Distributed Assessment of Risks Tool
(DART)

Feasibility Rationale Description (FRD v3.0)

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Team 15

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Version control

Date	Author	Changes	Version
10/21/01	Michael J. Klug	Initial Version	0.1
10/22/01	Michael J. Klug	? Added section 2.3 ? Revised section 2.1 per release LCP v0.1 ? Added another client meeting	0.1.1
10/23/01	Michael J. Klug	Per lecture, assumed 17 projects per CS577a/b class.	0.1.2
10/24/01	Michael J. Klug	Fixed total hours worked for example project in CS577b.	0.1.3
10/27/01	Michael J. Klug	Incorporated comments per formal team review.	0.2
10/28/01	Michael J. Klug	Forgot to update business case analysis.	0.2.1
11/04/01	Michael J. Klug	Baseline for LCO.	1.0
11/24/01	Michael J. Klug	Initial updates for LCA consisting of risk list updates.	1.1
12/01/01	Michael J. Klug Pallavi Raghavan Antonia Yeung	? Updates for LCA continued. ? Incorporated LCO comments.	1.2
12/04/01	Michael J. Klug	Updates per LCA ARB. Baselined.	2.0
01/27/02	Michael J. Klug	? Post-LCA updates. ? New team member updates.	2.1
02/03/02	Michael J. Klug	? Updates per decision on version numbers for COTS. ? Updates per the addition of development languages requirement (R100), coding standard (R101), and GUI color scheme (R102). ? Added draft “RLCA Change Summary” section.	2.2
02/04/02	Michael J. Klug	Changed “RLCA Change Summary” to “Change Summary”	2.3
02/09/02	Michael J. Klug	? Updated “Development Cost Analysis” per new COCOMO II run. ? Added comments concerning development of Iteration Plans. ? Updated “Project Risk Assessment”.	2.4
02/10/02	Michael J. Klug	Incorporated changes that were made to the OCD.	2.5

02/12/02	Michael J. Klug	Incorporated changes per IV&V review.	2.6
02/17/02	Michael J. Klug	Baselined for RLCA.	3.0

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1 Introduction

1.1 Purpose of the Feasibility Rationale Description Document

The Feasibility Rationale Description Document will ensure the consistency of all documents for the DART project for each anchor point in the Win-Win Spiral Model as well as show that the project will:

- Be achievable within the project budget and schedule,
- Satisfy the project requirements,
- Stay true to the key ideas laid out in the prototypes, and
- Support the operational concept.

1.2 References

- Operational Concept Description v3.0
- System and Software Requirements Definition v3.0
- System and Software Architecture Description v3.0
- Life Cycle Plan v3.0
- MBASE Guidelines v2.3.6c
- B.W. Boehm, "Software Risk Management: Principles and Practices", IEEE, January 1991, pp.32-41.
- USC Center for Software Engineering - URL: http://sunset.usc.edu
- EPG Web Resources – URL: http://sunset.usc.edu/research/MBASE/EPG
- Easy WinWin Negotiation Results
- Easy WinWin Sessions: 09/25/01, 09/27/01
- Client Meetings: 09/21/01, 09/25/01, 09/27/01, 10/22/01, 10/31/01, 11/12/01, 11/14/01, 11/30/01, 12/03/01, 01/24/02, 02/14/02
- Team Meetings: 09/18/01, 09/21/01, 09/23/01, 09/25/01, 09/27/01, 09/30/01, 10/03/01, 10/07/01, 10/11/01, 10/14/01, 10/18/01, 10/21/01, 10/25/01, 10/28/01, 10/30/01, 11/04/01, 11/08/01, 11/11/01, 11/12/01, 11/15/01, 11/18/01, 11/27/01, 11/29/01, 12/02/01, 12/03/01, 01/10/02, 01/17/02, 01/24/02, 01/27/02, 01/31/02, 02/07/02, 02/10/02, 02/14/02, 02/17/02

1.3 Change Summary

The changes made to this document were very minor and correspond to the changes made in the OCD, SSRD, SSAD, and LCP. Updates were also made to incorporate any comments from LCA which mainly dealt with which requirements belonged in which sections.

Table 1 - Change Summary

Change Description	Rationale	Sections Affected	
		Here	Elsewhere
Updated to reflect the new COCOMO II run which reduced team effort for CS577b to one 5-person team.	Needed to update the COCOMO II estimate based on the new team formed in CS577b.	? 2.1 Business Case Analysis ? 3.3 Consistency of Priorities, Process and Resources	? None
Updated to reflect development of Iteration Plans to better prove consistency of priorities, process, and resources.	Needed to make sure that the system can be developed on schedule, meeting the capabilities and resource planned in the LCP.	? 3.3 Consistency of Priorities, Process and Resources	? None
Updated risks to take into account project transition, test, and development risks.	Needed to make sure we remove risks that are no longer needed due to the formation of the new team. Also needed to add new risks that directly affect development and deployment.	? 4 Project Risk Assessment	? LCP 4.1.4 Risk Monitoring and Control

2 Product Rationale

This section describes the rationale for the system being able to satisfy the specifications, budget, and schedule.

2.1 Business Case Analysis

This section describes the monetary and non-monetary impact of the product and value added.

2.1.1 Development Cost Analysis

There will be no monetary cost to the customer with respect to the initial development of the system. However, one 5-person CS577a team has already spent, on average, 67 man-hours per week on the project. Continuing in CS577b, one 5-person development team is expected to spend on average 60 man-hours per week based on COCOMO II estimates in order to develop the product. Given the typical CS577b development schedule of 10 weeks, a total of 600 man-hours will be needed to complete the initial operating capability of the system. See LCP 5.2 for a detailed analysis.

2.1.2 Transition Cost Estimate

There will be no monetary cost associated with the transition to the new system. The 5-person team which develops the team that develops the system will be responsible for the system training, user's manuals, initial installation of the system for the system maintainer, and testing after installation. The time needed to do this is included in the development cost analysis above. See LCP 5.2 for a detailed analysis.

2.1.3 Operational Cost Estimate

The administrator of the system is expected to be a graduate student from the CSE department, preferably a teaching assistant for a CS577a/b class. The maintenance required will be 1 hour per week for 48 weeks out of the year. See LCP 5.2 for a detailed analysis.

2.1.4 Evolution Cost Estimate

The monetary cost of implementing the evolutionary requirements for the system is $6000 based on a single graduate student teaching assistant working 5 hours per week for 48 weeks out of the year. This cost could be avoided by having future CS577b students or undergraduates develop the evolutionary capabilities of the system.

2.1.5 Estimate of Value Added and Return on Investment

The monetary cost of implementing the system for the first year will be $6000. Since the engineering and production of the system will be performed by CSE graduate students as a class project with tools and hardware provided, the expected first year cost of the system will be 1404 man-hours ((12 weeks * 1 CS577a team * 13.4 man-hours per week * 5 team members) + (10 weeks * 1 CS577b team * 12 man-hours per week * 5 team members)) for the design and development of the system, 24 man-hours ((48 weeks total – 24 weeks for development) * 1 man-hour per week * 1 maintainer) for operational cost, and 120 man-hours for evolutionary cost ((48 weeks total – 24 weeks for development) * 5 man-hours per week * 1 maintainer).

The real benefits of the system are non-monetary in nature though. Project managers for CS577a/b classes are expected to realize a 50% reduction in the amount of time they spend on risk management given the new tool because they will spend less time figuring out how to present the risk management data to the teaching assistants and professors. Given a typical CS577a class project (12 week long project with a project manager working 3 hours per week on risk management), the project manager would realize an overall savings of 18 man-hours per CS577a/b project per class.

Teaching assistants for CS577a/b classes are expected to realize a 70% reduction in the amount of time they spend gathering the risk management data from project managers because they do not need to spend any time understanding the different formats that project managers use when submitting risk management data. Given a typical CS577a/b class (17 projects and 0.2 hours per project per week for 12 weeks to gather risk management data), the teaching assistant would realize an overall savings 28.56 man-hours per CS577a/b class.

Research assistants analyzing the data over the summer are expected to realize a 50% reduction in the amount of time they spend pouring through the risk data collected during the previous year's CS577a/b classes. Given a typical year, at least 2 research assistants are needed for the summer break (3 months working part-time or 20 hours per week) to analyze the risk data for the CS577a/b classes held during the year. This would translate into a savings of 240 man-hours over the course of one year.

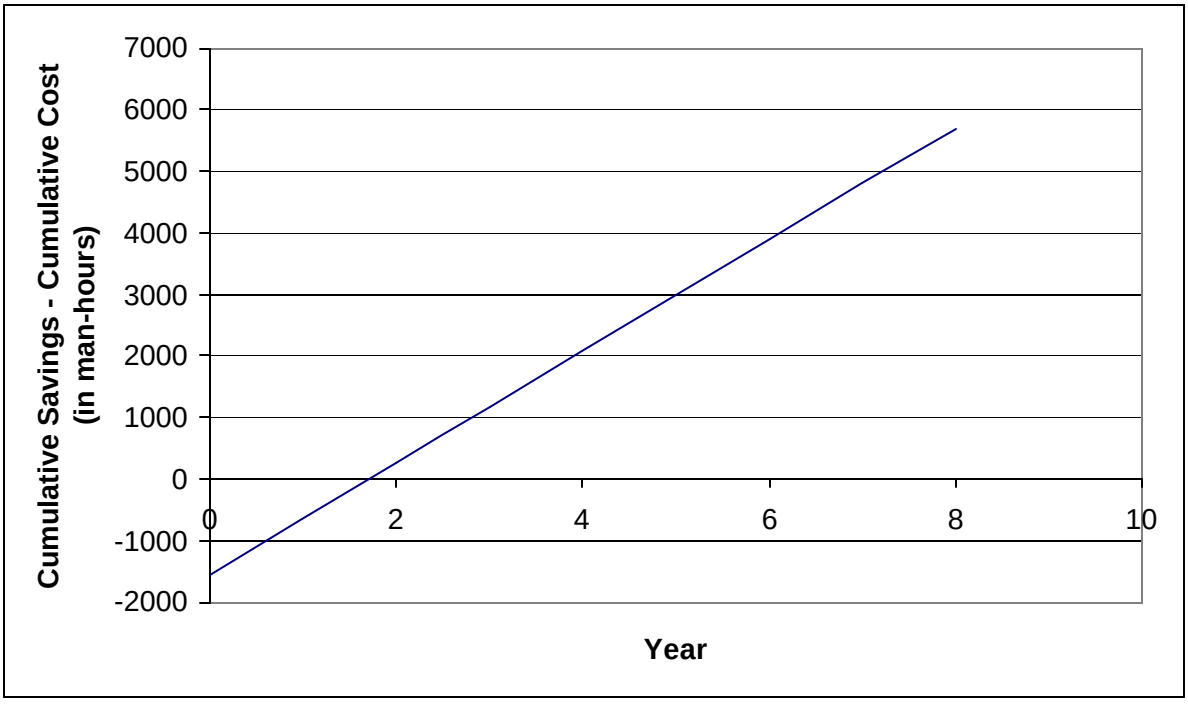
Although the benefits to the individual products this tool is used for, because of reduced rework and breakage due to missed or unmitigated risks during the project, is difficult to quantify, because the benefit would depend on the risk, we can use COCOMO to help us estimate it. If we assume that the "Architecture/Risk Resolution", RESL, factor can be improved by one factor, this would translate into a savings of 1 – 1.5% for a project. On a typical CS577a project this would mean a maximal savings of 10.8 man-hours per semester (12 weeks * 12 man-hours per week * 5 team members * 1.5%).

Given the above data, Table 3 shows that a positive return on investment will start to be realized after the 1st year of the project's use. However, this period can be shortened if more projects use the tool.

Table 3 – Estimated Return on Investment Summary

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Typical Number of CS577a/b Projects		34	34	34	34	34	34	34	34
Hours Saved per Project by Project Manager		16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Hours Saved per CS577a/b Class by Teaching Assistant per Project		1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
Hours saved per project due to better risk management		9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Hours Saved per Year by Research Assistants		240	240	240	240	240	240	240	240
Cumulative Time Saved in Hours		1194.7	2389.4	3584.2	4778.9	5973.6	7168.3	8363	9557.8
Time Invested in Hours	1548	288	288	288	288	288	288	288	288
Cumulative Time Invested in Hours	1548	1836	2124	2412	2700	2988	3276	3564	3852
Return on Investment		0.6507	1.125	1.486	1.77	1.9992	2.1881	2.3465	2.4812

Figure 1 – Estimated Return on Investment vs. Time



2.2 Requirements Satisfaction

This section describes how the system as designed per the System & Software Requirements Architecture Description, SSAD, and implemented per the Life Cycle Plan, LCP, satisfies the requirements specified in the System & Software Requirements Definition, SSRD, and concepts laid out in the Operational Concept Description, OCD. Where appropriate matrices have been used to show how traceability has been achieved throughout all of the above mentioned documents.

2.2.1 Operational Concept Satisfaction

Table 5 shows how each of the requirements from the SSRD trace back to capabilities, activities, and/or project goals as set in the OCD. The table is meant to describe how each of the requirements meets a capability that was set forth in the OCD. Each row should be read as "SSRD Requirement X realizes OCD Reference Y by …". For the purposes of Table 5 the keys in Table 4 can be used to understand OCD references.

Table 4 - OCD Reference Key

OCD Reference Key/Acronym	Description
PG	Project Goal
SC	System Capability
LS	Level of Service
PA	Proposed Activities
OS	Operational Scenario
PE	Proposed Entity

Table 5 - Requirements to Concepts Traceability

SSRD Requirement	OCD Reference Description & Realization
R18 – No Expense	? Realizes and is in accordance with PG-02, "Very limited budget for project".
R38 – Implementation Time	? Realizes and is in accordance with PG-01, "System implementation must be achievable in 12 weeks".
R55 – Test Lab	? PG-01, "System implementation must be achievable in 12 weeks", by requiring the use of an already existing CSE asset.
R65 – Test PCs	? PG-01, "System implementation must be achievable in 12 weeks", by requiring the use of an already existing CSE asset.
R39 – Currently Available Tools	? PG-01, "System implementation must be achievable in 12 weeks", by requiring the use of existing implementation tools in the CSE department to develop the system. ? PG-02, "Very limited budget for project", by requiring the use of existing implementation tools there are no expenses needed for new tools.
R63 – Tomcat Software	? PG-02, "Very limited budget for project", by requiring the use of existing implementation tools there are no expenses needed for new tools.

SSRD Requirement	OCD Reference Description & Realization
R64 – Database Software	? PG-02, "Very limited budget for project", by requiring the use of existing implementation tools there are no expenses needed for new tools.
R100 – Development Language	? PG-02, "Very limited budget for project", by requiring the use of existing implementation tools there are no expenses needed for new tools.
R101 – Java Coding Standard	? PG-02, "Very limited budget for project", by requiring the use of existing implementation tools and the standards with them to develop the system, less time will be spent figuring our other developer's code.
R56 – Deployment Platform	? PG-02, "Very limited budget for project", by requiring the CSE department to provide a platform to install the system on so that costs are not incurred in order to buy hardware.
R66 – User Guide Deployment	? LS-01, "Usability", by requiring the development team to supply a user's guide with the system.
R58 – Installation Guide	? LS-01, "Usability", by requiring the development team to provide an installation manual to the maintainer of the system.
R57 – Administrator Training	? LS-01, "Usability", by requiring the development team to provide training to the maintainer of the system.
R44 – Administrator Staffing	? PG-02, "Very limited budget for project", by requiring the CSE department to provide its own maintenance support for the tool after initial development is complete.
R40 – Platform Support	? PG-02, "Very limited budget for project", by requiring the CSE department to provide its own backup procedure and personnel for the system.
R03 – Risk Data	? SC-01, "Choose Voting Option", by calling out what data needs to be saved for a risk. ? PA-08, "Enter mitigation plan", by detailing that a mitigation plan needs to be stored with each risk. ? OS-04, "Submit mitigation plan", by requiring a data element associated with each risk for the mitigation plan. ? PE-02, "Risk Info", by tracing the data as described in PE-02 to a requirement.
R42 – Risk Report	? SC-02, "Generate top-n list", by displaying the data for each risk in a risk report. ? PA-02, "Add/Edit/Delete Risk Item(s) to project", by requiring a way to view all of the data for a risk so that it can be modified. ? OS-07, "Manage Project Risks", by requiring a way to view all of the data for a risk so that it can be modified.

SSRD Requirement	OCD Reference Description & Realization
R04 – Distributed Viewing	? SC-02, "Generate top-n list", by requiring the need for reports of this type to be viewable in a distributed fashion. ? SC-04, "Attain Data", by requiring the need for reports of this type to be viewable in a distributed fashion. ? PA-07, "View Top N List", by requiring the need for this activity to be distributed. ? PA-09, "View Risk History Report", by requiring this activity to be distributed. ? OS-05, "View Risk List", by requiring this activity to be distributed.
R05 – Rating Scales	? SC-01, "Choose Voting Option", by stating the scale to be used for voting. ? PA-04, "Stakeholders cast votes on risk items or abstain from voting", by stating what scale users use to vote on a risk. ? OS-03, "Vote on risks", by describing the scale used to rate P(UO) and L(UO).
R07 – Voting Interface	? SC-01, "Choose Voting Option", by calling out what is needed when a vote is cast by a user casts a vote. ? PA-04, "Stakeholders cast votes on risk items or abstain from voting", by requiring what data is needed for a vote to be cast. ? OS-03, "Vote on risks", by requiring a P(UO) and L(UO) entry for each vote cast. ? PE-01, "User", by capturing what data for a user is needed to cast a vote. ? PE-02, "Risk Info", by capturing what data is needed for a risk in order to cast a vote on the risk.
R43 – Collect Votes	? SC-01, "Choose Voting Option", by calling out what needs to be done with votes when they are cast by multiple users. ? PA-03, "Start assessment period", by describing what needs to be done over an assessment period with votes. ? PA-04, "Stakeholders cast votes on risk items or abstain from voting", by requiring what data is needed for a vote to be cast. ? PA-05, "Close assessment period", by describing what needs to be done at the end of an assessment period with votes. ? OS-03, "Vote on risks", by requiring that the vote data needs to be for collection.

SSRD Requirement	OCD Reference Description & Realization
R08 – Average Votes	? SC-01, "Choose Voting Option", by calling out what needs to be done with votes when they are cast by multiple users in order to come up with the RE for the risk. ? PA-04, "Stakeholders cast votes on risk items or abstain from voting", by requiring what data is needed for a vote to be cast. ? PA-05, "Close assessment period", by describing what needs to be done at the end of an assessment period with votes in order to calculate a valid RE for the risk. ? OS-03, "Vote on risks", by requiring that the vote data needs to be for collection.
R33 – Calculate Risk Exposure	? SC-01, "Choose Voting Option", by calling out what how the RE is calculated for a risk.
R11 – Display Risk Exposure	? SC-02, "Generate top-n list", by describing an additional value that needs to be displayed in the top-n list. ? PA-06, "View All Risk List", by describing an additional value that needs to be displayed in the risk list containing all risks for a project. ? PA-07, "View Top N List", by describing an additional value that needs to be displayed in the top-n list. ? OS-05, "View Risk List", by describing an additional value that needs to be displayed with each risk in a risk list.
R12 – RE Sorted	? SC-02, "Generate top-n list", by describing the order risks should be displayed in the top-n list. ? PA-06, "View All Risk List", by describing the order risks should be displayed in the risk list containing all risks for a project. ? PA-07, "View Top N List", by describing the order risks should be displayed in the top-n list. ? OS-05, "View Risk List", by describing the order risks should be displayed with each risk in a risk list.
R13 – Complete Risk Report	? SC-02, "Generate top-n list", by requiring the generation of a list of risks that can be tailored by the project manager so that he/she is not overwhelmed by the number of risks associated with a project. ? PA-06, "View All Risk List", by requiring the generation a risk list as described in the capability. ? PA-07, "View Top N List", by requiring the generation of a list of risks that can be tailored by the project manager so that he/she is not overwhelmed by the number of risks associated with a project. ? OS-05, "View Risk List", by requiring the generation of a risk list as described in the capability.
R14 – Risk History	? SC-04, "Attain Data", by requiring the storage of past risk data in order to populate the risk history report. ? PA-09, "View Risk History Report", by requiring the storage of past risk data in order to populate the risk history report.

SSRD Requirement	OCD Reference Description & Realization
R16 – History Report	? SC-04, "Attain Data", by requiring the capability to view past risk data. ? PA-09, "View Risk History Report", by requiring the capability to view past risk data.
R17 – CSV Output	? SC-04, "Attain Data", by requiring the tool to be able to export all project risk data. ? PA-10, "Export/Import CSV File", by requiring the tool to be able to export all project risk data in CSV format. ? OS-06, "Export/Import CSV File", by requiring the tool to be able to export all project risk data in CSV format. ? PE-05, "CSV File", by requiring the tool to be able to export all risk history data, including P(UO) and L(UO) values, in CSV format.
R30 – User Interface R102 – User Interface Color Scheme	? LS-01, "Usability", by requiring the tool to meet the user's needs.
R59 – Hardware Support	? PG-02, "Very limited budget for project", by requiring the CSE department to provide a UNIX workstation with a connection to the Internet means that the development team does not have to supply such a workstation, thus reducing costs.
R60 – Server	? PG-02, "Very limited budget for project", by requiring the CSE department to provide a UNIX workstation that can act as a web server means that the development team does not have to supply such a workstation, thus reducing costs.
R61 – Operating System	? PG-02, "Very limited budget for project", by requiring the CSE department to provide a UNIX workstation that can run Solaris 2.8 means that the development team does not have to supply such a workstation, thus reducing costs.
R62 – Server Software	? PG-02, "Very limited budget for project", by requiring the CSE department to provide a UNIX workstation that can run Apache means that the development team does not have to supply such a workstation, thus reducing costs.
R35 – Reliability	? LS-04, "Reliability", by directly requiring at least a certain level of reliability from the tool.
R36 – Risk Exposure Calculation Accuracy	? LS-02, "Accuracy of Risk Exposure value", by directly requiring that the value calculated for RE be accurate as described in the OCD.
R37 – Risk Value Display Accuracy	? LS-03, "Risk Value Display Accuracy", by directly requiring that the displayed values for a risk be accurate.
R09 – User's Guide	? LS-01, "Usability", by directly requiring the delivery of a user's guide with the tool.
R31 – Number of Users	? LS-05, "Number of Users", by directly requiring the support for a given number of users as defined in the OCD.
R32 – Amount of Data	? LS-06, "Amount of Data", by directly requiring the tool to support a minimal amount of data.

SSRD Requirement	OCD Reference Description & Realization
R41 – Maximum Time Steps	? LS-07, "Maximum Time Steps", by directly requiring the support for a minimal number of assessment periods.
R19 – Top-N Report	? SC-02, "Generate top-n list", by requiring the tool to be able to support the display of a variable number of risks in a risk report. ? PA-07, "View Top N List", by requiring the tool to be able to support the display of a variable number of risks as decided by the user. ? OS-05, "View Risk List", by requiring the tool to be able to support varying number of risks in a risk list.
R23 – Distributed Voting	? SC-01, "Choose Voting Option", by requiring the tool to be able to support voting from multiple users and locations.
R24 – User Privileges	? SC-01, "Choose Voting Option", by requiring the tool to support user recognition for voting, risk and project modification. ? SC-02, "Manage Session", by requiring the tool to support the ability to assign certain privileges to users. ? SC-05, "Project Configuration Management", by requiring the tool to be able to support an administrator privilege in order to modify projects. ? SC-06, "Project Data Manager", in order to recognize the tool administrator, user privileges are needed. ? PA-01, "Manage stakeholder information", so that the project manager is the only one who can add stakeholders and modify their information. ? PA-11, "Manage Project list", by requiring the tool to support an administrator privilege to modify the project list. ? OS-01, "Manage Stakeholder Names", by requiring a certain privilege to navigate and modify data for a project. ? OS-02, "Manage Projects", by requiring certain privileges to modify project list information. ? PE-01, "User", by requiring a privilege level be associated with each user. ? PE-06, "Administrator", by adding a privilege level so that an administrator can be added to the system.
R27 – Multiple Project Support	? SC-05, "Project Configuration Management", by requiring the tool to be able to support multiple projects. ? PA-11, "Manage Project list", by requiring the tool to be able to support multiple projects so that a project list can be managed. ? OS-02, "Manage Projects", by requiring the tool to be able to support multiple projects so that new projects can be added and older ones deleted. ? PE-06, "Administrator", since multiple project need to be supported, an administrator will be needed.

SSRD Requirement	OCD Reference Description & Realization
R49 – Risk Appearance Tracking	? SC-02, "Generate top-n list", by requiring a new field be displayed in the risk list. ? PA-06, "View All Risk List", by requiring a new field be displayed in the risk list. ? PA-07, "View Top N List", by requiring a new field be displayed in the risk list. ? OS-05, "View Risk List", by requiring a new field be displayed in the risk list.
R47 – CSV Input	? SC-03, "Import CSV File", by requiring the tool to be able to import project risk data. ? PA-10, "Export/Import CSV File", by requiring the tool to be able to import project risk data in CSV format. ? OS-06, "Export/Import CSV File", by requiring the tool to be able to import project risk data in CSV format. ? PE-05, "CSV File", by requiring the tool to be able import risk history data, including P(UO) and L(UO) values, in CSV format.

2.2.2 Project Requirements Satisfaction

LCP 4, "Approach", details how the project's activities will be performed during the different life cycles of the project. The project requirements specified in SSRD 2 are satisfied in various forms by the proposed system due to having a well-defined plan for control and monitoring of the project. Each deliverable for the system, whether code, test plans, or supporting documentation, will go through a review process, as described in the Quality Management Plan, and be baselined periodically, as described in the Configuration Management Plan. No direct monetary cost will be incurred by the project due to the use of currently existing tools and facilities and/or freeware by the development team.

Table 6 details how each of the project requirements is met by either the LCP or the customer, the CSE department.

Table 6 - Project Requirements Satisfaction

SSRD Requirement	Satisfaction Description
R18 – No Expense	This requirement is satisfied by using CSE facilities, tools, and hardware, and by using CS577b students to develop the Initial Operating Capability.
R38 – Implementation Time	The implementation time required for the core capabilities is achieved by the schedule as set forth in LCP 2 and the staffing plan as set forth in LCP 3.
R55 – Test Lab	Satisfied by CSE providing the needed test platforms, hardware, and tools or by downloading the needed tools and standards from the Internet.
R65 – Test PCs	
R39 – Currently Available Tools	
R63 – Tomcat Software	
R64 – Database Software	
R100 – Development Language	
R101 – Java Coding Standard	
R56 – Deployment Platform	
R66 – User Guide Deployment	The development schedule, LCP 2, sets aside time for the generation of applicable support documentation and
R58 – Installation Guide	

SSRD Requirement	Satisfaction Description
R57 – Administrator Training	training for the system.
R44 – Administrator Staffing	Satisfied by CSE providing the needed test platforms, hardware, and tools.
R40 – Platform Support	

2.2.3 Capability Requirements Satisfaction

The requirements from SSRD 3.2 are satisfied in the SSAD as defined in the tables that follow. Risks that are specific to a particular requirement are detailed in the tables. For readability, risks that could affect the feasibility of the system and project as a whole are not included in the tables. Please refer to FRD 4 for more information on project risks.

R03 – Risk Data

Criticality	High – Risk data storage and management is one of the main purposes of the system.
Technical Issues	Since some of the data associated with a risk is in the form of text, a limit will need to be put on the amount of text that can go into these fields. It might be useful to add the ability to put in a web link to a larger description.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	If the risk data specified in this requirement is not available, the system serves no purpose and all other requirements are directly affected.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-02, SSAD 2.2 UC-8, SSAD 2.2 UC-9, SSAD 2.2 UC-10, SSAD 2.2 UC-12

R42 – Risk Report

Criticality	Medium – This will give the user the ability to see the data that is associated with a risk once it has been entered into the system.
Technical Issues	None identified at this time.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R03 – The data needs to be in the system in order for it to be displayed. If it cannot be displayed, the system is much more difficult to use and serves no other purpose except to store data.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-17

R04 – Distributed Viewing

Criticality	High – This will make the tool useable for CS577a/b students and researchers in the future so that they can view the risk data remotely.
Technical Issues	When the system goes distributed and allows for users over the Internet, simultaneity, firewalls, security, and general network topology become a concern. Extensive testing will need to be done to ensure proper operation of the system with respect to these technical issues.

R04 – Distributed Viewing

Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R59, R60, and R61 – Without a machine that has a connection to the Internet and the ability to run a web server, this requirement cannot be realized. R62, R63 – The choice of an object-oriented architecture using Java facilitates the need for these two pieces of software in order to realize this requirement. R42, R13, R16, and R19 – These are the reports that need to be viewable by this requirement.
Risks	Medium – Possible lack of understanding of Internet development languages on the part of the development team make this risky to implement.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.1 COM-03, SSAD 2.2 UC-16, SSAD 2.2 UC-17

R05 – Rating Scales

Criticality	Medium – This will make the risk P(UO), L(UO), and RE more standard across projects using the system and help with validation testing.
Technical Issues	The rating scale was arbitrarily chosen for test purposes but there are no technical issues with this requirement at this time.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R07 – Rating scales are needed in order to build an initial voting interface. If the voting interface is no longer needed, this requirement is obsolete.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-02, SSAD 2.2 UC-14

R07 – Voting Interface

Criticality	High – The ability to rank/vote on a risk with respect to its P(UO) and L(UO) is one of the main purposes of building the system.
Technical Issues	The voting interface needs to save the data for a user's vote into the database and be able associate the vote with the current assessment period. A valid vote should have both a P(UO) and L(UO) specified.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R23 – In order to achieve distributed voting, an interface is needed. If the distributed voting requirement is no longer needed, this requirement is obsolete. R05, R43, and R08 – These requirements exist to support the voting process and what is needed in order to relate votes to an overall RE for a risk.
Risks	High – The voting interface just like R30 is a little IKIWISI and may not meet the needs of all of the teams and how they perform their risk manager duties.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-8, SSAD 2.2 UC-9, SSAD 2.2 UC-10, SSAD 2.2 UC-14

R43 – Collect Votes

Criticality	High – The ability to allow multiple users rank/vote on a risk with respect to its P(UO) and L(UO) is one of the main reasons the system is being built. It will allow each stakeholder in a project to assess a project's risk individually.
Technical Issues	If the votes cast are not valid or are missing information the vote collection may yield data that is unexpected. For simplicity, the design uses fixed risk assessment periods as defined at the beginning of a project and thus vote collection and averaging is done at fixed intervals during a project.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R07 – This requirement assumes that there is a voting interface that will allow for collection. If there is no voting interface, the data cannot be collected. R08 – The purpose of collecting the data is to average it and eventually use the averaged data to relate the votes to the risk.
Risks	Medium – When the system goes distributed this may prove to require a lot of testing to make sure that the collection of votes works well.
SSAD Traceability	SSAD 2.1 COM-02, SSAD 2.2 UC-13, SSAD 2.2 UC-14

R08 – Average Votes

Criticality	High – Relating the votes collected via R43, "Collect Votes", to the risk and its overall risk priority with respect to the project is key to the system because votes need to be related to a risk in a simple form.
Technical Issues	The average is done over only those votes that are cast for the given assessment period and does not take into account stakeholders/users who have not cast votes. For simplicity, the design uses fixed risk assessment periods as defined at the beginning of a project and thus vote collection and averaging is done at fixed intervals during a project.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R07 – In order to average votes, a collection of the initial P(UO) and L(UO) needs to be done.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-02, SSAD 2.2 UC-13

R33 – Calculate Risk Exposure

Criticality	High – Calculating overall risk exposure for a risk provides a simple form of relating individual ranks/votes to a risk. For simplicity, the design uses fixed risk assessment periods as defined at the beginning of a project and thus vote collection and averaging is done at fixed intervals during a project.
Technical Issues	None identified at this time.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R33 – The RE value for a risk is calculated based on the average votes, P(UO) and L(UO) collected for the risk.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-02, SSAD 2.2 UC-13

R11 – Display Risk Exposure

Criticality	High – Displaying the RE on a report will allow a user to view a collection of RE values and risks and make comparisons between them.
Technical Issues	None identified at this time.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R12, R13, R16, and R19 – These reports need to display the RE value for a risk as defined by the requirement.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-17

R12 – RE Sorted

Criticality	High – Sorting risks in reports will further help users understand the ranking of risks for a project.
Technical Issues	As more risks are added to a project, the sorting algorithm chosen may degrade in performance and a new algorithm may need to be used.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R12, R13, R16, and R19 – Risks in these reports need to be displayed in the order as defined by this requirement.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-17

R13 – Complete Risk Report

Criticality	Medium – Generating a complete risk list of all risks for a project will provide a way to view all risks for a project together.
Technical Issues	If too many risks are in a project database, the GUI that displays the risks and the load time for the web page may increase. To minimize this for larger project the top-n risk list, R19, will be implemented during the evolutionary phase of development.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	None identified at this time.
Risks	Medium – This is an IKIWISI requirement with respect to how the data is displayed in the report. The risk falls under the R30 requirement.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-17

R14 – Risk History

Criticality	Medium – The capability to store the history for a risk over a project life cycle will allow for future analysis on the risk data by researchers.
Technical Issues	None identified at this time.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.

R14 – Risk History

Side Effects & Dependencies	R16 – The reason the data is being collected is to provide the data needed to satisfy this requirement. If the need to display the risk history becomes obsolete, this requirement may become invalid.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-02, SSAD 2.2 UC-16

R16 – History Report

Criticality	Medium – The ability to view the history of a risk's RE with respect to time will allow users to see the project progress with respect to project risk management.
Technical Issues	As the number of assessment periods increases, the load time for the web page will increase. If all assessment period results are displayed the current display design could be more difficult to read.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R14 – In order to display the history of a risk, the history data must exist in the system.
Risks	Medium – This is an IKIWISI requirement with respect to how the data is displayed. With the technical issues as described, the IKIWISI-ness of the requirement gets worse.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-16

2.2.4 Interface Requirements Satisfaction

The system interface requirements are met by the design as described in the SSAD, LCP, and by the CSE department. The following tables detail how each of the interface requirements are met by the SSAD, LCP, or the customer, the CSE department. Risks that are specific to a particular requirement are detailed in the tables. For readability, risks that could affect the feasibility of the system and project as a whole are not included in the tables. Please refer to FRD 4 for more information on project risks.

R17 – CSV Output

Criticality	High – In order to provide data to researchers for further processing it is necessary to be able to extract the data from the database in a common format.
Technical Issues	Generating this file from the database could take more time as more risk data is collected for a project because of the number of transactions that have to be made to the database.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool and prototyping this capability during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Side Effects & Dependencies	R03 – If there is no data in the system, there will be no data to output to a CSV file.
Risks	High
References	SSAD 2.1 COM-01, SSAD 2.1 COM-02, SSAD 2.2 UC-15

R30 – User Interface

Criticality	High – The user interface allows the user to modify all data in the system.
Technical Issues	None identified at this time.

R30 – User Interface

Cost and Schedule	The cost associated with meeting this requirement is proportional to the amount of time spent with the customer reviewing the GUI prototype and incorporating suggestions.
Side Effects & Dependencies	Since this is a distributed tool with a GUI, all requirements in the system. If the user is not satisfied with the GUI, the system will not be used.
Risks	High – This is an IKIWISI requirement so user feedback may differ. The risk mitigation plan for this requirement will handle this.
References	SSAD 2.1 COM-01, SSAD 2.1 COM-04

R102 – User Interface Color Scheme

Criticality	Medium – Needed to decide on this in order to start GUI screen development.
Technical Issues	None identified at this time.
Cost and Schedule	The cost and schedule associated with this item is only what is needed to develop the style sheet to be used for the GUI.
Side Effects & Dependencies	If the style sheet is not completed the GUI cannot be developed.
Risks	Medium – This is an IKIWISI requirement so user feedback may differ. The risk mitigation plan for this requirement will handle this.
References	SSAD 2.1 COM-01, SSAD 2.1 COM-04

R59 – Hardware Support

Criticality	High – To achieve the distributed aspect of the system a connection to the Internet is needed.
Technical Issues	None identified at this time.
Cost and Schedule	None. The CSE department will satisfy this requirement.
Side Effects	R04, R23 – Without a connection to the Internet, the system cannot be made truly distributed.
Risks	None identified at this time.
References	SSAD 2.1 COM-03

R60 – Server

Criticality	High – A web server needs to be running on the supplied workstation provided in order to achieve the distributed aspect of the system.
Technical Issues	None identified at this time.
Cost and Schedule	None. The CSE department will satisfy this requirement.
Side Effects & Dependencies	R04, R23 – Without the ability to service requests from the Internet, the system cannot be made truly distributed.
Risks	None identified at this time.
References	SSAD 2.1 COM-03

R61 – Operating System

Criticality	High – The workstation supplied needs to be able to run the Apache web server that is run on UNIX.
Technical Issues	None identified at this time.
Cost and Schedule	None. The CSE department will satisfy this requirement.
Side Effects & Dependencies	R04, R23 – Without the ability to run Apache, the system cannot support Tomcat and will not be distributed.
Risks	None identified at this time.
References	SSAD 2.1 COM-03

R62 – Server Software

Criticality	High – In order to develop the distributed aspect of the system Apache is needed.
Technical Issues	None identified at this time.
Cost and Schedule	The CSE department will satisfy this requirement and the development team will install and learn Apache as needed during the RLCA and first construction phases.
Side Effects & Dependencies	R04, R23 – Without the ability to service requests from the Internet, the system cannot be made truly distributed.
Risks	None identified at this time.
References	SSAD 2.1 COM-03

2.2.5 Level of Service Requirements Satisfaction

The level of service requirements as specified in the SSRD will be satisfied as detailed in the following tables. Risks that are specific to a particular requirement are detailed in the tables. For readability, risks that could affect the feasibility of the system and project as a whole are not included in the tables. Please refer to FRD 4 for more information on project risks.

R35 – Reliability

Criticality	High – An unreliable system will deter usage.
Technical Issues	Since the system is web-based, very little can be done about network outages that could occur outside of the system and server that the system resides on. The team developed code and interfaces are the only things that the team has control over so the reliability of the system will be tested deduced based on these.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2.
Risks	None identified at this time.
References	SSAD 2.1 COM-03

R36 – Risk Exposure Calculation Accuracy

Criticality	Medium – An inaccurate system will deter usage.
Technical Issues	The risk exposure calculated for a risk is only as good as the data that is input in for the P(UO) and L(UO) values.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Risks	None identified at this time.
References	SSAD 2.1 COM-03

R37 – Risk Value Display Accuracy

Criticality	Medium – An inaccurate system will deter usage.
Technical Issues	The accuracy of the data displayed from the database is only as good as the data entered into the database.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Risks	None identified at this time.
References	SSAD 2.1 COM-01

R09 – User's Guide

Criticality	Medium – A system that is difficult to understand and learn about will not be used.
Technical Issues	None identified at this time.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Risks	None identified at this time.
References	SSAD 2.1 COM-01

R31 – Number of Users

Criticality	Medium – A system that does not support a reasonable number of users will prevent larger projects from using the tool.
Technical Issues	This number is on a per project basis and is a minimum. For scalability reasons the design of the system has accounted for the inclusion of more users.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Risks	None identified at this time.
References	SSAD 2.1 COM-02, SSAD 2.2 UC-1, SSAD 2.2 UC-3, SSAD 2.2 UC-4, SSAD 2.2 UC-5, SSAD 2.2 UC-6, SSAD 2.2 UC-7

R32 – Amount of Data

Criticality	High – A system that does not support enough data for CS577a/b students and medium-sized projects will not be used.
Technical Issues	This number is on a per project basis and is a minimum. For scalability reasons the design of the system has accounted for the inclusion of more risks.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.
Risks	None identified at this time.
References	SSAD 2.1 COM-02, SSAD 2.2 UC-8, SSAD 2.2 UC-9, SSAD 2.2 UC-10

R41 – Maximum Time Steps

Criticality	Medium – A system that does not support enough assessment periods for a CS577a/b project or medium-sized project will not be used.
Technical Issues	This number is on a per project basis and is a minimum. As this number grows, the size of the database will grow at a much faster rate than for requirements R31 and R32. For scalability reasons the design of the system has accounted for the inclusion of more time steps. However, for simplicity, the design uses fixed risk assessment periods as defined at the beginning of a project and thus vote collection and averaging is done at fixed intervals during a project. The assessment period intervals as defined at the beginning of a project and this requirement directly affect the minimum length that a project can be.
Cost and Schedule	There is no monetary cost is associated with this requirement. The only cost is in the hours spent developing the tool during the construction phase of the project as detailed in LCP 2. This requirement will be completed according to the production stage detail in LCP 2.2.2.

R41 – Maximum Time Steps

Risks	None identified at this time.
References	SSAD 2.1 COM-02

2.2.6 Evolution Requirements Satisfaction

The evolutionary requirements as specified in the SSRD will be satisfied by the SSAD as detailed in the following tables. Risks that are specific to a particular requirement are detailed in the tables. For readability, risks that could affect the feasibility of the system and project as a whole are not included in the tables. Please refer to FRD 4 for more information on project risks. Cost and schedule for adding each of these evolutionary requirements is dependent on when and who will implement them. Risks associated with each of these requirements do not directly affect the initial operating capability of the system. However, they are dependent on the delivery of the initial operating capability. Detailed risk information has been included to help future management and development teams identify the risks early in their spiral cycles.

R19 – Top-N Report

Criticality	Medium – Generating a smaller list of risks as defined by the user will allow a user to concentrate on more important risks.
Technical Issues	If "n" is greater than the number of risks in the database for a given project, only the number of risks in the database will be displayed.
Side Effects & Dependencies	None identified at this time.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-17

R23 – Distributed Voting

Criticality	High – The ability for stakeholders/user to vote on risks from different machines will help to make sure all stakeholders comments are accounted for.
Technical Issues	When the system goes distributed and allows for users over the Internet, simultaneity, firewalls, security, and general network topology become a concern. Extensive testing will need to be done to ensure proper operation of the system with respect to these technical issues.
Side Effects & Dependencies	This is a major capability of the system and thus affects all of the other requirements.
Risks	High – This part of the system, since it will test each component from the user interface down to the persistence layer, is high risk because of its dependency on the initial operating capability and software tools chosen to build the system.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.1 COM-03, SSAD 2.2 UC-8, SSAD 2.2 UC-9, SSAD 2.2 UC-10, SSAD 2.2 UC-14

R24 – User Privileges

Criticality	Medium – Having a distributed system that allows for user input and modification to the project data could mean unauthorized users could corrupt data. User privileges will help to prevent this.
Technical Issues	The selection of the authentication algorithm and use of SSL to provide secure transactions will need to be weighed and analyzed before starting on the implementation for this requirement.
Side Effects & Dependencies	R23 – User privileges will be used to authenticate users on the same project so that mistakes can be avoided when entering votes. R27 – In order to avoid unauthorized users from modifying data in a different project user privileges are needed.

R24 – User Privileges

Risks	High – Due to the technical issues identified above, this requirement is seen as high risk because of the need to get agreement with the customer and stakeholders on the authentication algorithm that is acceptable.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.1 COM-03, SSAD 2.1 COM-04, SSAD 2.2 UC-1, SSAD 2.2 UC-2

R27 – Multiple Project Support

Criticality	Medium – Supporting multiple projects will allow researchers to access project data from multiple projects more quickly.
Technical Issues	Adding multiple project support to the infrastructure and database complicates the data architecture and will require a reliable infrastructure so as to reduce down time.
Side Effects & Dependencies	R24 – In order to avoid unauthorized users from modifying the wrong project, user privileges will be needed.
Risks	None identified at this time.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.1 COM-02, SSAD 2.1 COM-04, SSAD 2.2 UC-3, SSAD 2.2 UC-4

R49 – Risk Appearance Tracking

Criticality	Low – The ability to see how often a risk appears on a top-n risk list will allow users to develop mitigation plans for risks.
Technical Issues	The "n" for this requirement is decided at the start of the project for ease of use and avoiding recalculation of the values if each user could enter in their own "n".
Side Effects & Dependencies	R13, R19 – The format and display of these reports is directly affected by this requirement.
Risks	Medium – This requirement will involve a lot of computation and analysis of time periods on existing risk data in the system. If it is not done right, the data could be wrong or inconsistent project to project. It may also be difficult to explain to a user.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.2 UC-17

R47 – CSV Input

Criticality	Medium – This give the tool the ability to import risk data from previous projects that existed before this system existed.
Technical Issues	The format of the data being imported will need to conform to a standard format that the tool reads. If the data is not formatted according to the standard, it will not be imported. The design for this requirement describes the import process and any error checking that is done in order to ensure that data is properly imported. When importing data into a project all data previous used for the project will be lost.
Side Effects & Dependencies	When importing data into a project all previously recorded data for that project will be lost.
Risks	High – Due to the damage that it could cause when importing data into an existing project and the need the delete large amounts of data from the database without corrupting it, this requirement is deemed high risk.
SSAD Traceability	SSAD 2.1 COM-01, SSAD 2.1 COM-02, SSAD 2.2 UC-11

2.3 Stakeholder Concurrence

Stakeholder concurrence has been documented in the Easy WinWin Negotiation Results document. Win conditions were identified during the process and prioritized as follows:

- Low Hanging Fruits (LHF)
- Important with Hurdles (IWH)
- Maybe Later (MLR)
- Forget Them (FGT)

Those win conditions that were identified as having client/developer conflicts, were analyzed and agreements reached so that they could be implemented. See the Easy WinWin Negotiation Results document for details : http://www-scf.usc.edu/~csci577/teams/team15a/LCA/EWW_LCA_F01a_T15.doc.

3 Process Rationale

The following sections provide an analysis of the system priorities and process, as provided in the OCD, SSRD, SSAD, and LCP, in order to rationalize the ability of the system to meet the stakeholder's win conditions with respect to cost and schedule.

3.1 System Priorities

The Organizational Goals for the USC-CSE department are to research and develop practical software technologies that will aid its 577a/b graduate students and USC-CSE Affiliates in the development of various software projects. For more specific goals, please refer to OCD 3.2. The proposed system, after development is completed per the LCP, will provide the USC-CSE department a tool that will store and track project risk data during the project life cycle for CS577a/b classes.

The requirements for the proposed system have been prioritized into three (3) categories in the SSRD: high, medium, and low. Requirements that are categorized as high and medium are the core requirements of the system as described in the OCD. The development team will make every effort to deliver the low priority requirements if schedule permits. For more details, please refer to SSRD 3.2 and LCP 2.

3.2 Process Match to System Priorities

3.2.1 Ability to Meet Milestones

The engineering stage for the system has been split into three spiral cycles/phases: Inception (LCO), Elaboration 1 (LCA), and Elaboration 2 (RLCA). The Inception Phase was used to get a general idea of what the system was meant to accomplish, provide a concept of operations to make all stakeholders winners, and decide on at least one feasible architecture for the system. Elaboration Phase 1 was used to develop the feasible architecture discussed and presented in the previous phase, Inception. Each phase was concluded with an architecture review board meeting, ARB, with all stakeholders and the professors from the class present. The class schedule was the driver used to meet the first two phase milestones. The last spiral cycle in the engineering stage, Elaboration 2 (RLCA), will be completed in the next semester and is a short cycle to capture any changes that might have occurred during the break between semesters.

The production stage for the system has been split into three spiral cycles: Construction Cycle 1, Construction Cycle 2, and Transition. The higher priority requirements that are the core of the system will be met in Construction Cycle 1. Construction Cycle 2 has been reserved for requirements that are additions onto the core capabilities. Please refer to LCP 2.2.2 for further details. The Transition Cycle is a short cycle to rollout the initial operating capability completed in the construction cycles. Construction Cycle 1 has been allocated more time for completion due to the number of core capabilities that need to be met and to ensure that the schedule milestones can be met.

The risk mitigation plans and LCP also detail the need to prototype and become familiar with new tools at the beginning of the RLCA phase which will help ensure the ability to meet the construction milestones.

3.2.2 Choice of Process Model

The process model that has been used for the engineering phase and will be used for the production phase of the system is a Win-Win Spiral model. Since the system is new to the stakeholders and is intended to be used by USC-CSE affiliates in the future, the system may undergo change as new stakeholders are introduced. Since the Win-Win Spiral uses a risk-driven approach to design and development, it is ideal for this project because of the high probability of changing requirements.

3.2.3 Spiral Cycles & Anchor Points

As stated in 3.2.1, two spiral cycles have been completed so far and there are four spirals left to complete. The anchor points associated with each cycle are detailed in Table 6 .

Table 6 - Spiral Cycles and Anchor Points

Spiral Cycle/Phase	Anchor Point
Inception Phase (Completed)	Life Cycle Objectives (LCO) ARB
Elaboration Phase (Completed)	Life Cycle Architecture (LCA) ARB
Re-baselining Phase	Re-baselined Life Cycle Architecture (RLCA) ARB
Construction Phase 1	Core Capabilities Complete
Construction Phase 2	Transition Readiness Review (TRR) Initial Operating Capability (IOC)
Transition Phase	Release Readiness Review (RRR)

3.3 Consistency of Priorities, Process and Resources

The initial operating capability for this project is achievable within the budget and schedule as defined in the LCP. As stated in the LCP, COCOMO 2000 was used to do the effort analysis for the project and based on this post-architecture analysis, the most likely effort needed for project development is 8.5 person-months with a pessimistic estimate of 10.6 person-months. Using the team size estimating formula on the CS577a class website, a 5-person team is most likely needed in order to complete the initial operating capability on time. See the following web page for more information on the formula: http://sunset.usc.edu/classes/cs577a_2001/announce/COCOMOII-Estimates.html .

As discussed in Section 2 and 4 of this document there are risks and technical issues associated with a few of the requirements from the SSRD. Depending on the risk or technical issue it may be necessary to re-negotiate requirements but, most likely, lower priority requirements will need to be moved to a later evolutionary spiral or re-negotiated before the beginning of the second construction cycle. As shown in LCP Section 2, the two construction phases have been broken up in order to deliver the core capabilities in the first construction phase and less important capabilities in the second construction phase. The requirements to be implemented in the first construction phase are not dependent on the requirements to be implemented in the second construction phase.

LCP Section 2 also shows that no more than four (4) tasks are occurring simultaneously during the CS577b semester so as to make sure that the team does not get stretched too thin during the semester. This will also assure the quality of the deliverables allowing each member to have a shadow programmer or tester that understands that persons responsibilities. More details on the work breakdown structure for the two construction phases will be supplied in the Iteration Plans I and II.

4 Project Risk Assessment

This section describes the major risks associated with this project.

Risk 2 – Web Server Security	
Description	Web server being hacked into and losing the project source code.
Risk Exposure	Probability – Medium Potential Loss – High Adversely affects development and on-time delivery of the system.
Risk Reduction Leverage	The team is using complex passwords and all necessary security patches have been applied to the web server.
Actions to Mitigate Risk	Convince someone in the CSE department to buy a D-Link 704 external firewall.
Contingency Plan	Install firewall software on the web server.

Risk 2 – Maintainer's Knowledge Base	
Description	Maintainer's knowledge base is not completely understood in order to make sure that the maintainer can actually maintain the system.
Risk Exposure	Probability – Medium Potential Loss – High Adversely affects usability, maintainability, and on-time delivery of the system.
Risk Reduction Leverage	The architecture relies on programming languages and COTS products that are standards in the community.
Actions to Mitigate Risk	Make sure that the maintainer has knowledge about the languages and products we are using. Wherever there may be a deficiency, provide the maintainer with sufficient information to get the appropriate training.
Contingency Plan	Re-negotiate requirements and architecture with customer.

Risk 3 – Testing Time	
Description	Not have enough resources or time to thoroughly test the system as the team would like.
Risk Exposure	Probability – Medium Potential Loss – Medium Adversely affects usability, quality, and on-time delivery of the system.
Risk Reduction Leverage	During initial planning, testing time was taken into account when choosing those requirements which would be implemented during construction phases 1 and 2. Therefore, the set of requirements that were chosen for implementation during construction phases 1 and 2 allow for enough "risk driven" testing.
Actions to Mitigate Risk	Further breakdown the test cases so that all tests are identified and make sure that, at least, the high risk tests are performed.
Contingency Plan	Re-negotiate requirements with customer.

Risk 4 – Training Participants	
Description	We have not yet identified all of the individuals that we may need to train on the system since the identification of our new client.
Risk Exposure	Probability – Medium Potential Loss – Medium Adversely affects usability, maintainability, and on-time delivery of the system
Risk Reduction Leverage	The team has been keeping a detailed log of how to install tools on the system. This log will be made available at IOC along with a basic user's guide for the system.
Actions to Mitigate Risk	Work with client to identify a time toward the end of the semester to hold a brief 1-2 hour training session to go over the user's guide and development log.
Contingency Plan	Re-negotiate requirements with customer.

Risk 5 – CS577a Deployment Plan	
Description	No deployment plan for CS577a users yet because the system will not be ready for full up use by CS577a users until after the evolutionary capabilities are completed.
Risk Exposure	Probability – Medium Potential Loss – Low Adversely affects maintainability, usability, and on-time delivery of the system.
Risk Reduction Leverage	Since LCO, it was identified that the system at the end of CS577b was not going to be adequate to support CS577a students.
Actions to Mitigate Risk	Work with customer to identify the major issues involved in deploying the system for CS577a students next fall and develop a supplementary plan that will be delivered with the system at IOC. This WILL NOT be in addition to the normal Transition Plan supplied with the system at IOC.
Contingency Plan	Re-negotiate scope of project with client and other stakeholders.

Risk 6 – Lack of Performance Requirements	
Description	No major performance requirements were ever identified. This means that the only stress testing of the system that will be done will be by the developers and what they see as risky not to test.
Risk Exposure	Probability – Medium Potential Loss – Low Adversely affects quality, and on-time delivery of the system
Risk Reduction Leverage	Minor performance and level of service requirements were identified at LCO and LCA in order to make the system minimally usable.
Actions to Mitigate Risk	Make sure the client understands that we will not be stress testing the system over and above what the developers think is necessary because no requirements were levied on us. Stress test the system on a "risk-driven" basis.
Contingency Plan	Re-negotiate requirements with customer.

Risk 7 – Lack of Understanding of Documentation Process	
Description	Lack of understanding of documentation process with respect to what is expected in Win-Win spiral anchor point packages because the documentation is risk driven.
Risk Exposure	Probability – Low Potential Loss – Low Adversely affects documentation of the system.
Risk Reduction Leverage	MBASE Guidelines have been provided and are kept up-to-date.
Actions to Mitigate Risk	Understand documents early using examples from previous projects.
Contingency Plan	Put into the documents only what is necessary and of high risk. Leave out unneeded sections.

Risk 8 – IKIWISI GUI Requirement (R30)	
Description	(R30) The GUI design requirement is an IKIWISI requirement.
Risk Exposure	Probability – Low Potential Loss – Medium Adversely affects usability of the system.
Risk Reduction Leverage	Involved users early in the process so that the LCA prototype reflects inputs from the user.
Actions to Mitigate Risk	Involve client early in development cycle and keep him informed of how development is progressing, giving him access to the system as needed.
Contingency Plan	Apply Modified Golden Rule and try to figure out what the user might need.

Risk 9 – Web Server Memory	
Description	The web server provided for development has little memory and this may adversely affect the testing and development of the system.
Risk Exposure	Probability – Low Potential Loss – Low Adversely affects quality of the system and on-time delivery.
Risk Reduction Leverage	The software packages the team has chosen to do the development with use little memory and there will be only 6 users allowed on the machine.
Actions to Mitigate Risk	The machine's memory will be upgraded this semester.
Contingency Plan	Re-negotiate scope and schedule with the customer.

Risk 10 – Requirements Creep with Respect to Collaborative and Distributed Parts of the System	
Description	As the project moves through more iterations of the Win-Win spiral model it is possible that developers will come up with new ideas for the system and clients come up with new requirements.
Risk Exposure	Probability – Low Potential Loss – Low Adversely affects quality of the system and on-time delivery.
Risk Reduction Leverage	All stakeholders have been involved in Easy WinWin negotiations and client meetings. Modified Golden Rule has been applied where applicable.
Actions to Mitigate Risk	During development keep the client informed of the progress.
Contingency Plan	Re-negotiate scope and schedule with the customer.

Risk 11 – Use of Database	
Description	Use of database for persistence layer may be a poor choice and too complicated for development in 10 weeks.
Risk Exposure	Probability – Low Potential Loss – High Adversely affects reliability and on-time delivery of the system.
Risk Reduction Leverage	The system has been designed so that the persistence layer can be changed with little or no impact to the development schedule and architecture.
Actions to Mitigate Risk	Keep tabs on the development of this layer of the architecture. If development is not proceeding as planned, regroup and do a little re-architecting.
Contingency Plan	Revisit architecture and assess breakage when a file system interface is used instead. Re-negotiate scope of project with customer if needed.

5 Analysis Results

5.1 Product Features

5.1.1 Advantages

The new system will replace a system that involves using spreadsheets and documents to convey risk management information. It will improve readability, accuracy, and data tracking capabilities for risk management data and thus reduce long-term project costs, prevent or strongly reduce project problems, and reduce rework. The system's planned use is as a web-based tool that provides distributed viewing of risk data and non-distributed collaborative risk assessment.

5.1.2 Limitations

The initial system will not provide a robust distributed collaborative risk assessment system with the ability to secure risk data on a project and per user/stakeholder basis.

5.1.3 Tradeoffs Considered

The following tradeoffs were considered during the design analysis of the system.

Table 7 - Design Tradeoffs

Tradeoff	Pros	Cons
System should be made standalone.	Easier to maintain and develop because maintainer and developer do not have to worry about the networking portion of the tool.	Not extendable. Could mean major design rework to make it distributed and truly collaborative.
Use of flat-file system for the persistent data layer.	Data can be readily modified and the need for a separate export function could be eliminated if the data was stored in a CSV file.	Not extendable for larger projects and/or projects that run for a long time. Performance suffers.
Use a database system for the persistent data layer.	Can represent data by using relational database scheme. No need to keep data one-dimensional.	Overkill for a single CS577a/b project. Harder to debug GUI and work in parallel with low-level routines that provide data.
Use Microsoft Excel as the system.	Already has a spreadsheet capability and graphing capability.	Not distributed so that multiple users can access the spreadsheet and vote on risks. Not scalable for larger number of projects.

Tradeoff	Pros	Cons
Use a floppy disk to achieve distributed capability by passing the floppy disk around to team members.	Don't have to worry about the Internet and security in the future.	Not scalable. Process problems with people in different locations.

5.1.4 Changes Considered but Not Included

None identified at this time.

5.2 Commercial-Off-The-Shelf Solutions

The following Commercial-Off-The-Shelf products will be supported by the system:

- Microsoft Internet Explorer (v5.5)
- Tomcat (v4.0)
- Apache (v1.3)
- MySQL (v3.23)

Appendix

None