

**World War I - Access Enhancement (WWI-AE)
Remote Book Access Server (RBASe)**

WWI-AE Project

Life Cycle Architecture (LCA)

Feasibility Rationale Document

**University of Southern California
Center for Software Engineering**

CSCI 577b

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1.0 Introduction

1.1 Purpose of the Feasibility Rationale Document

The main purpose of this document is to rationalize the development decision of World War I Access Enhancement system in a way that prime audience of the system can understand.

Feasibility Rationale Document (FRD) will show that the software project

- will satisfy the requirements ([refer to SSRD](#)),
- will support the operation concept ([refer to OCD](#)),
- will remain faithful to the key features determined by the prototype, and
- will be achievable within budget and schedule stated in life plan. ([refer to LCP](#))

The Feasibility Rationale is the glue that holds the Life Cycle Objective (LCO) and Life Cycle Architecture (LCA) packages together. The document provides evidence of the feasibility and consistency between the LCO and LCA package component. Feasibility Rationale Document will also address the shortfalls in ensuring the feasibility, consistency as project risk items.

The target audience of the Feasibility Rationale Document is key stakeholders and ARB (Architecture Review Board). The key stakeholders connected with World War I – Access Enhancement System project are staff of Von KleinSmid Library, patrons of the system and developers.

In this document you will also find suggestions for potential future development and improvements foreseen by the development group that we considered to be “value added”.

1.2 References

- Meetings with Customer
- Original [Project](#) Description
- E-mail Interaction with our Client
- E-mail Interaction with in-charge of remote storage facility.
- E-mail interaction with CCP – ISD Department.
- [Operational Concept Definition](#)
- [System and Software Architecture Description](#)
- [System Software Requirement Definition](#)
- [Life Cycle Plan](#)

2.0 Product Rationale

Most of the capabilities of the proposed system attempts to improve on the current manual processing, which is labor intensive, costly, error prone and time-consuming.

2.1 Business Case Analysis.

An estimate of the development and operational cost associated with the proposed system is described in the following sections. The objective of the business case analysis is to compare the costs of the system called Remote Book Access Server (RBASE) system with benefits.

[Refer to OCD 2.0](#) for additional Information.

2.1.1 Development Cost Analysis

There are no development costs because this project will be developed for free by a team of graduate students enrolled in CS577b, and the development will be on hardware and software owned by ISD ([Refer OCD 7.0](#)). The project is developed under an agreement between CSE and the ISD. So, there are no monetary things involved here.

We have done the COCOMO II Cost Estimation ([Refer to LCP 5.3](#)) with SOLC ([Refer to OCD 7.0](#)) and Object Points ([Refer LCP 8.0](#)).

With Object Points, Total Development Effort we calculated is

Personnel Months

The personnel months has been calculated to 3.1 months. [Refer to LCP 5.3](#) for more details. Note: The estimate of 3.1 was calculated using the preliminary prototype. As of the writing of this document it has been decided to change from the preliminary prototype to a more complete prototype that will result in an increase in man-months.

Note that each Personnel Month = 152 hours of work.

Using COCOMO II the following estimates were produced for Source Lines of Code (SLOC):

Man Months calculated with SOLC

The man months has been calculated to 6.6 months. [Refer to LCP 5.3](#) for more details. Note: The estimate of 6.6 was calculated using the preliminary prototype. At the writing of this document it has already been decided to change from the preliminary prototype which will result in an increased man-months. And for

implementation, if we take Intermediate COCOMO Phase distribution percentage figures, then code and unit test plus Integration and Test for small 2KDSI organic mode, it is about $42 + 16 = 58\%$. So, implementation team will need $(0.58)(6.6) = 4MM$

Conclusion

The project is going to be implemented by CS577b team in 12 weeks. If we assume each team of 5 members, and each member gives 12 hours in a week, then that will be total

$$\begin{aligned} &12 \text{ hrs/week (by each member)} \times 5 \text{ (team members)} \times 4 \text{ weeks} \\ &= 240 \text{ hrs/month} \\ &= 720 \text{ hrs/month} > (3.1 \times 152\text{hrs}) \end{aligned}$$

The above analysis shows that the provided schedule is adequate to deliver the system. As new requirements are added the results will change (e.g., As stated previously it has been decided to change from the preliminary prototype to a more complete prototype that will result in an increase in man-months).

The hardware and other COTS packages are being used for the project are provided by ISD for free. The system's database will be part of IBM Digital Library.

2.1.2 Implementation Cost Estimates

This section provides rough estimate for costs, which accumulate during transition of the product into production use. ([See LCP 5.2](#))

The World War-I collection consists of approximately 1,200 books. An administrator is needed to scan the pictures, table of contents, and index from each book in the World War I collection and upload the scanned images. Most of the scanning is going to be done by ISD's CCP Production Department, as they are going to handle our database, and therefore they will also upload the scanned images into database.

Approximately 1200 volumes are to have their Table of Contents and Indexes scanned and OCR'ed. Approximately 15% of the materials are expected to be in languages other than English. These are expected to be French, German, Dutch, Italian, Russian, and possibly Spanish.

The total number of pictures that can be contained in any given book is undetermined, as are the total number of pages for the table

of contents and index of each book. However, assuming an average of 5 pictures per book, 3 to 4 pages for the table of contents and 7 to 8 pages for the index, there would be a total of around 15 pages to scan per book. Consequently, there would be a total of around 24,000 items to scan:

$$15 \times 1200 = 18,000 \text{ items.}$$

We decided to have only OCR'ed text format for English language volumes and text (PDF) format for Non-English language volumes of World War – I collection.

There are 15% of the volumes are in Non-English. Therefore,

$$\begin{aligned} \text{Total No. of Volumes in Non-English} &= (0.15) * 1200 \\ &= 180 \text{ volumes.} \end{aligned}$$

Below is summary of costs involved in scanning images and text :
(data is got from CCP Production Department)

For English Volumes				1080 vol.
Types	Cost/page	pages/volume	Total pages	TotalCost /type
OCR(Text File) TOC	\$0.17	4	4320	\$734.4
OCR(Text File) Index	\$0.17	6-7	6480	\$1101.6
Pictures	\$1.00	4	4320	\$4320
For Non English volumes				180 vol.
Types	Cost/page	Pages/volume	Total pages	TotalCost/type
Text(PDF) TOC	\$0.32	4	720	\$230.4
Text(PDF) Index	\$0.32	6-7	1080	\$345.4
Pictures	\$1.00	4	720	\$720
TOTAL COST				\$ 7451.8

For above cost calculations,

- No Special Materials Handling is necessary.
- No OCR Checking/Cleanup will be performed by CCP people
- No special image manipulation will be performed by CCP people.
- No meta-data capture or management will be performed by CCP people.

For OCR Checking and Clean-up , Image manipulation and put data into database, there will be additional overhead. We think ISD has to hire some students to do the job.

Estimating that each item average will take a half minute for OCR Checking and Cleaning, the total amount of time to upload the images would be 150 hours.

$$\begin{aligned} 18,000 \times 0.5 &= 18000 \text{ minutes} \\ &= 150 \text{ hours.} \end{aligned}$$

Assumption is based on – most of the OCRed pages will be clean. (This assumption we make from experience of scanning sample five volume's pages).

If we assume for each item it takes another 0.5 minutes to upload into database then,

$$\begin{aligned} 18,000 \times 0.5 &= 18000 \text{ minutes} \\ &= 150 \text{ hours} \end{aligned}$$

The total will be $150 + 150 = 300$ hours

If a part-time operator working 20 hours/week were hired to do the above tasks, then it would take 15 weeks to finish the scanning.

$$\begin{aligned} \text{Total time (weeks)} &= (300 \text{ hours} \div 20 \text{ hours/week}) \\ &= 15 \text{ weeks of work.} \end{aligned}$$

Therefore, if 2 *work-study* students are hired to work 20 hours a week, then, the process could be finished within 7.5 weeks.

$$\begin{aligned} \text{Total cost (dollars)} &= 300 \text{ hr} \times \$10.00/\text{hr} \\ &\quad \times (50 \% \text{ of work-study}) \\ &= \$1500. \end{aligned}$$

This system does not require a very high reliability and a very occasional failure of the system will not mean that all library activities come to a standstill. However, it might cause inconvenience to patrons and library staff. Basically the system provides an enhancement to the library system, making it available for use can be done as soon as the project has been completed and the final system is stable and secure.

The costs for COTS license is zero, as developers are going to use IBM Digital Library in place of any COTS product. The IBM Digital Library is provided by ISD for free. There will be no cost added for on site preparation, as the patron can use the WWI-AE system from computers of the library, which provide access to HOMER. The only cost involved is at administrative site. Administrator must have a good PC/workstation, scanner and it associated scanning software to use it.

2.1.3 Operational Costs

VKC Library plans to hire one staff member whose job would be to administer the System. As such, the administrator's job would include scanning images of new arrivals, entering textual data, and any updates to the database. The operational cost of the system will decrease as the number of new arrivals relating to World War I decreases. If we hire any working Librarian for the job as a part time administrator, he has to do a job of maintaining and keeping database up to date for one average one hour per week..

Then, cost of keeping system up for a year will be –

$$1 \text{ hr/ week} * 52 \text{ weeks} * \$12 / \text{hr} = \$624$$

2.1.4 Maintenance Costs

In terms of server maintenance and software maintenance and cleanups, hardware maintenance etc. will be handled by ISD. Currently we don't have any information about the cost of Digital Library maintenance. Note that currently actual figure of Annual Change Traffic is not known. But we expect that it will not be much, unless there is a need to enhance the capability of the system. ([Refer to LCP 5.2](#))

We expect ISD to maintain our database as it will reside on their DB2 Digital Library Server on which many other collections other than World War – I collection. And also World War I - Access Enhancement (WWI – AE) System's web - server will be Lotus Domino Web Server (Refer to SSRD 5.2.3.3) which will be provided by ISD, so they will maintain them.

Only cost we see at this time is only maintaining Administrator System. The cost of maintaining Administrator System which includes PC and scanner is about \$150 for a year, which includes repairing of hardware if any damage happens, upgrades etc.

2.1.5 Estimated Value Added and Relation to Cost

The WWI-AE System will provide easy access to World War books through the World Wide Web (WWW). Thus WWI-AE saves revenue by reducing the labor costs associated with the unnecessary retrieval of World War I books from the remote warehouse where the books are stored.

For description current system working and its shortfalls [Refer to OCD 2.3.2 Current System Shortfalls.](#)

The purpose of proposed system World War I - Access Enhancement (WWI-AE) System is to provide more information than is currently available in the automated cataloging system (HOMER). This is necessary because most of the books stored in the WWI-AE/RBAsE database will be warehoused in a remote location. With the books far away in a remote location the user will eventually become a tired requesting books that after retrieval are found not usable in their research. WWI-AE System will enhance their capabilities to choose the correct book by enabling the search of the book's table of contents, index and associated pictures. This coupled with the ability to directly submit the book's information in HOMER's query interface without additional keyboard entry will provide a powerful, useful tool yet simple to operate. Thus RBAsE will enable World War-I scholars and researchers to get an 'overview' of a book before making up their mind about borrowing a book. It also in turn will minimize the amount of unnecessary retrievals from remote storage by the library staff.

Additionally, this frees up valuable space by sending a significant proportion of lesser-used materials to the storage facilities where they can be warehoused cheaply.

Return on Investment (ROI) Analysis:

Costs:

Development Cost : \$ 0

Implementation Cost : \$ **7541.8** - OCR and Image Scanning Cost
(first 6 months)

: \$ **1500.0** OCR Checking/Cleaning &
Database uploading Cost
(first 6 months)

Operational Cost : \$624 per year = \$52 per month (After first 2 months)

Maintenance Cost: \$150 per year = \$18 per month (After first 2 months)

Benefits:

Annual shelving cost of a volume in VKC Library,
Cost/volume is \$ 4.

There are 1200 volumes. So, total cost will be - \$4800.

Annual storage cost of an “AVERAGE SINGLE VOLUME” is in remote storage place, Grand is roughly \$0.25-\$0.30, which includes rent, shelving and lighting costs, utilities and other related costs.

So, total costs of storing at remote storage, Grand is
= $1200 * (\$0.25) = \$ 282$.

So, every year savings will be – $(\$4800 - \$282) = \$4518$.
Saving per month will be $\$4518 / 12 = \376.5

Now, once the WWI collection is moved to remote storage, the retrieval of a volume cost comes in the picture.

There are average 5-6 requests received for World War – I collection. The average cost for a retrieval is \$0.50-\$0.70

With enhanced access our proposed system will provide, there will be 75% drop in potential paging i.e. retrieval of a book. That would mean that, instead of having to page four books, at cost of \$2.00 -\$2.80, to get the information she/he needs, a user patron would only have to page one volume, at a cost of \$0.50-\$0.70.

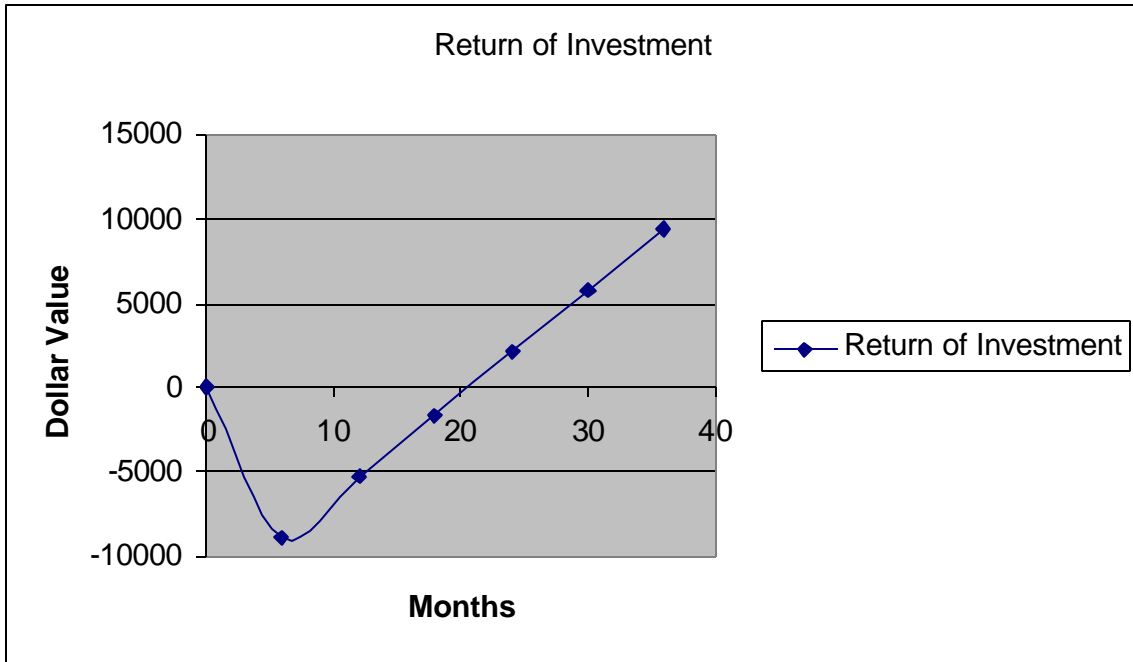
So, there will be saving of $(\$2.80 - \$0.70) = \$2.10$.

So, for 5-6 requests savings will be - $6 * \$2.10 = \12.60 .

So, savings in month will be, (as we cut 8 Saturday and Sunday from 30 days – Library is closed on these days)
= $22 \text{ days} * \$12.10 = \$ 266$

Savings in first year (First 3 months for implementation)
= $9 * \$266$
= \$ 2394.

Months	6	12	18	24	30	36
Savings		\$3855	\$3855	\$3855	\$3855	\$3855
Comm.	0	\$3855	\$7710	\$11565	\$15420	\$19275
Savings		\$160	\$160	\$160	\$160	\$160
Costs	\$8991.5	\$9111.5	\$9271.5	\$9431.5	\$9591.5	\$9911.5
Comm.	\$8951.5	\$9111.5	\$9271.5	\$9431.5	\$9591.5	\$9911.5
Costs						
ROI	0	0.423	0.83	1.23	2.46	1.95



2.2 Requirement Satisfaction

This section summarizes how well a developed system will satisfy the system requirements.

2.2.1 Capability Requirements

The System capabilities can be broadly classified into two categories. This classification is based on the functionality of the person related to using or maintaining the system. The categories are:

- WWI-AE Administrative Subsystem.
- WWI-AE Search Engine.

Capabilities for the WWI-AE Administrative Subsystem

Administrator Authorization.

Function:

The World War – I Access Enhancement shall protect access to administration function from non-authorized users by requiring the Administrator to login from a Java client's machine.

As administrator system will have a Java client which is on a local isolated machine and not available through World Wide Web that itself provide a kind of security from outside intruders. System further enhances security feature by providing a password for a group of administrators. The password is registered with ISD's Digital Library DB2 Database server. And when sending sensitive data like a password over a network, WWI-AE Administrator system will use encryption before sending it. [\[Refer to SSAD 3.3.2.8\]](#)

Capability described. [See SSRD 2.1 NRMQ – 05](#) for more information.

Criticality: Essential. Without this capability would render the information of the database to intruders and compromise the system integrity.

Technical Issues: This will be accomplished using IBM Digital Library Passwords and use their API to send the value.

Cost and Schedule: None. As it is done in Development Phase.

Risks: Password must be stored some inaccessible place to prevent misuse.

Dependencies with other requirements: NRMQ-01, NRMQ-02.

Architecture: [BHEV-08.](#)

Updating of the WWI-AE database

Function:

The World War I –Access Enhancement (WWI-AE) System allows administrator to enter a new book, to modify a pre-existing record, to delete a record in the database when a book is no longer available.

The capability will be implemented when developing team implements an Administrator Subsystem in a Java. All

administrator related queries will be handled by Query manager at a client side. System will use ODBC between a local Administrator Subsystem and IBM DL's database server. All queries execution will be handled by IBM's DB2 database server. [\[Refer to SSAD 3.3.2.6 and 3.3.2.7\]](#)

Capability described. [See SSRD 2.1 NRMQ-01 and NRMQ-02](#) for more information.

Criticality: Essential. This capability enables the administrator to make changes to the system. Without it the system becomes static and will not be usable for future enhancement.

Technical Issues: Administrator subsystem will be a Java Application. And Java Database Connectivity (JDBC) will be used for data transfer between Administrator Subsystem and Digital Library's DB2 database server. DB2 server will handle all administrator related to queries.

Cost and Schedule: None. As it is done in a development phase. But, still found -

As this is a major requirement on the administrator part. It will take around 3.2 MM. [See LCP 5.3](#) for more information.

Risks: Disk space may run low if too many items added. Database might be adversely affected during addition, deletion and updating when system crashes. The loss of data can be prevented by transaction roll over mechanism at the part of database server.

Dependencies with other requirements: [NRMQ-01, NRMQ-02, NRMQ-09, NRMQ-10](#)

Architecture: [BEHV-01, BHEV-02, BHEV-03](#)

Capabilities for the WWI-AE Search Engine Subsystem

The Remote Book Query Server allows visitors of the World War I - Access Enhancement (WWI-AE) System web site to perform queries on the sites' database to retrieve relevant books concerning World War-I.

Query Database

Function:

The WWI-AE search engine will allow user – patron to search a World War Collection of books with a keyword through table of

contents, index and picture captions. And it will also allow patron to search WWI collection with Author and Title.

The WWI-AE Search Engine will validate user's query before submitting it. A Net.data scripting language, which will reside on a Search Engine's Web page, will handle patron's query. The Net.data scripting language will be executed at IBM's Lotus Domino Web – Server. And it will send SQL query to DB2 database server. So, Architecture will accomplish search capability by depending on DB2 database server search capability. [Refer to SSAD 3.3.2.4].

Capability Described. [See SSRD 2.1 – NRMQ-11](#)
Capability is also demonstrated by a prototype.

Criticality: Essential. This is the only method for using a proposed system.

Technical Issues: This will be accomplished using macros written in Net.data scripting language residing at Lotus Domino Server, which in turn communicate with IBM Digital Library's DB2 database server.

Cost and Schedule: None. As it is done in a development phase. But, still found -
As this requirement contributes a major part to the Patron-User Interface Cost, which according to COCOMO estimation is 2.3KDSI.

Risks: None.

Dependencies with other requirements: [NRMQ-09](#), [NRMQ-11](#)
Architecture: [BEHV-04](#), [BEHV-09](#) and [BEHV-10](#)

Communicating with library staff.

Criticality:

This is a feature that will be helpful to the people accessing the web interface. However it is not critical to the system.

Implementation and Technical issues:

Providing an email facility with which the users can contact the library staff satisfies this requirement.

Cost & schedule:

This feature can be easily incorporated and will add value to the system.

Dependencies:

Requirements: NMRQ-10

Architecture: [BEHV-12](#)**Requirement Satisfaction Matrix:**

Requirement Identifier	Requirement Satisfaction	Architecture Elements	Comments
NRMQ-01	Partial		No Scanning Capability Included
NRMQ-02 NRMQ-05	Complete Partial		Only one password for a group of users.
NRMQ-09 NRMQ-10 NRMQ-11 NRMQ-12	Complete Complete Complete Complete		

2.2.2 Interface RequirementsGraphical User Interface

From our Client we get information that average user will not be so computer literate. Therefore World War I - Access Enhancement /Remote Book Access Server (RBASE) will use direct manipulation menu screens where possible. This will help reduce human error and at the same time make the interface friendlier to the user. We have opted Match all, Exact match etc. menus instead of more complicated Boolean algebra for searching criteria.

We will GUI for both administrator and User system.

Described. [See SSRD 4.1.1 4.1.2](#)

Command - Line Interface

Not Applicable

Application Programming Interface

System will use Java API for a stand alone Administrator Subsystem to achieve portability. For Search engine, system will use IBM DB2 Digital Library's Java API provided as this is one of constraint provided by client. ([Refer to SSRD 4.1.3](#))

Diagnostics

Not Applicable

Hardware Interfaces

Not Applicable

Communication Interfaces

The system will use Local Area Network (LAN) HUB and Wide Area Network (WAN) HUB, which will support TCP/IP protocols and 10 Base-T connections. LAN will relay the USC user community traffic into the World War I - Access Enhancement's (WWI-AE) system. WAN will relay the outside of the USC user community traffic into the World War I - Access Enhancement's (WWI-AE) system. The HUB relays both patron/user and Administrator subsystem communication. This is one of the constraints on a WWI-AE system, as it will reside in USC on-campus so it will use the LAN of USC for communication. Described. [See SSRD 4.3](#)

External Software Interfaces

The World War I - Access Enhancement's (WWI-AE) system will interface with USC's automated catalog system (Homer). The proposed architecture will accomplish this using Homer's query interface and submitting name value pairs like put and get methods, to through Homer's web interface. Described [See SSRD 4.4](#)

2.2.3 Quality Requirements

Reliability

The World War I - Access Enhancement (WWI-AE) System will handle at least 80-90% of all completed transaction successfully, without crashing. The numbers came out from Interface Checking method and analysis of IBM's Digital Library Server. ISD is using Digital Library's DB2 database server for many other applications beside this.

Product Strategies:

- Backup Recovery, Fault Tolerance Functions (Inherited from IBM DB2 Server) and ISD will going to backup data weekly.
- Error Reducing, User Input/ Output Checking.
- Input Validation and Integrity functions.

Process Strategies:

- Inherited from IBM DL - ISD will going to backup World War Collection data weekly.
- Formal Specifications and Verifications will be done for each module. Testing done by outsider.
- Inspection.

Described. [See SSRD 3.2. QRAQ 5](#)

Security

Described. [See SSRD 3.1 QRAQ 1](#)

Product Strategies:

- Input Validation and Integrity functions.
- Intrusion Detection and Handling.

Process Strategies:

- Inspection.
- Inherited from IBM DL - ISD will going to maintain password database.

Usability

The World War I - Access Enhancement (WWI-AE) System user interface will be designed to be easy to use. The administrator/librarian will be able to use the Administration subsystem easily to perform book entries, deletions and updates. Additionally the patron/user who will use the system less frequently than the administrator will also be provided with an interface that will enable easy queries of the system and navigation of the results.

Described. [See SSRD 3.2 1-3.1.3 QRAQ 2,3,4](#)

Product Strategies:

- Error reducing user input-output
- Help explanation
- Navigation
- UI – Consistency
- UI – Flexibility
- User – Tailoring.

Process Strategies:

- User manuals.
- On – line help navigation.
- User Interface Tools.

Performance

This will depend on performance of DB2 database server. From analysis of DB2 database server's specification at IBM's web site and information given by ISD, the performance of a server will be satisfactory for WWI-AE system.

See for more details - see

<http://www.software.ibm.com/data/db2/benchmarks/mettle.html>

All accesses to the system from within the University of Southern California Local Area Network (LAN) and have a direct Internet access of at least 10 Mbps will be fulfilled by the system in two minutes or less, as average table of content, or image size is around 300KB.

When the information must traverse a Wide Area Network (WAN), for which the developer has no control, then there is no system response time requirement

Described. [See SSRD 3.2.5 QRAQ 6](#)

Product Strategies:

- Platform feature Exploitation.

Process Strategies:

- Performance Analysis.

2.2.4 Evolution Requirements*Capability Evolution*

The Administrator's subsystem is developed in a Java. The proposed architecture is a two-tier architecture for admin subsystem. The Administrator' subsystem is a stand-alone application, so it will be easy to add code which will provide scanner interface.

Described. [See SSRD 6.1](#)

2.3 Operation Concept Satisfaction.

World War I –Access Enhancement r (WWI – AE) System works in two different scenarios - Patron scenario and Administrative scenario. [See OCD 5.0](#) for more details.

The Patron scenario includes all the activities involved with patrons and WWI – AE System interaction.

WWI – AE System patron scenarios

Search by Title or Author name

The patron may know the title or the author of a book, and might want to see the table of contents, picture or index of the book. By doing that he wishes to make certain that the content of book is the same as the one he wants. The World War I – Access Enhancement / Remote Book Access Server will provide such capability, so that the patron can view the Table of Content, Abstract, index and Pictures of the book.

Note: This feature has not been demonstrated in the LCO prototype but is expected to be there in the final version.

Search by Any Phrase.

The Patron may wish to search the Table of Contents of the WWI Book collection to check whether any of them contains information about a topic (phrase) in which he/she is interested. The World War I – Access Enhancement (WWI –AE) System will provide such capability, so that patron can search for multiple phrases with match all, exact match or any match options. The RBASe will automatically list all books for which the archived information contains that particular phrase.

Search by any Word.

The patron may have knowledge of any work like “The Battle of Waterloo” and might wish to locate the books in World War I collection mention the battle. The World War I – Access Enhancement System will allow a patron to search a particular word in Index. The RBASe will automatically generate a list of all the books whose index contains that particular word.

Search through the Caption of Pictures.

Most patrons are interested pictures of World War I. The World War I – Access Enhancement (WWI-AE) System will allow the user to search through the titles of pictures stored in the archive. RBASe generates the list of pictures whose caption contains search keyword.

WWI – AE/ RBASE Administrative Scenarios.

Administrator Verification.

Whenever an administrator attempts a login, he is asked to enter his name and password for authentication. Only authorized personnel are allowed to operate in the administrative mode.

Each scenarios below assumes that the administrator performing the operation has been authenticated.

Modify or delete a record of the book.

The administrator may choose a filter option before making a decision to modify or delete a particular record. The World War I – Access Enhancement (WWI-AE) System will provide filter option, which allows the filtering of listed books by Title or Author name. After the filtering criteria has been entered, only book titles which matches the selected criteria will be shown. When the administrator chooses a particular book from the displayed list, the options to modify its table of contents, index, abstract or pictures will appear on the screen. This allows the administrator to modify or delete the corresponding book detail.

Create a new record.

The World War I – Access Enhancement (WWI – AE) System will allow the administrator to enter a new record. The administrator will be provided with the option of either adding pictures as soon as a new entry has been created or at a subsequent time.

Add or delete pictures.

When administrator wants to add or delete a picture related to particular record, he/she will be presented with same screen as the one to enter a new record. He can easily link the picture file with record.

Exception Handling Scenarios

- If the search results exceed 250 hits, then the system will prompt the user to refine their query instead of attempting to return all the search results, which may take a very long time to process, or may over load the client machine.
- If the file selected (Picture, TOC, etc.) by the Administrator for upload to the system is unreadable, the system will prompt the operator that a error occurred during it file submission.
- If a connection to the database is not be established with 10 seconds the system will timeout and prompt the user that the system is unavailable and that they should retry their operation at a later time.

2.4 Stakeholder Concurrence

The three primary stakeholders – Customer, User, Developer are involved in the agreement process. During the WinWin negotiations, win conditions were created and entered by all three primary stakeholders. The client, Mr. Ken Klein, provided customer `s win conditions. A complete spiral of the WinWin process was completed with issues, options and agreements to cover the win conditions.

3 Process Rationale

3.1 System Priorities

The main priority of the system, in addition to successfully designing and building the World War I – Access Enhancement (WWI-AE) System, is to design a system which should be implemented within a 12 week span. Based on the priorities of the Win condition, we can categorize win conditions as essential, desirable, or Optional.

Essential Capability: (Done in first 3 phase – Date: - April 2nd 1999)

- Artifact Searching (Phase 1, Date: - February 19th 1999)
- Provide list of artifacts returning hits (Phase 1, Date: - February 19th 1999)
- Administrator Subsystem – modification and deletion capability (Phase 2, Date: - March 9th 1999)
- Supported by ISD on multiple platforms
- Usable interfaces (Phase 3, Date: - April 2nd 1999)
- Link to Homer (Phase 3, Date: - April 2nd 1999)
- User/Client Training

[\[Refer to LCP 2.2\]](#) [\[SSRD 3.1\]](#)

Desired Capability:

- Utilize the Digital Library
- Scalable System
- Enhanced search capabilities
- Low cost of development
- Optimal use of network resources (response time/bandwidth)

Optional Capability:

- Filtering options for the administrator
- Internal scanning of artifacts from within the software
- Easily accessible system

3.2 Process Match to System Priorities

We are using the Win - Win Spiral model, together with MBASE to design World War I –Access/ Remote Book Access Server (WWI – AE/ RBASE). These two will aid in meeting the objectives of the system. The Win -Win Spiral model is the recommended process model and was adopted by the development team. The first cycle has been completed. All the stakeholder win conditions have been identified and some

agreements have been reached. Our next step is to elaborate each win condition and possibly refine them. This allows constant communication with the client throughout the process. All win conditions will be covered to begin with followed by specifying additional win conditions and refinement of existing ones. This will ensure specification of all the win conditions in detail and establish agreements before continuing to the next level of objectives.

Growth envelope of the WWI-AE system is limited to medium and has a low understanding of requirements. The robustness of the system will be Low - Medium. The developer team will use Risk Driven Evolutionary Development process Model. This is derived from Process Model Decision Table.

The prototype will be built in an incremental process. This gives the development team the opportunity to enhance the prototype based on feedback from the customer and user.

3.3 Consistency of Priorities, Process and Resources

The system priorities will be implemented first to give a functioning system that will be expanded on as time permits. This method will allow the development team to produce a working program within the 15-week development cycle.

Every team member has defined roles and responsibilities to ensure that all aspects of our project are covered. Overlapping roles ensures that there are no gaps. Each artifact in the documentation set will have a primary role and a secondary developer. The project manager evaluated the strengths of all team members and assigned them to areas in which their talents were best used.

Consistency of the artifacts developed by the team is built on a foundation of incremental development. (Refer to gdeepakDev_WinC3). During the incremental development we follow the Life Cycle Plan and its phases. Each completed phase is followed by a testing phase in order to avoid finding out that there was a major bug late in the project development.

Completion Criteria

Phase 1 - Functioning interfaces, query builder and online help system from the developer's perspective. The customer and system users must validate these artifacts before official delivery can be made.

Phase 2 - A functioning database built according to the predefined schema.

Phase 3 - A functioning HOMER link that is validated by the customer and system users.

Phase 4 - A functioning program that is validated by the customer and users. This program need not have been thoroughly tested, but must be stable enough to undergo the system test procedures defined by the development team.

Phase 5 - A fully functional program validated by the customer and the users. Completion of documentation and training also constitutes requirements for phase completion.

For more details [Refer to LCP 2.3.2](#)

The above description shows that consistency of documents has been maintained by incremental development.

Project will took 3.1 person months according to Object Point Analysis and 4 Man Months according to COCOMO II SLOC analysis. [\[Refer LCP 5.3\]](#)

Now, 2 MM = 1 CS577b student. It will took only a team of 2 people to develop it. But this figure might change considerably it will be safe enough to have a team of 4 people which will develop WWI-AE System.

4 Project Risk Assessment

Number	Risk
1	Personnel Short falls
2	Schedule
3	User Interface mismatch
4	Data generation capabilities for maintenance
5	Copyright for digitized data.
6	COTS, External components
7	Externally Performed tasks
8	Lack of knowledge
9	Requirement Changes
10	Budget

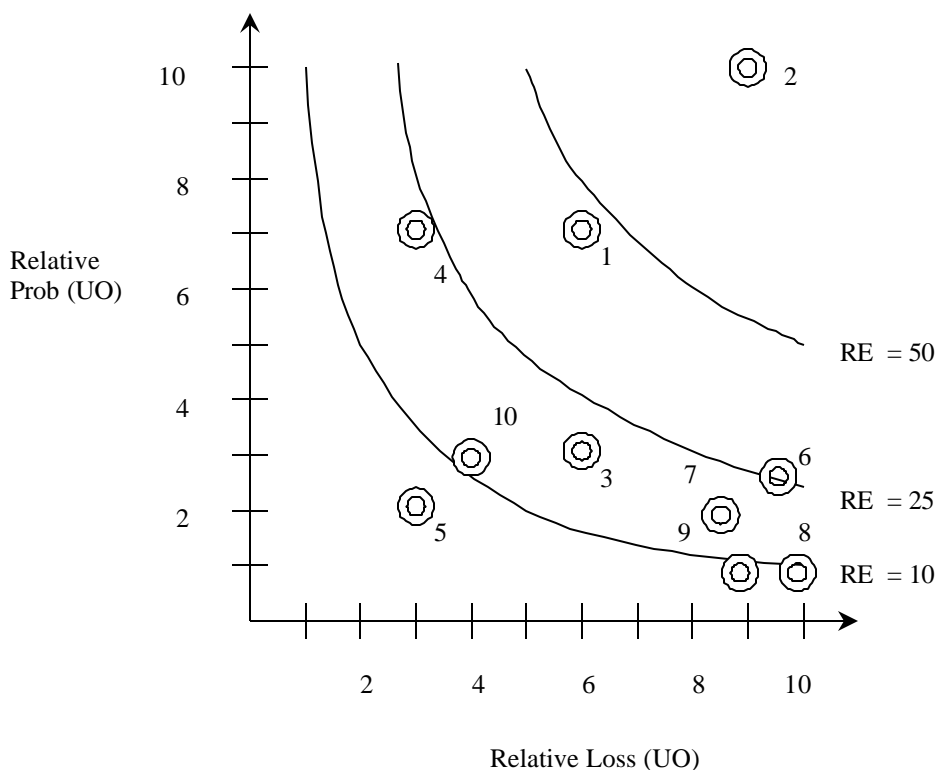
Number:	RISK-01
Description:	Members of the 577b team may leave the project in between the production stage.
Name:	Personnel shortfall
Risk Exposure:	$RE = \text{Prob(UO)} \times (\text{Loss}) = (6) \times (7) = 42$ (on a scale of 1 to 10)
Damage:	High
Action to Mitigate Risk	Such a risk is reduced in 577 as students are committed to completing the course after a certain initial period. However assigning teams that have previously worked on the project can reduce this risk.
Contingency plan:	In case this does occur then Dr. Boehm can assign other students to the team.

Number:	RISK-02
Description:	The team might not be able to complete the development process on time.
Name:	Schedule slippage
Risk Exposure:	$RE = \text{Prob}(\text{UO}) \times (\text{Loss}) = (10) \times (9) = 90$ (on a scale of 1 to 10)
Damage:	Very High
Action to Mitigate Risk:	Estimation helps reduce the risk as teams perform it and they will have an idea of its feasibility
Contingency plan:	In case the team falls behind schedule, increment – 03 may be dropped.

Number:	RISK-03
Description:	The interfaces developed do not match to the user expectations.
Name:	User Interface mismatch
Risk Exposure:	$RE = \text{Prob}(\text{UO}) \times (\text{Loss}) = (3) \times (6) = 18$ (on a scale of 1 to 10)
Damage:	Medium
Actions to mitigate risk:	This risk can be reduced by developing the user interface so that it can be reviewed by the client and changed if necessary. Extensive prototyping was done to ensure that the interfaces are what the users and customers desire.

Number:	RISK-04
Description:	Once the initial artifacts are entered, if any additional artifacts need to be added or modifications to present data is required, then similar data generation capabilities may be needed.
Name:	Data generation capabilities for maintenance
Risk Exposure:	$RE = \text{Prob}(\text{UO}) \times (\text{Loss}) = (7) \times (3) = 21$ (on a scale of 1 to 10)
Damage:	Medium
Action to Mitigate Risk:	Text modifications could be done by the administrative subsystem
Contingency plan:	CCP could be approached to generate image/OCR data for the required material.

Number:	RISK-05
Description:	There is a possibility that permission to reproduce some of the books digitally can not be obtained.
Name:	Copyright for digitized data.
Risk Exposure:	$RE = Prob(UO) \times (Loss) = (2) \times (3) = 6$ (on a scale of 1 to 10)
Damage:	Very Low
Action to Mitigate Risk:	Every effort should be made to obtain approval for reproduction of the artifacts.
Contingency plan:	In the case permission to reproduce the artifact can not be obtained, it will not be entered into the database.



Number:	RISK-06
Description:	There is a possibility that IBM DB2 we are going to use may not be able to provide what we assume.
Name:	COTS, External Interface.
Risk Exposure:	RE = Prob(UO) X (Loss) = (8) X (3) = 24 (on a scale of 1 to 10)
Damage:	Medium
Action to Mitigate Risk:	Every effort should be made to obtain the information from ISD about IBM DL.
Contingency plan:	In the case assumptions changes, architecture should reflect that and team will drop the 3 rd increment.

Number:	RISK-07
Description:	There is a possibility that CCP may delay the OCR and Scanning activity.
Name:	Copyright for digitized data.
Risk Exposure:	RE = Prob(UO) X (Loss) = (2) X (10) = 20 (on a scale of 1 to 10)
Damage:	Low
Action to Mitigate Risk:	Every effort should be made by a team to look after the progress made by them. Weekly Reviews.
Contingency plan:	System would run on the small set of database. In summer We try add more records.

Number:	RISK-08
Description:	Lack of knowledge about application platform.
Name:	Lack of knowledge
Risk Exposure:	RE = Prob(UO) X (Loss) = (1) X (10) = 10 (on a scale of 1 to 10)
Damage:	Very Low
Action to Mitigate Risk:	Every effort should be made by team member to learn about new platform.
Contingency plan:	-

Number:	RISK-09
Description:	Client Requirement Changes may lead to change in all architecture.
Name:	Requirement Changes.
Risk Exposure:	$RE = Prob(UO) \times (Loss) = (1) \times (8) = 9$ (on a scale of 1 to 10)
Damage:	Very Low
Action to Mitigate Risk:	Every effort should be made to keep in touch with client and keep him update.
Contingency plan:	Drop the other requirements – except core requirements

Number:	RISK-10
Description:	Client may don't have enough budget
Name:	Budget may slippage.
Risk Exposure:	$RE = Prob(UO) \times (Loss) = (1) \times (10) = 10$ (on a scale of 1 to 10)
Damage:	Very Low
Action to Mitigate Risk:	-
Contingency plan:	

5 Analysis of Results

The original concept of using a entry level database such as Microsoft Access was unacceptable due to lack of processing power. The searches on the artifact set of 1200 books were estimated to take a significant amount of time.

The typical user of the system was identified as a student with limited knowledge of computers. An easy to master search language with the power to accommodate advanced users was preferred. The method of searching with Boolean operators was dropped in favor of adopting an option driven keyword search language.

We had also considered different programming languages for implementation for Administrator application. The main choices were Perl and Java, both of which had relative advantages from the programming perspective. The primary motivation for the decision to use Java, however, was the restrictions against using CGI scripts and the portability aspect of Java. For Search engine, we considered CGI and Net.data scripting language. We rejected CGI as it was not allowed on ISD's Digital Library Server and opted Net.data as it was only choice for implementation.

Another major decision was regarding the kind of Database to use. We began designing the WWI-AE System using a DBMS such as ORACLE as the back-end archive. However, the option of using the Digital Library, which was offered to us, was found to offer considerable performance and security advantages in comparison to the initial approach. Our project involved the management of a large number of image files for retrieval as a result of which the performance would be heavily dependent on the server used. The use of a fast IBM Digital Library server, coupled with the availability of very large amount of storage space steered our decision in its favor.

3.2 Off-the-shelf solution

We do not see any existing available in market, which provide off-the-shelf solution.

3.3 Components

The following is the list of options commercial off the shelf solutions, which we may use:

DBMS:
IBM Digital Library

Java IDE:

Any of the following tools are acceptable and considered for development as all the below are supported ISD:

- Microsoft's Visual J++ 1.1a
- Symantec's Visual Café Pro 1.0
- Sun Microsystems' Java Development Toolkit (JDK) 1.1.1
- Borland's J Builder
- Sybase jConnect for JDBC

Web page designer:

Microsoft FrontPage
Claris Home page 3.0
Adobe page Mill

Scanner Software:

Adobe PhotoShop

6.0 Appendix

- **Homer**

Homer is a web-based catalog of the books and materials in the University of Southern California's Library System. It allows patrons to search for materials by Words or Phrase, Author, Title, or Subject. Other searches and search combinations are also available and users may also restrict their search to a particular library or libraries. Use or visit [Homer](#) here.