Digital Library for ALDEN

WPI - MIS573

Final Project Documentation

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System request

Our team proposes a Digital Library to host project reports, technical literature, and related multimedia for ALDEN's research activities. The Digital Library will replace the existing as-is systems, which are primarily comprised of a network file server and Microsoft Access database that host digital media.

SYSTEM REQUEST – Digital Library System for Project Reports and Literature	
Project Sponsor	Christopher Head, IT Director, Alden Research Laboratory
Business Need	A digital information system to store and retrieve project reports and related technical literature needed for project work.
Business Requirements	A cloud-hosted database system that can store documents and multimedia and be searched by employees.
Business Value	Increase project profitability, reduce research labor, improve project outcomes, and increase client satisfaction.
Special Issues	System must have security controls to authorize appropriate access to sensitive materials. Physical records will require a digitization service.

Feasibility analysis

Technical Feasibility Analysis

Familiarity with the application – We have a deep understanding of the business application of the library system we are developing. Based on our analysis of the current system the risks and opportunities are clear. The limitations of the current system have helped us identify the exact features of the new system. Thus, we have a solid understanding of what the new system should achieve. Since this is a redesign of the current system many risks associated with developing a new system are eliminated.

Familiarity with the technology – To develop this information system we will require an operational data store. We were successful in identifying the technologies that will be required to develop this system. However, we have an intermediate understanding of the required technologies. Our lack of experience with these tools could be a major contributor to system development delays.

Project Size – This is a medium-sized project, led by a four-member development team. The project duration is three months. It involves planning, design, and implementation. Additionally, the complexity level is medium based on familiarity with the application and technology.

Compatibility – The new system is highly compatible as it is a redesign of the current system. The current system has a database; thus, the new system is compatible with the existing technologies.

Economic Feasibility Analysis

The costs related to the project encompass the development, data storage, server hosting, and maintenance. Since the system will involve user profile creation, the database will store user information. Additional investment will be required in information security. The system will mitigate the costs associated with maintaining the different repositories which are currently spread out. Finally, the costs associated with labor and time will be significantly reduced since employees will be able to easily access information from a common repository.

The current economic feasibility analysis is based on tangible benefits such as increased accessibility and improved service.

Organizational Feasibility Analysis

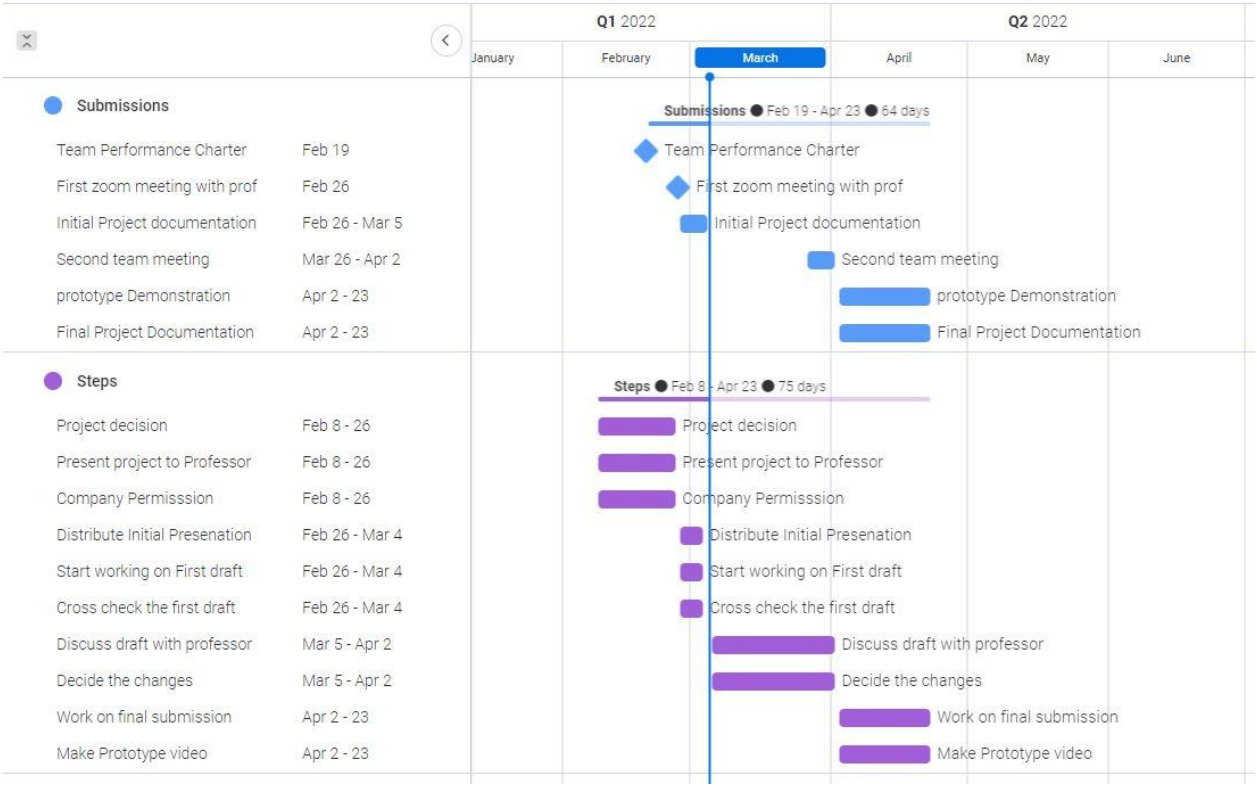
To assess the organizational feasibility, we conducted interviews with the stakeholders. We followed this with a survey that asked for feedback on whether to implement a digital library (See Appendix A).

Results of the Interviews:

We received positive results from the interviews. Around 96% of responses were in favor of establishing a digital library and 4% did not think it was necessary. Overall, the majority agreed that a digital library would be worthwhile.

Project Schedule

The team has developed the following project schedule.



Function Point Analysis

The team has developed the following Function Point Analysis (FPA) for the Digital Library. The FPA will require updates as we continue to work through the system planning process.

Description	Total Number	Complexity			Total
		Low	*Medium*	*High*	
Inputs	8	5 x 3	3 x 4	0 x 6	27
Outputs	7	4 x 4	2 x 5	1 x 7	33
Queries	2	1 x 3	1 x 4	0 x 6	7
Files	1	1 x 7	0 x 10	0 x 15	7
Total Unadjusted Function Points (TUFP):					**74**

TAFP = APC*TUFP=1*74= 74

55 lines of code per function point for Java, so multiplying it by TAFP we get:

55 * 74 = 4070

Therefore, the system will require an estimated 4070 total lines of code.

System Requirements

Requirements Elicitation

It takes a skilled analyst to get the requirements for a project to meet the stakeholders' needs. Incorrect requirements will cause the project to fail. Therefore, requirements elicitation is critical to success. From the course text, the author states that the process of requirements elicitation can be linked to three steps:

1. Understanding the existing situation (as-is);
2. Identify Improvements, and;
3. Define requirements for the new system (to-be).

In this project, the to-be system will be the focus since the as-is system is a collection of disjoined systems and manual processes. To gain a clear understanding of the organization’s needs, key stakeholders were interviewed using open-ended questions (see Appendix A) for requirements discovery. Informal Benchmarking was also used to discover requirements. Companies using existing digital library systems were studied to learn what features were the most frequently used. The Requirements Definition is the product of these interviews, informal benchmarking, and research.

Requirements Definition

The requirements listed apply to the creation of a Digital Library system for ALDEN.

Functional Requirements (System)		
REQID	**Requirement**	Priority
F1	The system will keep abreast of current research being conducted at the facility and related research occurring externally.	High
F2	The system will include literature retrieval internally and externally with other research libraries.	High
F3	The system will provide access to slides and photo storage.	High
F4	The system will have voice and text messaging for local researchers to conduct project meetings, share data and collaborate	Low
F5	The system will contain all relevant databases for the research being conducted at the facility.	High
F6	The system will provide training and documentation on the grant process	Low
F7	The system will include functions for data analysis.	Low
F8	The system will provide a function to review citation creation based on APA or MLA citation styles.	Medium
F9	The system will use machine learning to track the impact of research done within the facility on the world	Low
F10	The system will provide tools such that articles, thesis, images, audio, or video can be added to the system.	High
F11	The system will enforce access to system functionality based on user class.	High
F12	The system admin function will allow users to be added or removed from the system.	High
F13	The system will allow the user to set alerts for the latest information added to the system based on their interest criteria.	Medium
F14	The system will consolidate all legacy systems so a complete search of all acquisitions can be performed.	High
F15	The system will host peer reviews for original research.	Medium

Nonfunctional Requirements		
REQID	Requirement	Priority
Operational Requirements		
N1	The system will work with any browser.	Medium
N2	The system is extensible such that new services can be added as needed.	Low
N3	The system is scalable so that it manages to increase the number of users as well as increased hardware in servers and network configurations.	High
N4	The system is reliable and uses hardware redundancy to ensure this property.	High
Performance Requirements		
N5	The system is available, and users can login and access services 24-7.	High
N6	The system response time is within 5 seconds.	High
N7	Mean time between failures (MTBF) is 365 days.	High
N8	There will be no more than 50 users during peak hours.	Medium
Security Requirements		
N9	Users of the system will have a username and password.	High
Cultural and Political Requirements		
N10	Company specific documentation must be vetted based on United States security standards	High

Use Cases

The team has developed the following use cases based on the current high-level processes we expect to support with the library system. Additional use cases will be defined as the project progresses.

<table>
<tr><td colspan="2">Use Case Name: Add User</td><td colspan="2">ID: DL1</td><td>Priority: High</td></tr>
<tr><td colspan="5">Actor: Admin</td></tr>
<tr><td colspan="5">Description: Add User to Digital Library</td></tr>
<tr><td colspan="5">Trigger: A new employee is being onboarded.</td></tr>
<tr><td colspan="5">Type: External</td></tr>
<tr><td colspan="5">Preconditions: The new employee has a job code, PIN, and security level</td></tr>
<tr><td colspan="5">Normal Course:
1. The Admin logs into the Digital Library successfully.
2. The Admin assigns the new employee a permission level based on his security level.
3. The Admin assigns a default password to the new employee based on job code and the PIN.
4. The Admin assigns training modules for the use of the collection based on the job code.
5. The Admin, based on the new employee’s job code, generates a list of archives of interest and includes this with the training modules.
6. The Admin sends an email to the new employee with their password and instructions on how to login to the system.
7. The Admin logs off the system.</td></tr>
<tr><td colspan="5">Postconditions: The new employee can login to the Digital Library.</td></tr>
<tr><td colspan="5">Exceptions: 1. Not able to log into the system. He has the wrong username or password.</td></tr>
<tr><td colspan="2">Summary Inputs</td><td>Source</td><td>Summary Outputs</td><td>Destination</td></tr>
<tr><td colspan="2">New Employee job code, PIN, security level, and name</td><td>Admin</td><td>Password
Library training modules</td><td>New Employee</td></tr>
</table>

<table>
<tr><td colspan="2">Use Case Name: Remove User</td><td colspan="2">ID: DL2</td><td>Priority: High</td></tr>
<tr><td colspan="5">Actor: Admin</td></tr>
<tr><td colspan="5">Description: Remove User from Digital Library</td></tr>
<tr><td colspan="5">Trigger: An employee is being removed.</td></tr>
<tr><td colspan="5">Type: External</td></tr>
<tr><td colspan="5">Preconditions: The employee is leaving the company.</td></tr>
<tr><td colspan="5">Normal Course:
1. The Admin logs into the Digital Library successfully.
2. The Admin removes all information alerts connected to the employee.
3. The Admin generates a list of all outstanding physical media (books, video, audio recordings) and emails to HR.
4. The Admin removes all access to peer reviews for the employee.
5. The Admin forwards any outstanding charges for library services to HR.
6. The Admin logs off the system.</td></tr>
<tr><td colspan="5">Postconditions: The new employee is not able to login into the Digital Library.</td></tr>
<tr><td colspan="5">Exceptions: 1. Not able to log into the system. He has the wrong username or password.</td></tr>
<tr><td>Summary Inputs</td><td>Source</td><td>Summary Outputs</td><td colspan="2">Destination</td></tr>
<tr><td>Employee job code, PIN, security level</td><td>Admin</td><td>Employee list of physical media
Employee outstanding financial obligations</td><td colspan="2">HR</td></tr>
</table>

<table>
<tr><td>Use Case Name: Browse Collection</td><td>ID: DL3</td><td colspan="2">Priority: High</td></tr>
<tr><td colspan="4">Actor: User</td></tr>
<tr><td colspan="4">Description: Browse Digital Library Collections</td></tr>
<tr><td colspan="4">Trigger: The User is working with a broad research area and is attempting to narrow his focus.</td></tr>
<tr><td colspan="4">Type: External</td></tr>
<tr><td colspan="4">Preconditions: The User is registered in the system.</td></tr>
<tr><td colspan="4">Normal Course:
1. The User logs into the Digital Library successfully.
2. The User selects the Browse Collection option.
3. The System displays all the available collections.
4. The User selects a collection.
5. A broad list of all topics related to the collection is displayed.
6. The User selects a topic
7. The System displays a search screen.
8. The User chooses an area within the topic he selected. (The user is continuing to narrow his focus).
9. The User is satisfied with the result and logs out of the system.

• The Collection is a broad area of content. An example of a collection is Biological Sciences and a topic under that is neurology.
• The System is the Digital Library.</td></tr>
<tr><td colspan="4">Postconditions: The user has found a topic to continue his research.</td></tr>
<tr><td colspan="4">Exceptions: 1. Not able to log into the system. He has the wrong username or password.</td></tr>
<tr><td>Summary Inputs</td><td>Source</td><td>Summary Outputs</td><td>Destination</td></tr>
<tr><td>Research topic
Collections</td><td>User
System</td><td>More focused research topic</td><td>User</td></tr>
</table>

<table>
<tr><td>Use Case Name: Search</td><td>ID: DL4</td><td colspan="2">Priority: High</td></tr>
<tr><td colspan="4">Actor: User</td></tr>
<tr><td colspan="4">Description: Search entire Digital Library Collections</td></tr>
<tr><td colspan="4">Trigger: The User is attempting to determine any area that impacts his research even if those areas are in different categories/collections.</td></tr>
<tr><td colspan="4">Type: External</td></tr>
<tr><td colspan="4">Preconditions: The User is registered in the system.</td></tr>
<tr><td colspan="4">Normal Course:
1. The User logs into the Digital Library successfully.
2. The User selects the search option.
3. The User enters a topic from which to begin the search.
4. The System displays a global list of all items related to the topic in the various collections.
5. The User selects an item from the list.
6. The User is satisfied with the result and logs out of the system.

• The System is the Digital Library.</td></tr>
<tr><td colspan="4">Postconditions: The user has found a topic of interest he wishes to explore for his research.</td></tr>
<tr><td colspan="4">Exceptions: 1. Not able to log into the system. He has the wrong username or password.</td></tr>
<tr><td>Summary Inputs</td><td>Source</td><td>Summary Outputs</td><td>Destination</td></tr>
<tr><td>Research topic
Global Collections</td><td>User
System</td><td>Global topics related to user research</td><td>User</td></tr>
</table>

<table>
<tr><td colspan="2">Use Case Name: Add Information Content</td><td>ID: DL5</td><td colspan="2">Priority: High</td></tr>
<tr><td colspan="5">Actor: User</td></tr>
<tr><td colspan="5">Description: Add content to the Digital Library</td></tr>
<tr><td colspan="5">Trigger: The user wants to add content to the library.</td></tr>
<tr><td colspan="5">Type: External</td></tr>
<tr><td colspan="5">Preconditions: The user is registered in the system</td></tr>
<tr><td colspan="5">Normal Course:
1. The User logs into the system successfully.
2. The User selects the Submissions option.
3. The System displays the types of submissions available (*see types below)
4. The User selects a type.
5. The System displays an information entry screen associated with the selected type.
6. The User enters the associated information for the type and uploads the item.
7. The User selects submit.
8. The System displays a message that the entry has been successfully submitted.
9. The User logs off the system.

• The System is the Digital Library
• Information Entry Types: article, presentations, thesis, dissertation, book, report, map, images, video, audio</td></tr>
<tr><td colspan="5">Postconditions: The User’s submission was successful.</td></tr>
<tr><td colspan="5">Exceptions: 1. Not able to log into the system. He has the wrong username or password.
2. The User has entered duplicate information.
3. The User has not filled all the fields in the information entry screen.</td></tr>
<tr><td>Summary Inputs</td><td>Source</td><td>Summary Outputs</td><td colspan="2">Destination</td></tr>
<tr><td>Item to submit</td><td>User</td><td>Submission status message</td><td colspan="2">User</td></tr>
</table>

Use Case Name: Remove Article	ID: DL6	Priority: High	
Actor: Admin			
Description: Remove an article from the Digital Library			
Trigger: There is an issue with the article and the verdict is to remove the article.			
Type: External			
Preconditions: The article to remove is in the Digital Library.			
Normal Course: 1. The Admin logs into the system successfully. 2. The Admin selects the Submissions Removal option. 3. The Admin displays all the submission types. 4. The Admin sets the type = article for removal. 5. The System displays the information entry screen for the article. 6. The Admin enters the associated information for the article to be removed. 7. The Admin selects the removal option. 8. The System displays a message that the entry has been removed. 9. The Admin logs off the system. • The System is the Digital Library • Information Entry Types: article, presentations, thesis, dissertation, book, report, map, images, video, audio			
Postconditions: The article was removed from the Digital Library.			
Exceptions: 1. Not able to log into the system. He has the wrong username or password. 2. The article is not in the system. 3. The Admin has not filled all the fields on the information entry screen.			
Summary Inputs	Source	Summary Outputs	Destination
Item to remove	Admin	Removal status message	Admin

Use Case Name: Alerts	ID: DL7	Priority: Medium	
Actor: User			
Description: Register for latest information item submissions.			
Trigger: The User is doing research and wants to remain abreast of new developments in the field.			
Type: External			
Preconditions: The User has the permission level to be able to set alerts.			
Normal Course: 1. The User logs into the system successfully. 2. The User selects the option to Add Alerts. 3. The System displays a screen with all the information types eligible for alerts. 4. The User registers for an item or items for alert notification. 5. The System displays the alert registration was successful. 6. The User logs off the system. • The System is the Digital Library • Information Entry Types: article, presentations, thesis, dissertation, book, report, map, images, video, audio			
Postconditions: The article was removed from the Digital Library.			
Exceptions: 1. Not able to log into the system. He has the wrong username or password.			
Summary Inputs	Source	Summary Outputs	Destination
Items to register for notification	User	Alert Registration status message	User

Data Flow Diagrams

As-Is Systems

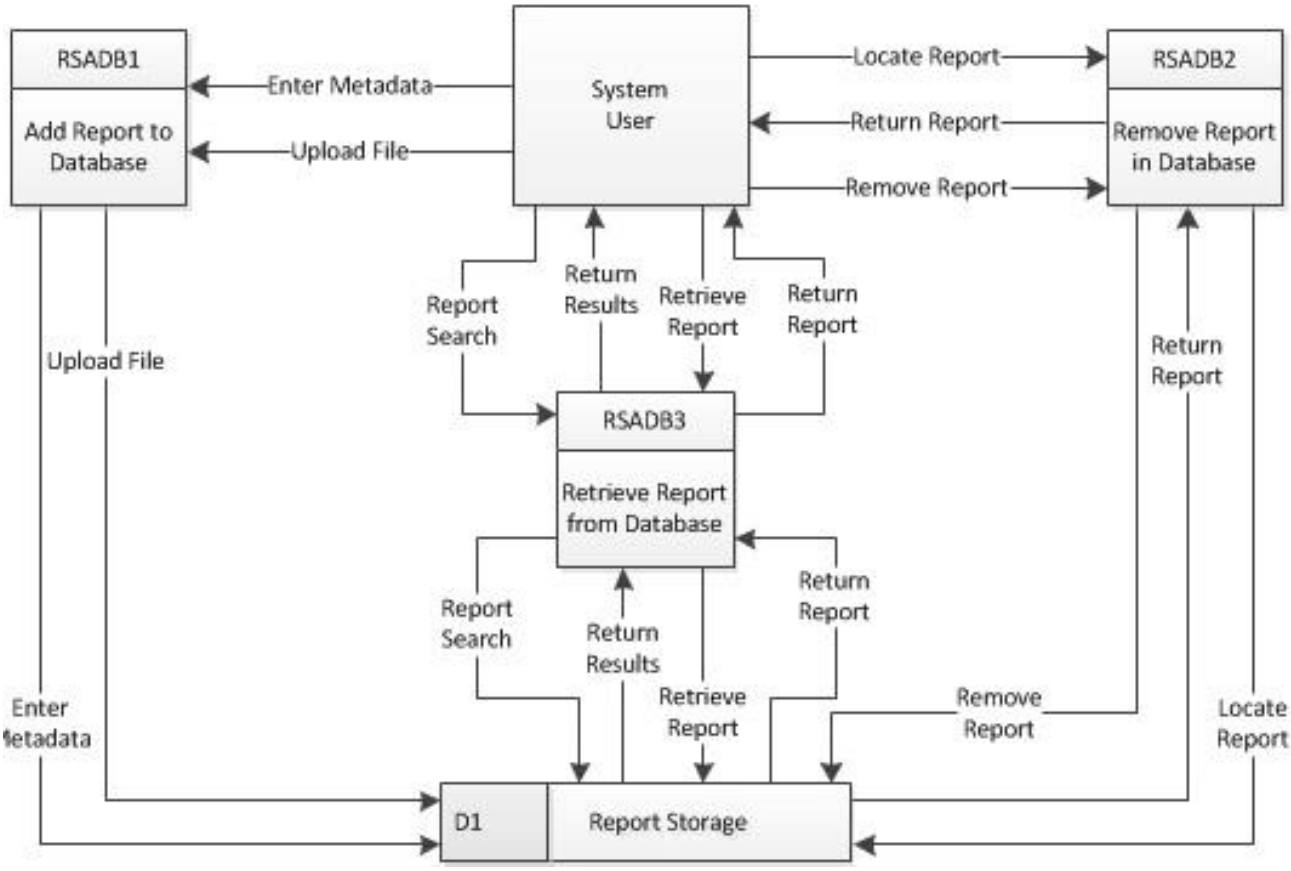


Figure 1: Data Flow Diagram – Level 0: As-Is Microsoft Access Report Library

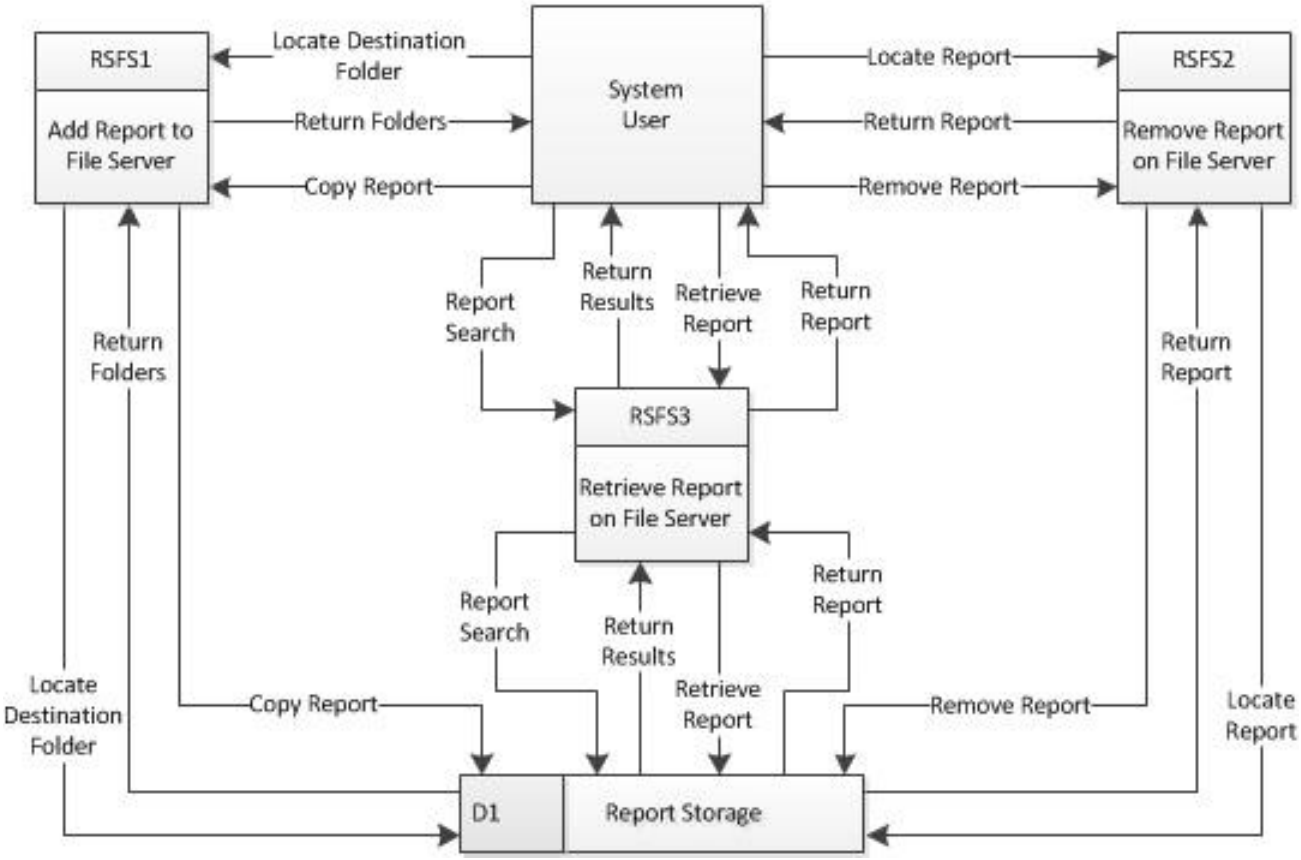


Figure 2: Data Flow Diagram – Level 0: As-Is File Share Report Storage

To-Be System

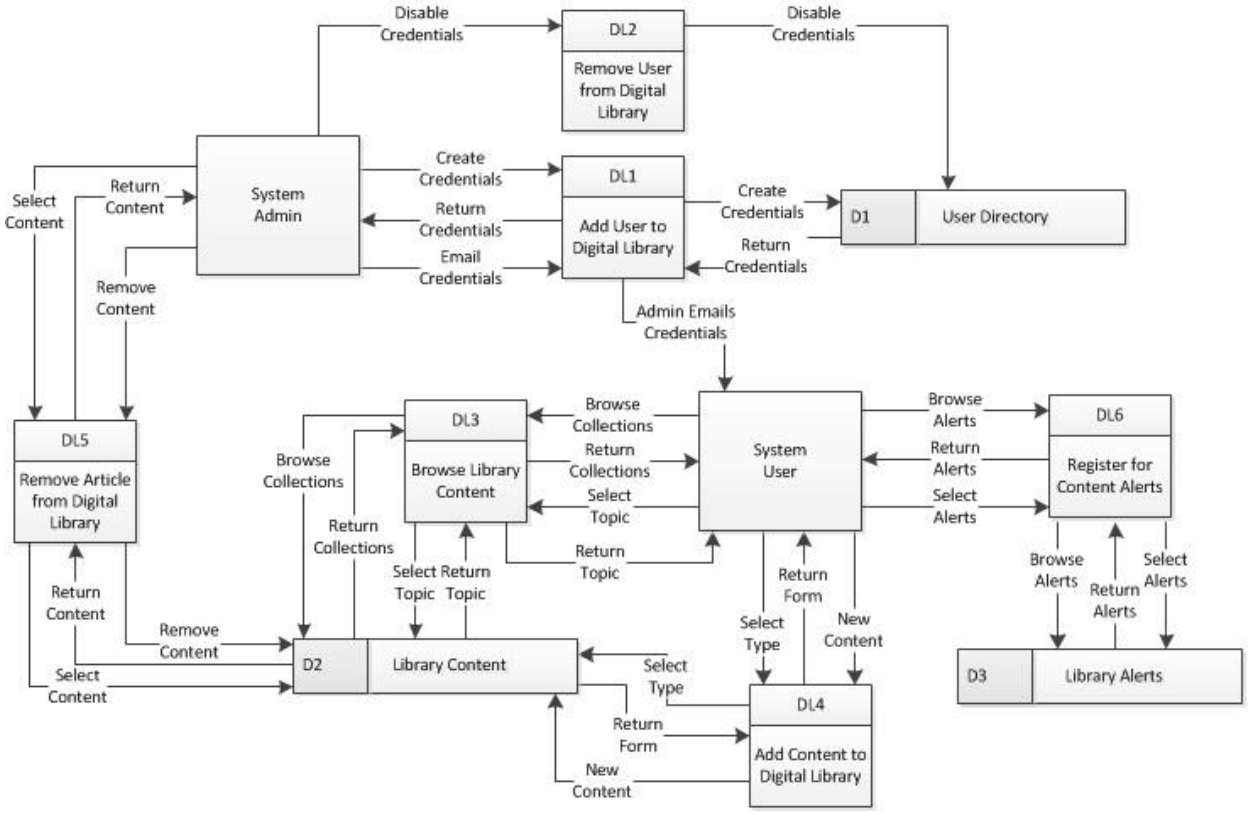


Figure 3: Data Flow Diagram – Level 0: To-Be Digital Library

Normalized Entity-Relationship Model

To-Be System

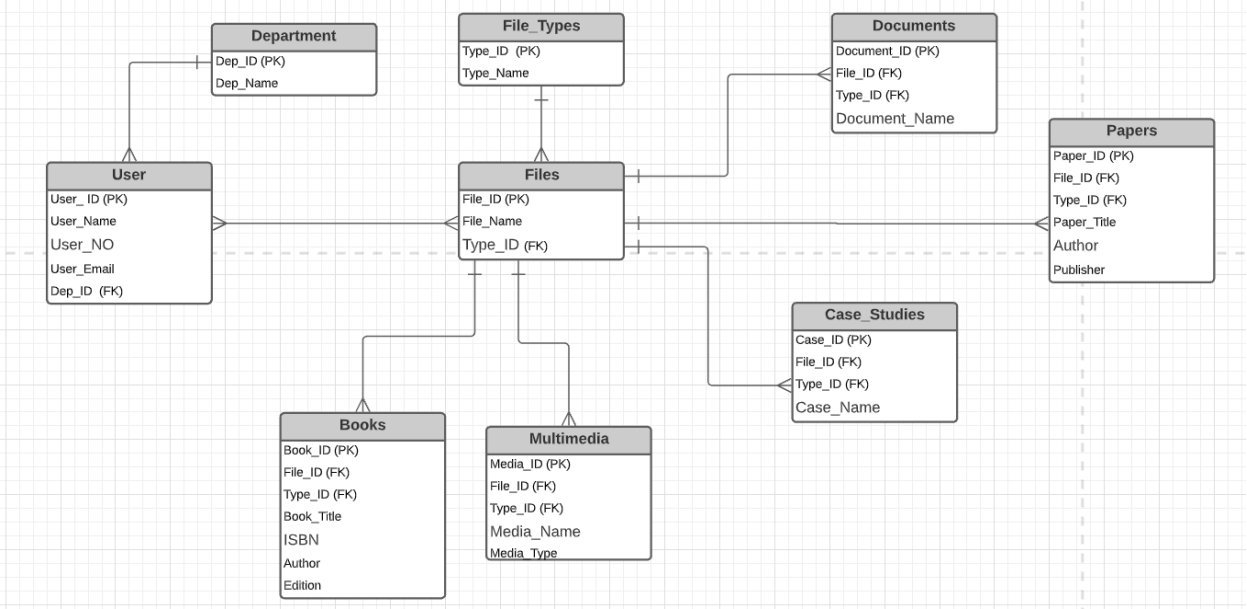


Figure 4: Entity-Relationship Model

Data Dictionary

The following data dictionary is used to define entities, attributes, and relationships on the Entity-Relationship Model (see Figure 4).

Entity: User		
Attribute	Description	Constraint
User_ID	User Id	Primary Key
User_Name	User name	
User_No	User Phone Number	
User_Email	User Email Address	
Dep_ID	Department ID	Foreign Key

Entity: Department		
Attribute	Description	Constraint
Dep_ID	Department ID	Primary Key
Dep_Name	Name of the Department	

Entity: File_Type		
Attribute	Description	Constraint
Type_ID	File type ID	Primary Key
Type_Name	Type of file	

Entity: Files		
Attribute	Description	Constraint
File_ID	File ID	Primary Key
File_Name	Name of the file	
Type_ID	File type ID	Foreign Key

Entity: Documents		
Attribute	Description	Constraint
Document_ID	Document ID	Primary Key
File_ID	Name of the file	Foreign Key
Type_ID	File type ID	Foreign Key
Document_Name	Name of the Document	

Entity: Books		
Attribute	Description	Constraint
Book_ID	Book ID	Primary Key
File_ID	Name of the file	Foreign Key
Type_ID	File type ID	Foreign Key
Book_Title	Name or title of the book	
ISBN	ISBN Number	
Author	Author of the book	
Edition	Book's Edition	

Entity: Multimedia		
Attribute	Description	Constraint
Media_ID	Media ID	Primary Key
File_ID	Name of the file	Foreign Key
Type_ID	File type ID	Foreign Key
Media _Name	Name of the Media file	
Media_Type	Type of media	

Entity: Case_Studies		
Attribute	Description	Constraint
Case_ID	Case ID	Primary Key
File_ID	Name of the file	Foreign Key
Type_ID	File type ID	Foreign Key
Media _Name	Name of the Case Study	

Entity: Papers		
Attribute	Description	Constraint
Paper_ID	Paper ID	Primary Key
File_ID	Name of the file	Foreign Key
Type_ID	File type ID	Foreign Key
Paper_Title	Research paper title	
Author	Author's Name	
Publisher	Publishers Name	

System Architecture

A two-tiered client-server architecture is ideal for the system given the application's design combined with the user-base it must support. Using this design, client devices will serve the presentation logic, and application and database services will be hosted on a single server due to the simplicity of the application. For the client side, we intend to build a responsive rich Internet application (RIA) client, which will make the application more accessible (e.g., on desktop and mobile devices), but would require additional technologies, such as a PDF reader, to be installed on the client device. We will use cloud technologies to host the application and database systems to further improve accessibility and reliability.

Based on the Alternative Matrix and our research, we concluded that Mendix's low-code software development environment would be the best option to use to develop the prototype for the digital library for the ALDEN.

Alternative Matrix

Criteria	Weight	Customized	Score	Weighted Score	Packaged (Mendix)	Score	Weight	Outsourced	Score	Weight
Technical Issues										
Upload books	20	Scanned and uploaded using a different software	3	60	Already built in and tested	5	100	Already built in	5	100
Remove books	20	Removed from both physical and digital Library	3	60	Already Built in and tested	5	100	Already built in	5	100
Alerts	10	Can use existing system	5	50	Would need to be worked around	3	30	Would need to ask everyone to make alerts again and cannot change once set	2	20
Economic Criteria										
Cost of adapting	20		5	100		5	100	Would need to be bought	3	60
Organizational issues										
Adding user	20		4	80	Already Built in and tested	5	100	Would need vendor help to learn	4	80
Remove User	20		4	80	Already Built in and tested	5	100	Would need vendor help to learn	4	80
Total				**430**			**530**			**440**

User Interface Development

For the user interface, we represented the major functions in our prototype that we would like to implement in the production system. The prototype incorporates features for each of the use cases, including: adding and removing users, searching and browsing content, adding and removing content, and creating different types of content alerts. We also built out a user database to support access control based on the principal of least privilege. The idea is to give the application admins full control over the application (application admin role) and include separate rolls for adding content (content admin role) and basic search functions (user role). This approach supports dynamic controls (i.e., buttons, pages, etc.) based on the logged in user's role, such as adding/removing content and users.

To improve the usability of the interface, we included the following features:

- Sortable lists
- Input validation (required fields, character limit)
- Pre-defined fields for content type
- Tab ordering to support keyboard input
- Global search with instant results
- Tablet responsive views

We also adhered to the following best practices for user interface design:

Place users in control of the interface

- Users can revert all actions as needed

Make it comfortable to interact with a product

- The app uses simple terms and an equality simple layout
- Searching can be accomplished in just two clicks; from login to search function

Reduce cognitive load

- A simple and intuitive design with plenty of whitespace is easy on the brain
- Help context is provided in data entry fields

Make user interfaces consistent

- Most features are contained on a single page (separated by tabs)
- User and admin layouts are identical, making the interface familiar for all users

User Testing Documentation

Testing is extremely important as it helps identify all software bugs and design flaws. This step cannot be omitted. Testing is a cost-effective way to prevent unexpected downtime or system failure once it has been placed into production. For this system, we recommend black box testing. The test plan was developed from the system requirements. For testing our system, we divided the application into three distinct parts namely 'Log-In,' 'Search,' and 'Upload.' Test plans were created for each part. Each functionality had different use cases in the form of commands and menu choices. Examples of test cases are as follows:

Test Case #:1					
Associated System Requirement(s): Tester: Execution Date: Description: This test will review the Login screen inputs and error messages					

Preconditions:
userId = inSystem // userid in the system
password = rtghjK89 // password for the system
The system is activated, and the login screen is displayed.
 	
*password is lower case + upper case + 0-9 and length is less than 25 chars
*userId contains no special characters and userId is less than 50 chars					

Step	Action	Expected Result	Actual Result	Pass/Fail	Comments
1	Enter userid = inSystem Password= @	Error message=password incorrect			
2	Enter Userid=sharon@t Password= rtghjK89	Error message=userid incorrect			
3	Enter Userid=sharon@t Password= 123$$####	Error message=userid incorrect and password is incorrect			
4	Enter Userid=inSystem Password= rtghjK89	User successfully logs into the system			

Test Case #:2					
Associated System Requirement(s): Tester: Execution Date: Description: This test will review the Book Search screen inputs and error messages.					
Preconditions: Logged into the system.					
Step	Action	Expected Result	Actual Result	Pass/Fail	Comments
1	Enter subject of interest that the system hosts	All books related to the subject will be displayed			
2	Enter subject that is not in the system	Message = "subject" not hosted by system			
3	Enter author in the system	All books related to the author will be displayed			
4	Enter author not in the system	Message = "author" not hosted by system			
5	Enter book title in the system	The book information will be displayed			
6	Enter book title not in the system	Message = "book" not hosted by system			

We also plan to employ the *think-out-loud protocol* for user interface testing. Members of ALDEN will be given specific tasks. They will be requested to talk about their thought process as they navigate through the process. Upon completion of the tasks, they will be requested to complete a small survey regarding the usability of the application. The tasks they will be requested to complete are as follows.

- Logging in
- Searching for specific content (Each user will be asked to search for a unique file. That is some will be asked to look for a specific book, others will be asked to look for documents)
- Uploading new content

User Manual

This User Manual was produced to help the users of ALDEN's digital library to navigate smoothly through the application. This manual will be provided in the form of digital and downloadable documentation. We focus on keeping the documentation online so that the users can easily navigate through the process of searching for specific information. The manual consists of definitions and a table of contents consisting of tasks and commands. The documentation is focused on how a particular task is performed and how a command is used.

Definitions

1. User – Regular users with a basic level of access to the account and can only view and download the content
2. Application Admin – Is a user with the highest level of access to the account and can create, edit, and delete users and content.
3. Content Admin – Is a user who has access to view, add or delete content but does not have access to the User Management Module.
4. Title – Name of the Document
5. Author – Name of the Author
6. Content-Type – Displays a dropdown functionality for selecting the content type.
7. Description – Additional Details of the document.
8. Content Creation date Start – Date on which the content was created
9. Content Creation date End – Date on which the content was last updated
10. File Name – Name of the file under the content
11. File Size minimum– The minimum size of the file
12. File Size maximum– The maximum size of the file
13. Search Button – Searches according to entry in the fields
14. Reset Button – Resets the entry boxes.

Login

The login process is identical for the User and Admin. To log in they must enter their Username and Password and click on the green Sign In button.

Landing Page

Once the user signs into their account, they are brought to the ALDEN Digital Library's Landing Page. The interface of the Landing page is mostly similar with two major differences between users and admins.

Landing Page for Users

The Landing Page for users consists of Two tabs namely 'Search' and 'Detailed search.' It also displays a 'Search entry box.' By default, the Landing page displays the Search tab content

Search - The Search Tab consists of the button 'View' and a column-wise display of Content. It also has a Search Entry Box Which Is prepopulated with the string 'Enter your search terms.'

This entry box is used for a quick global search. A search can be facilitated by simply entering the keywords for searches. The results are displayed in a column format. The columns consist of ‘Title,’ ‘Author,’ ‘Content Type,’ ‘Description,’ ‘File Name’ and ‘File Size.’ The display is limited to 14 rows. It also displays an arrow functionality to toggle between or navigate to other listings. Each column can be filtered by clicking on the column name. A small arrow beside the column highlights whether it is filtered in an ascending order or descending order or even alphabetically.

Detailed Search – This tab consists of additional fields for a more specific search. It consists of nine entry boxes and two buttons as listed - ‘Title,’ ‘Author’,’ Content-Type,’ ‘Description,’ ’Content Creation date Start,’ ‘Content Creation date End,’ ‘File Nam,’ ‘File Size minimum,’ ‘File Size maximum,’ ‘Search Button,’ ‘Reset Button.’

The Landing Page for the admin

The Landing Page for admin has an identical interface with additional functionality. The two main differences are the additional buttons including ‘New’ and ‘Delete’ and an additional tab on the top for ‘User Management.’

New – This is used to add new content. The Button leads to a Dialogue box that has entry boxes to enter ‘Title,’ ‘Author,’ ‘Content Type,’ ‘Description,’ ‘Content Creation Date,’ Max Size. And buttons for Save, Cancel, and Browse. The browse button is used to browse files that need to be uploaded. All the fields are required. If any of the fields are left blank a message pops up under the field ‘This is a required field.’

Edit - To edit the content simply click on the file and the same dialogue box opens and can be edited.

Delete – To delete an item, click on the file and click the delete button, this will lead you to a confirmation dialog box asking, ‘Are you sure you want to delete this?’

User Management – At a high level this provides the same functionality to create modify and delete but the dialogue boxes have input fields specific to the users.

To add a new user, use the new button to create a new user, the dialogue box requests for input fields including ‘User First Name,’ ‘User Last Name,’ ‘Username,’ ‘User Password,’ ‘User Role’ and buttons to ‘Save’ and ‘Cancel.’ To delete follow the same steps as for deleting the content

User Preferences

This allows users to select their notification preferences. User preferences will be dynamic based on their role. It has an option for having alerts sent to the user via email or SMS.

Sign out

The Sign Out button on the top left corner allows the user to securely log out of their account.

Appendix A

Interview Questions for Key Stakeholders

1. How do people currently use information systems to conduct research?
2. How is project knowledge shared amongst employees?
3. What information systems are used the most for project work?
4. What is the value of historical research data, pictures, reports, etc. to current projects?
5. Should we consider digitizing all physical reports?
6. What is the cutoff as far as time and/or study is concerned?
7. For example, do we want to include reports from the 50s, 60s, etc.?
8. What metadata is useful in identifying library documents and media?
9. What filtering controls are desirable?
10. Beyond project reports and media, and technical literature, are there any other media classes that should be included in the library system?