations:

- An LMS should include:
 - Options to create quizzes and tests with various ways to grade student learning
 - Support for multiple types of questions: multiple choice, matching, essays, ability to upload assignments in various formats including multimedia
 - The ability to create pop-up quizzes or polls
 - The ability to define each course's grading or scoring methods as a part of the course structure
- Automated tracking and grading of course participation may be defined as part of the scoring method
- Scoring/grading methods may be pre-defined and saved as templates, reused and remixed into new templates
- The LMS should also include the ability to define methods of tracking course completion

3.7.4.5 Scheduling and Enrollment

Staff expressed the need for flexible options to schedule courses and enroll students in them. Library patrons may find courses on their own and self-enroll, but staff will also need the ability to look up and manage individual enrollments on behalf of patrons, enroll new students individually, or import a group of patrons into a course's enrollment. For hybrid courses that require physical space or other resources,



it would be ideal to be able to either provide this scheduling capability internally or to be able to link with external scheduling systems currently in use for this purpose.

Recommendations:

- The LMS must have an integrated calendar component for scheduling courses and other events. Ability to integrate with external scheduling systems, such as authenticated subscription to an external Outlook, Google, or iCal/CalDAV calendar
- Other important features include the ability to define physical space and/or physical assets that may need to be booked as a component of hybrid or in-person courses
- The LMS should have the ability to book physical spaces and/or physical assets within the LMS for blended, time-bound content
- Staff managing courses may enroll students in a course individually, manage existing enrollments manually, or import a group of students

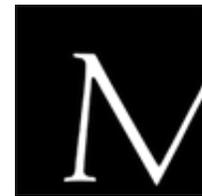
3.7.4.6 Course Promotion & Notification

Library staff require a way to promote courses available within the LMS to registered and non-registered patrons or groups. This feature might be implemented differently depending on the LMS features or APIs connecting its content to each library's ILS or integration with discovery layers. For example, the LMS could provide a public listing or calendar of courses for non-authenticated users, and this index or links to individual public course pages could be used for group or individual email promotion to affiliated organizations, or to library patrons using a different email or group management program. Alternatively, if the LMS provides an API to enable course listings in its catalog, the library might decide to promote the link to the catalog item.

Recommendations:

- LMS should provide a public listing of courses and descriptions, and a url for each course, allowing groups of courses or an individual one to be promoted to individuals and groups using external systems
- LMS should also provide an API so courses may be listed in a library's ILS and/or discovery layers and promoted from there

For patrons who register for courses in the LMS and for staff interacting with the LMS in various roles, a notification system internal to the LMS should enable notifications of various types to be created and/or received, and users should be provided options to control which notifications they wish to receive.



Recommendations:

- Features that should be supported in a collaboratively-defined LMS are:
 - An automatic reminder email or text for courses a patron has registered to attend
 - Within courses with assignment deadlines, automatic reminder about upcoming assignments that have not been completed
 - An automatic email upon successful completion of a course, including grading and certifications if relevant
 - Option for the patron to receive updates about new or suggested courses, based on past attendance, similar/related topics, or next in sequence courses.
 - Options for the patron to opt out of some or all notifications

Though not mentioned by participants in this feasibility study, for staff managing content and courses, or instructors delivering them, it may be advantageous to include notifications relevant to staff assigned to these roles. For example, if content authoring workflows include different staff roles for different tasks, a content publishing workflow might be defined and include a queue of outstanding tasks, and the option to receive notifications upon assignment or reminders about outstanding work to be completed. Instructors may wish to receive notifications of students completing content or assignments, or reminders to grade or take other actions on course evaluations or user generated assignments.

Recommendations:

- For course authors or instructional designers, provide the ability to receive notification or reminder of assigned tasks in content/course authoring workflows, if they are defined
- For instructors, provide options to receive reminders of course related actions needed such as grading assignments submitted by users, or notifications that students have completed assignments or courses

3.7.5 Integrated Experience & Accessibility

The LMS should provide a consistent experience for learners using any size screen. Whether they're using a phone, tablet, laptop, or desktop computer, the user interfaces should be designed to scale and adapt to the screen size and device capabilities.

Recommendations:

- A User Experience design process should be engaged to identify the specific features of the user interface for each targeted screen size/device type
- Native, cross-platform mobile app or site responsive for small screen accessibility is a key functionality for an inclusive product



- The application/service should be designed to be [508 Compliant](#)

Successful online learning keeps learners engaged, particularly in hybrid and synchronous courses. Integrating content and features for hybrid and synchronous courses into the same application as the content itself can help keep learners engaged, avoid distraction, and technical issues with third party platforms and services. For example, instead of using a Zoom call for video conferencing, the feature could be integrated into the application and used within courses.

Recommendations:

- Audio/video conferencing service, whether third party or internal to the application or server environment, may be integrated for attendees of synchronous or hybrid courses
- Ensure functionality that supports automated captioning service integrated for live or previously recorded video
- Ensure functionality for integrated chat that is usable within the synchronous course interface

3.7.6 User Onboarding, Self-Management, and Interactions with Content

When new users of the LMS log in, they should be led through an initial onboarding process or course that provides some initial level of training on how to use the LMS, and to guide the user through setting up their profile and options.

Recommendations:

- Onboarding process for new users may be defined and customized (per instance, if multi-instance)
 - Process should assess learning interests, and set privacy and other profile details
- User self-management options should include the:
 - Ability to create or delete account
 - Ability to manage contact information and notifications
 - Options to limit degrees of data collection, or blanket opt-out option
- The LMS should provide guidance or suggested content based on interaction with the system and/or previously-viewed content



3.7.7 Learner Engagement

Courses will need to encourage student engagement in different ways. For example, asynchronous courses may have little to no interaction with an instructor or with other enrolled students, but a synchronous or hybrid course will likely need some amount of student engagement to build camaraderie and learner motivation. Some examples of student engagement features within an LMS are discussion forums, live chat, etc.

Recommendations:

- Include features that support teacher-student and peer-to-peer engagement for hybrid or synchronous courses. These include:
 - Integrated live chat
 - Integrated video conferencing
 - Discussion forums
- Badges may be defined or imported
 - Distributed automatically earned badges for completing course content. These can be made visible on a student's profile if desired by student (this visibility may be controlled in user profile, i.e. "Show my badges")
- Certificates may be defined or imported, and associated with completing one or more courses
 - Certificates may be printed or emailed to the user by request
- In-class polling helps to encourage competitive motivation
 - For example, a pop up quick-question within a course would assess the student's learning, and participants could compare their answers with others

3.7.8 LMS Documentation & Training

The LMS would require training for all staff interacting with it, as well as for patrons who use it. Comprehensive documentation for functions of the LMS will be needed, and might be structured as its own self-guided course covering how users of different roles should use the system.

Recommendations:

- Develop documentation for the LMS, including:
 - General Documentation: overall product, functions, high level overview
 - Devops Administration Documentation: technical documentation for system administration, deployment



- Functional Documentation per User Role: specific how to documentation and training for users of different roles. *Note that these roles to be defined by METRO's Learning Consortium*

3.7.9 Reporting and Automated Statistics Tracking

Across all types of content and user interaction with it, the LMS needs to provide flexible and robust reporting features to enable external use. Users within different roles will have different reporting needs, and some report types may be common to groups of users. For example, instructors may need a report about learner outcomes from each of their courses, and administrators may wish to see a report covering learner engagement with multiple courses. In addition to individual reporting, the LMS should provide either a reporting API to enable direct reports to be pulled by external systems on both the learning content presented in the LMS, as well as statistics on learner engagement with the content. If an API is not provided, support for multiple report export formats should be available, including machine readable formats like JSON or CSV. Automatically running and delivering reports should also be a feature.

In all reporting use cases, the protection of patron information is essential. It is recommended that in the next project phases existing reporting needs are specifically compiled and reviewed, using the ALA Intellectual Freedom Committee's [Library Privacy Guidelines for Library Management Systems](#) as a framework.

Recommendations:

- Define needs for custom automated reporting, starting with the following:
 - The LMS should have the ability to define report templates, to be used as is, or copied and modified for individual use
 - Reporting may include details about all types of content and meta-content types, as well as how staff and learners interaction with it
 - Reports may be scheduled to occur periodically and may run automatically
 - Reports can be delivered via email
 - Course reporting includes ability to include user demographics and other user fields as consented by the user, course completion data, score tracking data if possible, ability to select fields for specific reports
 - Export formats are provided in well known formats including doc/docx, odt, ppt, pdf, xls/xlsx, and csv
- Set standards for operability of APIs and machine readable reporting, including::



- Reporting API is provided within the LMS to enable authenticated and secure access to other systems
- Export formats are provided in well known machine readable formats: csv, JSON, JSONL
- SQL integration or API would support be ideal for at least one Metro member library system
- All reporting use cases comply with the ALA Intellectual Freedom Committee's [Library Privacy Guidelines for Library Management Systems](#)



4. Project Recommendations

This section of the report focuses on recommendations for any possible LMS **project** led by METRO. It assumes that METRO and project partners agree, based on the research presented earlier in this report, that a collaborative LMS is feasible and that it should be pursued as a project.

As documented throughout this report, there are a lot of moving parts in this possible effort, and a number of decision points and/or dependencies throughout all project elements. For a listing of all recommendations within the context of different project elements (including technology, content & workflows, and other areas), please see Appendix E.

Regardless of the options selected, two key areas – **equity** and **success measures** – should be identified, articulated and documented by project participants as part of any project plan or charter. Some ideas to articulate both areas are listed below:

1. Equity:

- Though not part of the original project scope, before any work on Phase 1 begins, partners should conduct a thorough literature review of best practices in digital literacy training and digital equity service provision as it will provide important context for how the LMS could help promote the digital equity needs and aspirations of the communities most impacted by the digital divide in NYC and Westchester. METRO's Digital Equity Research Center is well positioned to undertake this work.
- Members of all working groups should have the expertise and skill sets necessary for the work, and have diverse lived experiences and be representative of the communities in which these libraries exist.
- Members of working groups should be clearly compensated and recognized for their contributions to this project as it may be in addition to pre-existing work.
- Partner libraries and funders should approach this project with the understanding that this project is an opportunity to bring equity of choice in online learning platforms to the library field. Creating an LMS “by us, for us” would mean that professional standards and ethics that guide library work would be the foundation of all the technology that is built upon it.

2. Success Measures:

- Funding to support prototyping and pilot phases is identified and secured.
- Interested library systems find the consortium model and shared costs of the prototyping and pilot phases acceptable and are willing to move forward.



- Member library systems interested in participating in the prototyping and pilot phases are able to dedicate sufficient staff time and resources to the Learning Consortium.
- The list of functional requirements provided by this study is refined such that a suitable prototype phase may be conducted for further evaluation.
- An existing open source LMS or a combination of open source products are identified that can meet the refined list of functional requirements.
- Development and deployment of a prototype LMS is successful within a reasonable time from the project's starting point.
- Libraries engaging in the pilot are able to identify and secure the participation of instructional staff and patrons to sufficiently evaluate the LMS from desired use cases.
- The LMS application is able to technically scale to support large numbers of users and growing amounts of content.
- The consortium is able to identify the cost structure for the final hosted LMS service, accounting for information learned in the pilot phase itself.
- The cost structure for using the final deployed LMS service is acceptable to interested library systems.
- The consortium is able to agree on a collaborative model that is supportable by METRO, and has a cost/fee structure that is acceptable to libraries.



4.1 Suggested Options for a Collaborative LMS Platform

Summary:

- 1) **Consortium Model:** METRO develops and manages the platform and makes a single instance available to all partners
- 2) **Tenant Model:** METRO develops and manages a platform and makes individual instances available to all partners
- 3) **Hybrid Model:** METRO manages platform instances for each library, governance includes all library partners, but content all sits in our own community warehouse

1) Consortium Model: METRO develops and manages the platform and makes a single instance available to all partners. Data separation between participating systems is minimal. All content is OER and it sits in one database regardless of which partner produced it, and the content can receive system-specific branding via a templating system based on which system is deploying the content for their patrons. METRO convenes governance, and both technical and content related decisions are made with a unanimity requirement. Based on an MOU/SLA METRO provides and/or convenes ongoing training for participants, provides individualized support, etc.). Comparable model: ILS consortium

2) Tenant Model: METRO develops and manages a platform and makes individual instances available to all partners. There is complete data separation between participating systems. Systems produce their own content according to standards enforced by the platform, and they have access permissions to build and load their own content, either proprietary (the library system retains rights), or OER. Libraries commit to METRO's terms of service and contract with METRO annually. Typical vendor stuff. Comparable models: ILS cloud vendor; Niche Academy.

3) Hybrid Model: METRO manages platform instances for each library, governance includes all library partners, but content all sits in our own community warehouse. Data separation is maximized for each library system, but a content library is managed separately. Governance is split between a technical advisory board and a content advisory board, with all stakeholders represented in each case.



4.2 Funding and Fee Model

Summary:

- This project would require a different business model/fee structure than other projects at METRO, but lessons can be learned from Archipelago services and the local Digital Culture of Metropolitan New York (DCMNY) service, as well as materials delivery
- If there is enough partner interest in pursuing a shared LMS, METRO and their partners should create a new funding & fee model based on whichever cooperative service option they agree upon
 - Together, METRO and their partners should pursue grant funding for a prototype and any associated startup costs. Which cooperative service option is selected may impact the eligibility of this work for different funding agencies
 - Startup fees should be required of participating libraries to contribute to startup costs and demonstrate commitment to the project
- The funding and fee model should be designed to serve the start-up and pilot needs, while considering the longer term capability to scale to other customers (outside of the NYC metro service area) as a fee-based service in the future
- An MOU or SLA should be created between METRO and participating partner libraries defining roles and responsibilities of METRO and partner libraries in key areas

Due to the unique characteristics of any possible collaborative LMS, such a project would require a different business model / fee structure than other projects at METRO. However, METRO's experiences with its other services, including **Archipelago**, **Digital Culture of Metropolitan New York** and materials delivery have provided experiences to inform possible new projects.

Digital Culture of Metropolitan New York (a multi-tenant repository service) has the most similarity to a possible LMS project. Key funding model issues that could be considered include:

- Offer as a "freemium" service (low barrier to entry with higher costs assessed for larger collections)
- Offer as a standard fee based (higher barrier to entry but potential to show more consistency of client collections and capabilities of the platform)

Individual **Archipelago** repository contracts vary significantly by use case and customer, this kind of software customization would defeat the purpose of a shared platform and would be difficult to sustain.

If there is enough partner interest in pursuing a shared LMS, METRO and their partners should create a new funding & fee model based on whichever cooperative service option they agree upon.



Recommendations:

- Together, METRO and their partners should pursue grant funding for a prototype and any associated startup costs. Which cooperative service option is selected may impact the eligibility of this work for different funding agencies.
- Startup fees should be required of participating libraries to contribute to startup costs and demonstrate commitment to the project.
- The funding and fee model should be designed to serve the start up and pilot needs, while considering the longer term sustainability for each phase of the project
- The funding and fee model should have the capability to scale to other customers (outside of the NYC Metro service area) as a fee-based service in the future.
- An MOU or SLA should be created between METRO and participating partner libraries defining roles and responsibilities of METRO and partner libraries in key areas, including:
 - Define participation of METRO and each partner in building any shared LMS
 - Define fundraising and sustainability contributions of METRO and each partner in funding any shared LMS, to include participation in:
 - Grant proposals and other fundraising activities
 - Fee structures
 - In-kind contributions of labor
 - Others



4.3 Governance and Member Participation

Summary:

- The success of any collaborative LMS platform will ultimately rest on the human infrastructure that supports the content and the technology.
- METRO will convene METRO board members representing willing partner libraries as the Governance working group; their charge will be to decide what collaborative LMS platform is feasible based on this report and each member library's interest, needs, and capacity.
- The overall project governance structure will depend on what collaborative LMS platform is selected by the Governance working group.
- The Governance working group would be complemented by other working groups as described in the Draft Project Roadmap in Section 4.4 of this report.
- Working groups may also convene internal stakeholders with needed subject matter expertise.

Shared Governance

The success of the LMS will ultimately rest on the human infrastructure that supports the content and the technology -- something simply, but not necessarily easily, done by designing a collaborative and non-competitive shared governance structure.

If a project is pursued, METRO will convene board members representing willing partner libraries as the Governance working group; their charge will be to decide what Collaborative LMS Platform is feasible based on this report and each member library's interest, needs, and capacity. The overall Project Governance structure will depend on what Cooperative Service Model is selected by the Governance working group. Suggested models are:

1. **Consortium Model:** METRO develops and manages the platform and makes a single instance available to all partners.
2. **Tenant Model:** METRO develops and manages a platform and makes individual instances available to all partners.
3. **Hybrid Model:** METRO manages platform instances for each library, governance includes all library partners, but content all sits in our own community warehouse.

The Governance working group would be complemented by Project Management, Content, and Technology working groups. As described in the Draft Project Roadmap in Section 4.4 of this report, each working group would be led by a METRO point person with appropriate member library subject matter experts advising.

Working groups will advise on topics such as:

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- Privacy policies and user data collection
- Workflows related to topic development, content processing, maintenance and review
- Internal asset mapping of pre-existing content platforms
- Internal asset mapping of staff skill sets

Potential representatives key to this work have begun the foundational work by participating in discussions for this report, but institutions may want to consider other internal stakeholders with talent development, training, programming or instructional design oversight to provide their subject matter expertise. Working groups may wish to convene internal stakeholders with expertise in the hosting and management of the library's IT systems and technologies, talent development, training, programming or instructional design oversight to provide their feedback on workflows, instructional design and user needs.

METRO has the holistic perspective and strategic capacity to facilitate shared governance conversations with willing partners and could serve as project leads and facilitators where further discussion and specifications are needed. METRO could convene working groups based on different aspects of the LMS project such as:

- LMS functional requirements
- Internal asset mapping of platforms and skill sets
- Workflows related to:
 - technology
 - topic development
 - content processing
 - maintenance and review
- Privacy policies and user data collection



4.4 Draft Project Roadmap

Summary:

- If a Learning Consortium is formed, a key concept is to start as simply as possible (with pilot phase 0), learn from experiences, and determine if future phases should be pursued
- Key elements include:
 - A small, attainable project that moves the ball forward: a service designed to do one thing well, and avoid trying to tackle all possible elements involved in the full implementation of Learning Consortium and LMS platform
 - Targeted partners, audience, and feature set

This Draft Project Roadmap suggests a simplified project approach with a focus on **pilot phase 0**. To help all readers understand the multiple elements involved in the pilot phase, just the major milestones are presented in a chart that shows the likely sequence of events over time. The roadmap is divided into functional areas; it is anticipated that each functional area will require a collaborative working group. If a Learning Consortium is pursued, this draft roadmap can be used as a basis for a detailed project plan.

Contemplating the formation of a full Learning Consortium, with the collaboration needed to meet impact, training and technical requirements, is daunting. Therefore, it is recommended that METRO and partner libraries start as simply as possible, learn from experiences, and determine if future phases should be pursued.

The consultants recommend that METRO and partners select a small, attainable project that moves the ball forward: a service designed to do one thing well, and avoid trying to tackle all possible elements involved in the full implementation of a Learning Consortium and LMS platform. Any pilot project selected should have targeted partners, audience and feature set – essentially “less is more” to test and prove the full Learning Consortium concept.

Following the draft project roadmap are sections that contain additional detail about efforts contributing to each milestone. These sections should be considered “sketches” of likely activities and the sequence of activities; if a project is launched, the roadmap should be reviewed and refined to reflect the participating library systems and further details about the chosen project.

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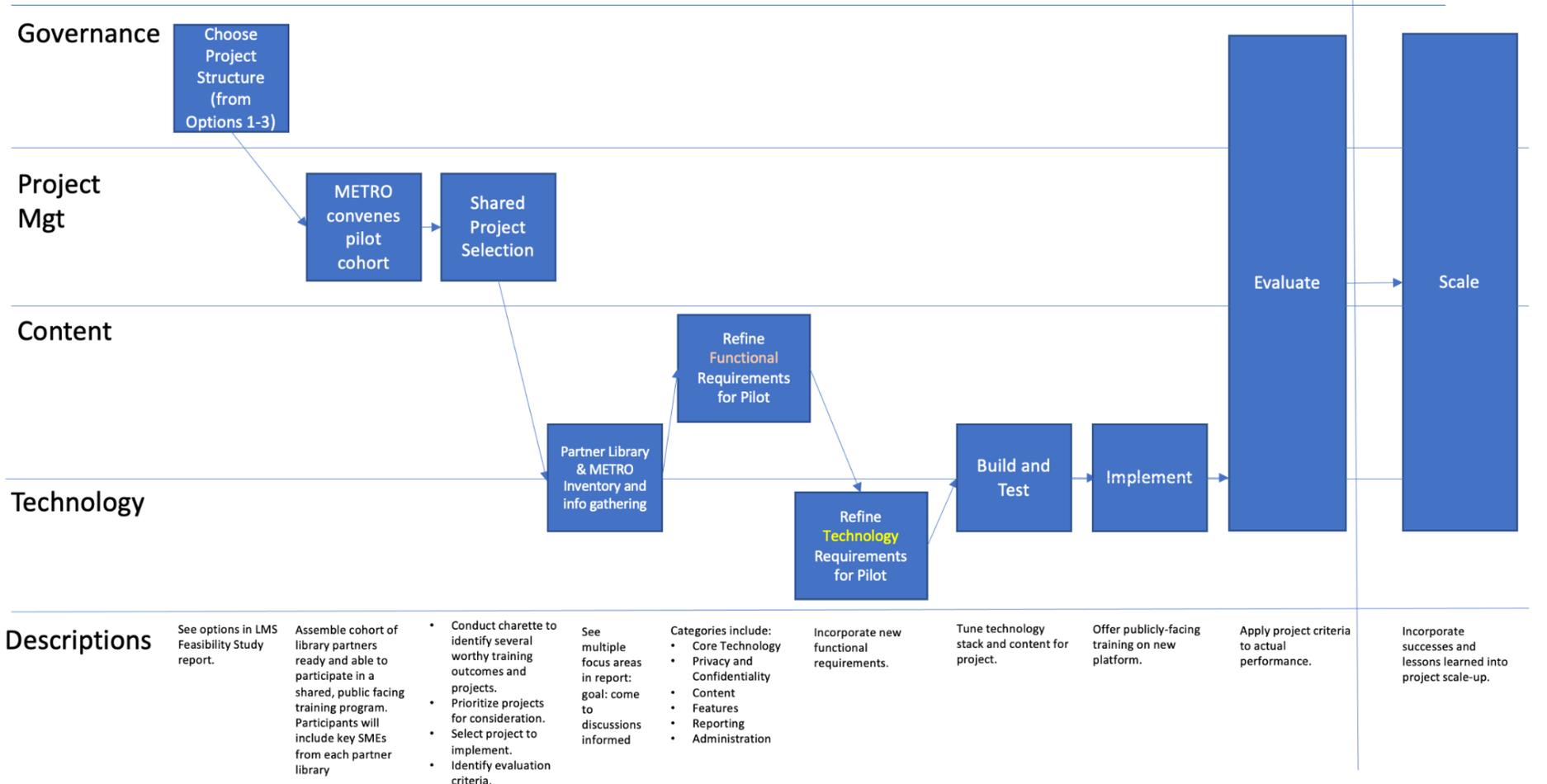
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METRO LMS Phase 0 Recommendations – Simplified Milestone Chart

Phases 1-3





4.4.1 Draft Project Roadmap Details

This section contains additional detail about efforts contributing to each milestone. The milestones and sequence are intended as a starting point for all participants to have a shared understanding of the likely major efforts involved in launching a possible project. It is likely that several working groups would be assembled to complete the project, as depicted on the left-hand side of the draft roadmap.

If a project is launched, the roadmap should be reviewed and refined to reflect the participating library systems and further details about the selected project.

Below are some preliminary ideas about the leadership, composition and role of each working group, as well as possible tasks for each group.

General

METRO would be the lead agency and would be responsible for managing the project, convening partners, and other project management responsibilities.

4.4.1.1 Governance Working Group

METRO Lead: Nate Hill

Membership: Representatives of each library system (possibly members of the METRO Board)

Elements of Charter:

- Provide representation of each partner library
- Contribute to shared project vision and leadership
- Facilitate communications about project status within their library system
- Provide ongoing project feedback
- Evaluate project performance

Tasks (preliminary list):

- Decide whether to proceed with Phase 0
- Choose project structure (Options 1-4 as outlined elsewhere in this report)
- Review regular project progress reports and offer feedback to project manager
- Review Phase 0 evaluation results
- Decide whether to proceed with next phase or phases



4.4.1.2 Project Management

Membership: METRO staff

Elements of charter:

- Provide all project management duties, to include:
 - Creation of project plan and other project frameworks (including evaluation frameworks)
 - Facilitate activities of all working groups
 - Ensure project runs on schedule and on budget

Tasks (preliminary list):

- Create project framework and milestones
- Provide project resources and support for all project teams
- Ensure that project runs on schedule and on budget
- Facilitate general project communications between all working groups
- Create regular project reports for Governance working group

4.4.1.3 Content and Workflows Working Group

Membership: participating libraries TBD

Elements of group charter:

- Represent each partner library's capacity with talent development, training, programming and instructional design (both internal and external)
- Lead inventory efforts at partner libraries to gather data about respective library platforms used and assets stored as well as pre-existing staff skill sets relevant to content and workflows.
- Serve as a subject matter experts to the other working groups with respect to how content workflows and curriculum development needs inform technical feasibility
- Communicate the activities and outcomes of the working group to the consortium

Tasks (preliminary list):

- Support the governance working group by evaluating the choice of a single LMS platform/service versus a multi-instance platform architecture from a collaborative instructional design perspective (i.e. does the selected tool not only benefit the learners in accessing the materials, but in assisting library staff to create, share, and collaborate in content creation)
- Create tools and processes for inventorying partner libraries about content platform usage, assets, and staff skill sets relevant to content and workflows
- Collect and identify institutional and collective privacy and patron data policies; support other Working Groups to convene discussions and center privacy and data collection in implementation and technical conversations



- Recruit representatives from across respective partner libraries to test instructional design workflows of initial prototype.

4.4.1.4 Technology Working Group

Membership: participating libraries TBD

Elements of charter:

- Be a technical resource to the governance working group with respect to key technology architecture decisions throughout all project phases, but especially in initial phases
- Serve as a technical resource to the other working groups with respect to content related features and technical feasibility
- Lead the evaluation of LMS products and/or other software
- Inform the technical implementation of initial prototype(s)
- Communicate the activities and outcomes of the working group to the consortium

Tasks (preliminary list):

- Support the governance working group by evaluating the choice of a single LMS platform/service versus a multi-instance platform architecture from a technical feasibility and scalability perspective
- Review and clarify the requirements outlined in this report to inform an initial prototyping/pilot phase
 - Confirm the consortium members' priority for integrating LMS content with each ILS system or whether findability is better suited to integrate within discovery layers
 - Consult with each library system's ILS teams to determine whether integration of ILS content via APIs or periodic record import is possible
 - Coordinate with other working groups to outline the privacy and security requirements for the LMS application
 - Audit the security of the prototype LMS with respect to patron and staff personal information, to ensure the system conforms to expected privacy protections
- Evaluate whether features/requirements would be fulfilled internally or externally, building an understanding of external dependencies and areas requiring custom development
- Identify and evaluate the most likely open source LMS products and/or other softwares that could meet those needs
- Coordinate with METRO and/or its contractors on the testing and implementation of ILS and Active Directory integrations
- Determine the best and most cost effective hosting platform for the LMS



4.4.1.5 Additional Working Groups (not depicted on project roadmap diagram)

- Participating Library - Internal Working Groups
 - Coordination and “More research needed” tasks:
 - Technology
 - Content and Workflows
- Fundraising - TBD

4.4.2 Consultant Thoughts for Project Implementation

As documented throughout this report, a shared LMS to serve the citizens of the metropolitan New York City area is certainly feasible. While such a project would be a significant effort (and would require additional resources and contributions from all parties involved), METRO and partner libraries certainly have the skills to succeed.

The potential impacts of a Learning Consortium for millions of NYC-area residents that is uniquely centered on the needs of public library patrons, and is built by the public libraries serving them, is significant. If the consultant were to name the single biggest technological challenge voiced by libraries across the country, it would be the disappointment that many libraries express in the lack of ability they have to tune their technology systems to best serve the needs of library users. The solution to that frustration is to “build” systems, but very few libraries have the knowledge, skills and resources to proceed.

It’s important to note that in terms of library services, technology is most often a means to an end; in the case of a Learning Consortium, the end has the potential for equitable, enduring, and positive impacts on people’s lives. As stated in the summary of this report:

“Technology is the convening element of this potential project, but the true heart and soul is the collaboration of partner libraries to address digital equity challenges by delivering library programs and services directly to the homes of people in the NYC area.”

Throughout the study, the consultant group took care to work through possible opportunities and challenges with all participants in this study in an iterative fashion. This method allowed us to authentically discover and address issues and topics, and also helped test the possibilities for and methods to create an environment that would promote the best chance of success for a possible collaborative LMS project.

Starting with technology, we were able to explore and confirm the compatibility of key systems that would make or break patron access and staff access, as well as take a fresh look at the open-source platform options available. Next came a look at learning content and workflows, which revealed exciting potential for inspiration-through-collaboration and opportunities for greater efficiencies in creating and

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offering training and the workflows that support learning. Finally, potential challenges in collaboration between partner organizations were explored.

This report started as a feasibility study, and based on findings ends with a suggested roadmap to implement a possible project. Essentially, should a Learning Consortium be formed, the information in this report is aimed at maximizing the combined skills of all partners and provides frameworks and recommendations to directly address potential challenges.



5. Appendices

5.1 Appendix A: Consultant Team and Focus Areas

The team assembled for this study collaborated deeply throughout the process. Although areas of focus are listed below, all members worked together as a team to review findings and create recommendations found in this report



Carson Block - Carson Block Consulting, Inc.
Project Management and Consultant Team Leadership

Carson Block has led & loved library technology efforts for more than 25 years. He's been called a "Geek who speaks English" and occasionally compared to Ferris Bueller and Calvin (and Hobbes). Carson is dead serious about the essential and positive community impacts of libraries and focuses his consulting practice on helping libraries increase their capacity to serve patrons. Carson has served in leadership positions in ALA ASCLA, ColoradoPLA and others, and evangelizes libraries to SXSW Interactive and other tech communities. Carson is

the author of *Managing Library Technology: A LITA Guide* (Rowman & Littlefield) and *Library Information Systems* (with Joe Matthews, Libraries Unlimited).

Chris Ritzo - Anemophilous Futures, LLC.
Technology and Libraries

Chris Ritzo is a librarian, technologist, researcher, and project manager with over 20 years experience supporting the technology and information needs of K20 schools, libraries, non-profits, researchers, and the general public. Chris focuses on work that brings community centered perspectives and library values to technology assessments and projects. His recent research and work has focused on developing and using open source tools to measure Internet service at libraries and schools.



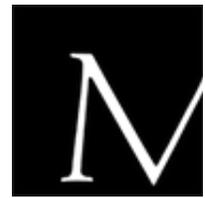
Cindy Fisher - Independent Consultant
Training, Instructional Design and Libraries

Cindy Fisher has been teaching technology and developing educational opportunities for library workers for the past 15 years in public, academic and special library settings. She works as a Digital Inclusion Consultant at the Texas State Library Archives Commission by day where she leads programs in digital equity and library technology management.

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Bonnie Nichols - Carson Block Consulting, Inc.

Administrative Assistant

Bonnie Nichols serves as Carson Block's assistant. Her previous work in libraries includes almost 10 years in the Circulation Department at the Poudre River Public Library District and a smattering of other duties also during that time. Bonnie enjoys working behind the scenes to help libraries plan their future in a dynamic world.





5.2 Appendix B: Acronym Glossary

ALA	American Library Association
ASCLA	Association of Specialized Government and Cooperative Library Agencies
API	Application Programming Interface
AWS	Amazon Web Services
BPL	Brooklyn Public Library
CalDAV	Calendaring Extensions to WebDAV (“Web-based Distributed Authoring and Versioning”)
CMS	Content Management System
CSS	Cascading Style Sheets
CSV	Comma Separated Value
DOE	Department of Education
ESL	English as a Second Language
ESOL	English to Speakers of Other Languages
GLAM	Galleries, Libraries, Archives, and Museums
HTML	Hyper Text Markup Language
ILS	Integrated Library System
JSON	JavaScript Object Notation
JSONL	A JSON file created in the JSON Lines format (contains plain text)
K20	Kindergarten to graduate degree (educational term)
LITA	Library and Information Technology Association
LMS	Learning Management System
MARC	MAchine-Readable Cataloging
METRO	Metropolitan New York Library Council

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MOU	Memorandum of Understanding
NYC	New York City
NYPL	New York Public Library
NYS	New York State
NYSED	New York State Education Department
PaaS	Platform as a Service
PDF	Portable Document Format
PLA	Public Library Association
QPL	Queens Public Library
SaaS	Software as a Service
SCORM	Sharable Content Object Reference Model
SimplyE	The New York Public Library's open-source e-reader app
SIP2	Patron authentication that requires individual library users to provide their circulation barcode and a valid password or PIN to complete specific actions.
SLA	Service Level Agreement
SQL	Structured Query Language
SSL	Secure Socket Layer
SSO	Simple Sign On
WLS	Westchester Library System



5.3 Appendix C: Content Platform Tools

[Airtable](#) - Online platform for creating and sharing relational databases. The user interface is simple, colorful, friendly, and allows anyone to spin up a database in minutes.

[Articulate Storyline](#) - Content creation platform for authoring interactive, engaging instructional content and tutorials.

[Brainfuse](#) - On-demand live tutoring, homework help, and studying suite designed to assist patrons of all ages succeed.

[Cornerstone](#) - Subscription-based Learning Management System (LMS) platform that integrates Artificial Intelligence (AI) for talent development. Also referred to as a Human Capital Management software solution.

[Drupal](#) - Free and open-source web content management system used by a wide variety of organizations across the world.

[Eventbrite](#) - Event management and ticketing website that users can browse, create, and promote local events. The service charges a fee to event organizers in exchange for online ticketing services, unless the event is free.

[Facebook Live](#) - Facebook Live is a feature of Facebook that lets users livestream directly to the social network platform. Viewers can react, share, and comment during the stream. A recording of the video is also published to the page or profile so it can be watched again later.

[LinkedIn Learning](#) - Subscription-based online platform of on-demand courses in a variety of topic areas. Used by government, corporation, academic institutions as well as libraries. Provides support for certifications and workforce development initiatives. Formerly Lynda.com.

[Google Classroom](#) - Learning platform developed by Google for educational institutions that aims to simplify creating, distributing, and grading assignments. The primary purpose of Google Classroom is to streamline the process of sharing files between teachers and students using all of the tools of Google Workspace.

[Google Workspace](#) (formerly GSuite) - Google Workspace includes collaboration tools like Gmail, Calendar, Meet, Chat, Drive, Docs, Sheets, Slides, Forms, Sites, and more.

[Microsoft Learn](#) - Free, open training platform focused on Microsoft products

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[NicheAcademy](#) - Subscription-based online platform for providing asynchronous tutorials specifically targeted to libraries.

[OneDrive](#) - Online cloud storage from Microsoft that integrates with Microsoft Office Suite and Office365.

[SharePoint](#) - Web-based collaborative document management and storage system platform that integrates natively with Microsoft Office / Microsoft 365. Many organizations use a staff intranet.

[YouTube](#) - Online video sharing and social media platform headquartered

[Zoom](#) - Videoconference platform that integrates live-captioning, chat, recording, and call-in participation features.



5.4 Appendix D: Site Visit Agenda

The outline in this appendix was used to guide the consultant's site visit focus group conversations with library partners in May 2022.

1. Orientation - what is the LMS study?
 - a. What might a shared LMS look like? What are the possibilities?
 - b. Quick answer: we're defining it through library partner input
 - c. Technology...
 - i. ...Is important (harnessing economies of scale to serve the needs of many, and to leverage the position and capabilities of METRO to build, maintain, and grow a "Platform as a Service" for shared training needs)...
 - ii. ...But is not the purpose.
 - d. Findings to date suggest opportunities for METRO to consider a shared model for any possible LMS scenario, which could foster inter-Library collaboration in key areas beyond technology:
 - i. Workflows
 - ii. Content
 - iii. Sharing/Leveraging Strengths and Best Practices of partners
 - e. Findings to date indicate questions from libraries about:
 - i. Governance of any shared LMS
 - ii. Privacy, confidentiality and the security model to protect both
 - iii. others
2. Discussion
 - a. Possible Collaboration Model - Partners: The most successful partnerships come from authentic reciprocity - e.g. each partner receives significant value from the partnership, and also offers significant value to other partners. From the perspective of your library:
 - i. Share your experience in a collaborative project, including the things that were successful and the things that were challenging.
 - ii. What are your greatest needs (in serving patrons, and equipping staff to serve patrons) from any shared LMS platform?
 - iii. What are your greatest offerings as a partner in any shared LMS system?
 - b. Governance:
 - i. What opportunities do you see when considering the possibility for a shared LMS?

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- ii. What are possible dangers/3rd rails/deal-killers from your perspective?
 - iii. How much work are you willing to contribute?
- c. Vision and dreaming:
- i. What outcomes of a shared LMS platform would be of the greatest benefit to your library and patrons?
 - ii. What do you feel would be the best benefits for all members (libraries and patrons) of a shared LMS?



5.5 Appendix E: Listing of Recommendations

Throughout this document, many recommendations have been made in relationship to findings in the key study topic areas. To help participants review all recommendations quickly, they have been collected in this appendix.

Section 3.1 LMS Landscape & Options

- **Recommendation:** New, custom software development should focus on add-ons, connectors, modules, etc., that augment or extend an existing open source LMS, or that connect the LMS to other open source software that fulfills one or more requirements.
- **Recommendation:** In summary, we recommend that METRO convene a Learning Consortium or cooperative to carry this work forward. The Learning Consortium should form a technical working group to clarify the requirements outlined in this report to inform an initial prototyping/pilot phase. The technical working group should evaluate the concept of a single LMS platform/service or multi-instance platform, and consider the overall scalability of the application in addition to individual libraries' preferences. The technical working group should then decide which existing, open source LMS should be evaluated, and determine which existing LMS products most comprehensively meet the consortium's requirements. Part of the evaluation should identify product features that would need to be fulfilled internally or externally:
 - by third-party software adjacent to the LMS service, and integrated with it
 - through existing third-party add-ons or modules
 - through new custom developed integrations, add-ons, or modules
- **Recommendation:** METRO should convene a Learning Consortium or cooperative to carry this work forward. The consortium should form a technical working group to clarify the requirements outlined in this report to inform an initial prototyping/pilot phase, and identify and evaluate the most likely open source LMS products and/or other softwares that could meet those needs. The evaluation should include whether features/requirements would be fulfilled internally or externally, building an understanding of external dependencies and areas requiring custom development.

Section 3.2.2 Findability, Indexing, and Reporting Requirements

- **Recommendation:** Obtain blank copies of the reports to NYSED that library systems and METRO must submit, and use to determine the potential for fulfilling this need via custom reports from the LMS.
- **Recommendation:** If possible, engage with relevant staff at NYSED to determine whether alternate submission formats are possible (such as CSV or JSON), or whether a sharable roadmap exists for updating the NYSED submission interfaces in the future.



Section 3.4 Content and Workflows

- **Recommendation:** Libraries that have formalized committees or divisions dedicated to learning could provide useful perspective on governance or workflows for a larger collaborative LMS project.

Section 3.4.1 Topic generation

- **Recommendation:** Recommend convening partner libraries to discuss and define their expectations and needs for types of content to be found in shared LMS. For example, some libraries may focus just on programming (e.g. educational content for pleasure) while others wish it as a training platform to implement and assess skills and/or competency-based learning.

Section 3.4.2 Curriculum development

- **Recommendation:** Any possible METRO Learning Consortium should discuss the place of branded content with the LMS early in the planning process.
- **Recommendation:** Project feasibility will be better scoped after discussing each library's expected institutional emphasis on online learning (versus in-person classes), as in-person and online classes require different tools, skill sets, and staffing models. It may also provide a roadmap for METRO partner libraries to show the direct correlation between library services and digital equity, especially universal broadband access.
- **Recommendation:** The Learning Consortium should evaluate the needs and expectations around different types of course enrollment and subsequent engagement in online courses. The expectation for course engagement will drive the type and amount of staff support needed to run the online LMS: the higher the level of engagement in a course, the greater the number of instructor and/or staff hours needed to facilitate that engagement.

Section 3.5.1 Overview of Library Platforms In Use

- **Recommendation:** METRO has the skills and capacity to lead this initiative given staff expertise with post-production online training workflows. Further discussion is provided in the post-production and content maintenance and processing section of this report.

Section 3.5.3 External Library Platforms

- **Recommendation:** To leverage pre-existing efforts to their fullest potential for this collaboration, each library should construct an inventory of internal and external platforms currently being used, including the type of assets hosted on these platforms, ownership of these assets, and overall purpose of the assets.



Section 3.5.4 Licensed content

- **Recommendation:** Due to the complications of including licensed content on any shared LMS platform, initial development should focus on original content created and owned or licensed⁴ by each participating library system. However, the platform should be flexible enough to incorporate leased/licensed in the future.

Section 3.5.5 Content maintenance and review

- **Recommendation:** Further discussion from collaborating libraries should identify people, processes, and timelines for reviewing and maintaining LMS content. This concept is expanded in the Shared Governance section.

Section 3.5.6 Content processing

- **Recommendation:** Each library should construct an inventory of internal partners whose skill sets align with the shared LMS project content processing needs in order to leverage pre-existing staff expertise.

Section 3.5.7 Privacy and Confidentiality

- **Recommendation:** Further discussion from partner libraries should identify institutional and collective privacy and patron data policies.

Section 3.7.2.1 Application Architecture, Hosting & Deployment

Recommendations:

- LMS should be hosted on with a cloud service provider such as AWS as a SaaS/PaaS service/platform. The specific service should be determined in the next project phases
- The LMS should have the ability to deploy as either:
 - A single application/service/platform
 - Multiple instances of the application/service/platform, from a common database
- Scalable to support unlimited users
- Instances and traffic scaling as needed by demand
- Accessible ([508 Compliant](#)), adaptive web interface and/or mobile application

Section 3.7.2.2 Account Authentication

Recommendations:

- The LMS service or platform must support secure single sign-on for patrons and staff of METRO and its member library systems
- The LMS service or platform must support SSO for patron accounts and Integrated Library Systems (ILS) using SIP2 protocol via SSL tunnels in concert with each library system's current infrastructure:
 - BPL - Innovative, [Sierra](#)
 - QPL - SirsiDynix (2023), Innovative, Virtua (2022)

⁴ To define how original content may be used and shared, participating libraries may wish to license their content under the appropriate Creative Commons designation. <https://creativecommons.org/>



- NYPL- Innovative, [Sierra](#)
- WLS - Evergreen
- Staff accounts must be authenticated through Azure Active Directory (OpenID Connect, OAuth 2.0)
- An LMS must support access by an unlimited number of users
- The system must have the ability to define local administrator accounts for deploying, managing, and maintaining the LMS

Section 3.7.2.3 Account Authorization

Recommendations:

- An LMS should include provisions for local administrator accounts that have blanket authorization to all features of the application (i.e. a DevOps admin)
- Base Patron and Staff roles could be based on the method of authentication
- The LMS should have settings available to define new user roles for staff and/or user accounts, assigning different privileges for accounts assigned to the role. Examples include:
 - Student
 - Teaching assistant
 - Course instructor
 - Course designer
 - Instance admin
 - Content admin

Section 3.7.2.4. External Systems Integrations

Recommendations:

- The LMS should support the use of API(s) like:
 - [SCORM API](#)
 - [TinCan API / xAPI / “Experience API”](#)
- The Learning Consortium should work together to determine and/or confirm the need for integrating LMS content into Integrated Library Systems for each library
 - If desired, the consortium should research and confirm the technical methods for LMS and ILS item integration per each library system’s technology. The LMS should be able to:
 - import LMS course titles into Sierra as item records using Sierra’s Items API (BPL, NYPL)
 - export Bib record or MARC record format, and these can be imported into Evergreen (WLS)
 - Further research is needed to confirm possible LMS and ILS content integration methods for Sirsi-Dynix (QPL)
- The Learning Consortium should research the viability and technical underpinnings for indexing within libraries’ Discovery Layers on:
 - Websites
 - Unified Search



Section 3.7.2.5 Security, Privacy, & Confidentiality

Recommendations:

- The application's hosting environment should be demonstrably secure
- All connections between the LMS application server(s) or service to external servers should also be demonstrably secure. Specific examples include:
 - SSL tunnels between the LMS's server and each library's ILS server
 - OpenID Connect, OAuth 2.0 connections to each library's and METRO's Active Directory servers
 - API calls to and from the LMS server(s)/service
- The LMS should provide patrons with options to limit degrees of data collection, or provide a blanket opt-out
- Patrons may manage their profile, contact info and preferences, notifications, and data sharing preferences with other library systems
- Patron accounts and staff accounts should be isolated from one another; patrons would not be able to see other patrons' info unless they explicitly allow it and staff can't see other staff's records

Section 3.7.2.6. Administration

Recommendations:

- Define roles and permission levels for administrator level access:
 - LMS Application/Service Admin
 - Develop op level, non-DevOps role for managing the overall LMS application/service
 - If using a multi-instance SaaS, this role should have the ability to create new instances, assign administrative users to them, and associate groups of users (learners) to new instances
 - This role could include the ability to manage existing and add new authentication methods and connect them to specific instances (if multi-instance)
 - Instance Admin
 - In a multi-instance scenario, this role would allow individuals assigned only to one instance the ability to administer that instance's branding, users, content, etc.
 - Content/Course Admin
 - Create/manage all content and related features
- Define workflows and setting for managing users
 - Create or delete user accounts whether individually or through batch import
- Define workflows and settings for reporting
 - Create and manage all reporting-related features



Section 3.7.3 Branding

Recommendations:

- Ensure that themes are separated logically from the content and features of the application
 - New themes can be uploaded and available themes may be selected in the UI
 - Application theme can be customized within the UI using a WYSIWYG editor by users with assigned permissions
 - HTML/CSS theme files can be edited directly in the UI using a theme editor UI, for users with assigned permissions and skill levels

Section 3.7.4 Content

Recommendations:

- An LMS developed in this process should:
 - Support the use of PDFs, Excel, Powerpoint, videos, links to external web pages for reference
 - Allow users the ability to upload material that was previously created
 - Support [SCORM API](#) and SCORM compliant content format
 - Support [TinCan API / xAPI / "Experience API"](#)
 - Allow content that may be authored natively in multiple languages
 - Support automated content translation via an API like, for example, [LibreTranslate](#)
 - Utilize a video content player that supports scanning or "scrubbing" backward and forward through a stream
 - Uses a built-in audio/video/course captioning or transcription service or API

Section 3.7.4.1 Content Licensing

Recommendations:

- The LMS platform content should include fields indicating its ownership and/or licensing status
- The LMS platform should be flexible enough to incorporate leased/licensed in the future

Section 3.7.4.2 Course Structures & Management

Recommendations:

- Additional course management and administration features that are needed include the ability to:
 - Create, clone, and categorize courses
 - Edit existing course content
 - Publish courses
 - Create and edit course separately from publishing them
 - Set flexible user registration options (individual as well as batch) for enrolling and tracking users within the course editing UI
 - Manage multiple dates, times, and locations for a course
 - Support blended, asynchronous classes



- The following attributes should be noted as well when designing an LMS:
 - Courses can be public or private
 - Courses may have virtual and/or physical space limits
 - Courses may have an automated waiting list if a participant limit is defined
 - Courses may have expiration dates
 - Course attendance is automatically tracked for reporting

Section 3.7.4.3 Course Creation Workflows

Recommendations:

- The LMS should include:
 - A feature allowing definition of Course Creation Workflows, defining the steps required for teams of staff working jointly on different aspects of a course
 - The ability to assign specific staff or groups of staff assigned to a specific role to complete workflow steps
 - The ability to set deadlines for completing workflow steps
 - An administrative user interface showing current and past content workflows and statuses
 - Options to enable notifications related to course creation workflow steps when:
 - New task assigned to an individual or group of staff within a role
 - Course status changes within the workflow
 - For courses actively being developed in a workflow, reminders for staff or groups assigned to content tasks

Section 3.7.4.4 Learner Assessment

Recommendations:

- An LMS should include:
 - Options to create quizzes and tests with various ways to grade student learning
 - Support for multiple types of questions: multiple choice, matching, essays, ability to upload assignments in various formats including multimedia
 - The ability to create pop-up quizzes or polls
 - The ability to define each course's grading or scoring methods as a part of the course structure
- Automated tracking and grading of course participation may be defined as part of the scoring method
- Scoring/grading methods may be pre-defined and saved as templates, reused and remixed into new templates
- The LMS should also include the ability to define methods of tracking course completion



Section 3.7.4.5 Scheduling and Enrollment

Recommendations:

- The LMS must have an integrated calendar component for scheduling courses and other events. Ability to integrate with external scheduling systems, such as authenticated subscription to an external Outlook, Google, or iCal/CalDAV calendar
- Other important features include the ability to define physical space and/or physical assets that may need to be booked as a component of hybrid or in-person courses
- The LMS should have the ability to book physical spaces and/or physical assets within the LMS for blended, time-bound content
- Staff managing courses may enroll students in a course individually, manage existing enrollments manually, or import a group of students

Section 3.7.4.6 Course Promotion & Notification

Recommendations:

- LMS should provide a public listing of courses and descriptions, and a url for each course, allowing groups of courses or an individual one to be promoted to individuals and groups using external systems
- LMS should also provide an API so courses may be listed in a library's ILS and/or discovery layers and promoted from there
- Features that should be supported in a collaboratively-defined LMS are:
 - An automatic reminder email or text for courses a patron has registered to attend
 - Within courses with assignment deadlines, automatic reminder about upcoming assignments that have not been completed
 - An automatic email upon successful completion of a course, including grading and certifications if relevant
 - Option for the patron to receive updates about new or suggested courses, based on past attendance, similar/related topics, or next in sequence courses.
 - Options for the patron to opt out of some or all notifications
- For course authors or instructional designers, provide the ability to receive notification or reminder of assigned tasks in content/course authoring workflows, if they are defined
- For instructors, provide options to receive reminders of course related actions needed such as grading assignments submitted by users, or notifications that students have completed assignments or courses

Section 3.7.5 Integrated Experience & Accessibility

Recommendations:

- A User Experience design process should be engaged to identify the specific features of the user interface for each targeted screen size/device type
- Native, cross-platform mobile app or site responsive for small screen accessibility is a key functionality for an inclusive product
- The application/service should be designed to be [508 Compliant](#)



- Audio/video conferencing service, whether third party or internal to the application or server environment, may be integrated for attendees of synchronous or hybrid courses
- Ensure functionality that supports automated captioning service integrated for live or previously recorded video
- Ensure functionality for integrated chat that is usable within the synchronous course interface

Section 3.7.6 User Onboarding, Self-Management, and Interactions with Content

Recommendations:

- Onboarding process for new users may be defined and customized (per instance, if multi-instance)
 - Process should assess learning interests, and set privacy and other profile details
- User self-management options should include the:
 - Ability to create or delete account
 - Ability to manage contact information and notifications
 - Options to limit degrees of data collection, or blanket opt-out option
- The LMS should provide guidance or suggested content based on interaction with the system and/or previously-viewed content

Section 3.7.7 Learner Engagement

Recommendations:

- Include features that support teacher-student and peer-to-peer engagement for hybrid or synchronous courses. These include:
 - Integrated live chat
 - Integrated video conferencing
 - Discussion forums
- Badges may be defined or imported
 - Distributed automatically earned badges for completing course content. These can be made visible on a student's profile if desired by student (this visibility may be controlled in user profile, i.e. "Show my badges")
- Certificates may be defined or imported, and associated with completing one or more courses
 - Certificates may be printed or emailed to the user by request
- In-class polling helps to encourage competitive motivation
 - For example, a pop up quick-question within a course would assess the student's learning, and participants could compare their answers with others



Section 3.7.8 LMS Documentation & Training

Recommendations:

- Develop documentation for the LMS, including:
 - General Documentation: overall product, functions, high level overview
 - Devops Administration Documentation: technical documentation for system administration, deployment
 - Functional Documentation per User Role: specific how to documentation and training for users of different roles. *Note that these roles to be defined by METRO's Learning Consortium*

Section 3.7.9 Reporting and Automated Statistics Tracking

Recommendations:

- Define needs for custom automated reporting, starting with the following:
 - The LMS should have the ability to define report templates, to be used as is, or copied and modified for individual use
 - Reporting may include details about all types of content and meta-content types, as well as how staff and learners interaction with it
 - Reports may be scheduled to occur periodically and may run automatically
 - Reports can be delivered via email
 - Course reporting includes ability to include user demographics and other user fields as consented by the user, course completion data, score tracking data if possible, ability to select fields for specific reports
 - Export formats are provided in well known formats including doc/docx, odt, ppt, pdf, xls/xlsx, and csv
- Set standards for operability of APIs and machine readable reporting, including:
 - Reporting API is provided within the LMS to enable authenticated and secure access to other systems
 - Export formats are provided in well known machine readable formats: csv, JSON, JSONL
 - SQL integration or API would support be ideal for at least one Metro member library system
- All reporting use cases comply with the ALA Intellectual Freedom Committee's [Library Privacy Guidelines for Library Management Systems](#)



Section 4.2 Funding and Fee Model

Recommendations:

- Together, METRO and their partners should pursue grant funding for a prototype and any associated startup costs. Which cooperative service option is selected may impact the eligibility of this work for different funding agencies.
- Startup fees should be required of participating libraries to contribute to startup costs and demonstrate commitment to the project.
- The funding and fee model should be designed to serve the start up and pilot needs, while considering the longer term sustainability for each phase of the project
- The funding and fee model should have the capability to scale to other customers (outside of the NYC Metro service area) as a fee-based service in the future.
- An MOU or SLA should be created between METRO and participating partner libraries defining roles and responsibilities of METRO and partner libraries in key areas, including:
 - Define participation of METRO and each partner in building any shared LMS
 - Define fundraising and sustainability contributions of METRO and each partner in funding any shared LMS, to include participation in:
 - Grant proposals and other fundraising activities
 - Fee structures
 - In-kind contributions of labor
 - Others