

System and Software Architecture Description (SSAD)

USC CONIPMO

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Version History

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1. Introduction

This document introduces and describes the details of system and software architecture for the project “USC COCOMO”.

1.1 Purpose of the SSAD Document

This document is the SSAD (Software and System Architecture Definition) for the USC CONIPMO project developed by Team 16. The SSAD transforms the requirements identified by the client and the project team in the SSRD (System and Software Requirements Definition) into the system architecture and implementation design. Its purpose is to document the results of analyzing the organizational concept of operation for the system, designing the architecture and implementation. This SSAD document will serve as a tool to ensure that the architecture of the system is accurately captured by the project team, and that the client & developers both have a common view of the system to be developed. This is the LCO version of the document, and it will be constantly reviewed and updated to be given as a part of the LCA package.

The SSAD will serve as reference for the developers of the system to understand the design details for the implementation during the construction phase of the project. The client can use the document to understand the approach followed by the project team to create the final product.

1.2 Standards and Conventions

We have used Unified Modeling Language [UML Version 2.0] for any UML diagrams in all the documentation. The standards and conventions currently used are the LeanMBASE Guidelines Version 1.7 for the documentation. We have also used Rational Software Architect for the UML Diagrams.

1.3 References

- LeanMBASE Guidelines version 1.7
http://greenbay.usc.edu/csci577/fall2006/site/guidelines/LeanMBASE_Guidelines_V1.7.pdf

- LeanMBASE Version 1.0 Templates for SSAD
https://www.uscdcn.net/webapps/portal/frameset.jsp?tab=courses&url=/bin/common/course.pl?course_id=2288_1/LeanMBASE_v1.0_templates_for_SSAD.doc

- USC CONIPMO Prototype Document V 1.1 (For Screenshots)
http://greenbay.usc.edu/csci577/fall2006/projects/team16/LCO/PROTOTYPE/Initial_prototype_1.doc

- Additional SSAD Guidelines
http://greenbay.usc.edu/csci577/fall2006/site/guidelines/LeanMBASE_Additional_SSAD_Guideline_v1.4.pdf

- SSRD
http://greenbay.usc.edu/csci577/fall2006/projects/team16/LCA/SSRD_LCA_F06a_T16_V1.4.doc

- OCD
http://greenbay.usc.edu/csci577/fall2006/projects/team16/LCA/OCD_LCA_F06a_T16_V2.8.doc

2. System Analysis

This section describes the architectural model for the proposed system. This section identifies the actors and artifacts associated with the system and the interrelation between those. This section also provides the insight into behavior of the system to satisfy the requirements specified in SSRD.

2.1 Structure

The primary function of the proposed system “USC CONIPMO” is to provide the network security cost estimation using the methodology of CONIPMO cost estimation model through a Visual Basic front end tool, with the back end as XML. The US Army, US Navy & Lockheed Martin Corporation are providing us with calibration data, and are also acting as users for the system. The final system will be primarily used by Network Security Analysts, Cost Analysts, & Network Administrators.

The USC CONIPMO tool is going to be operated primarily to calculate network cost estimation, usually after calibrating the CONIPMO constants by loading previous project file, and calculating the constants based on the difference between the actual & estimated cost. There is also another mode of operation, in which the user can perform maintenance on the CONIPMO tool. **This mode will be elaborated in detail in the LCA phase.** The system architecture at present can be better understood by observing the conceptual class diagram given below:

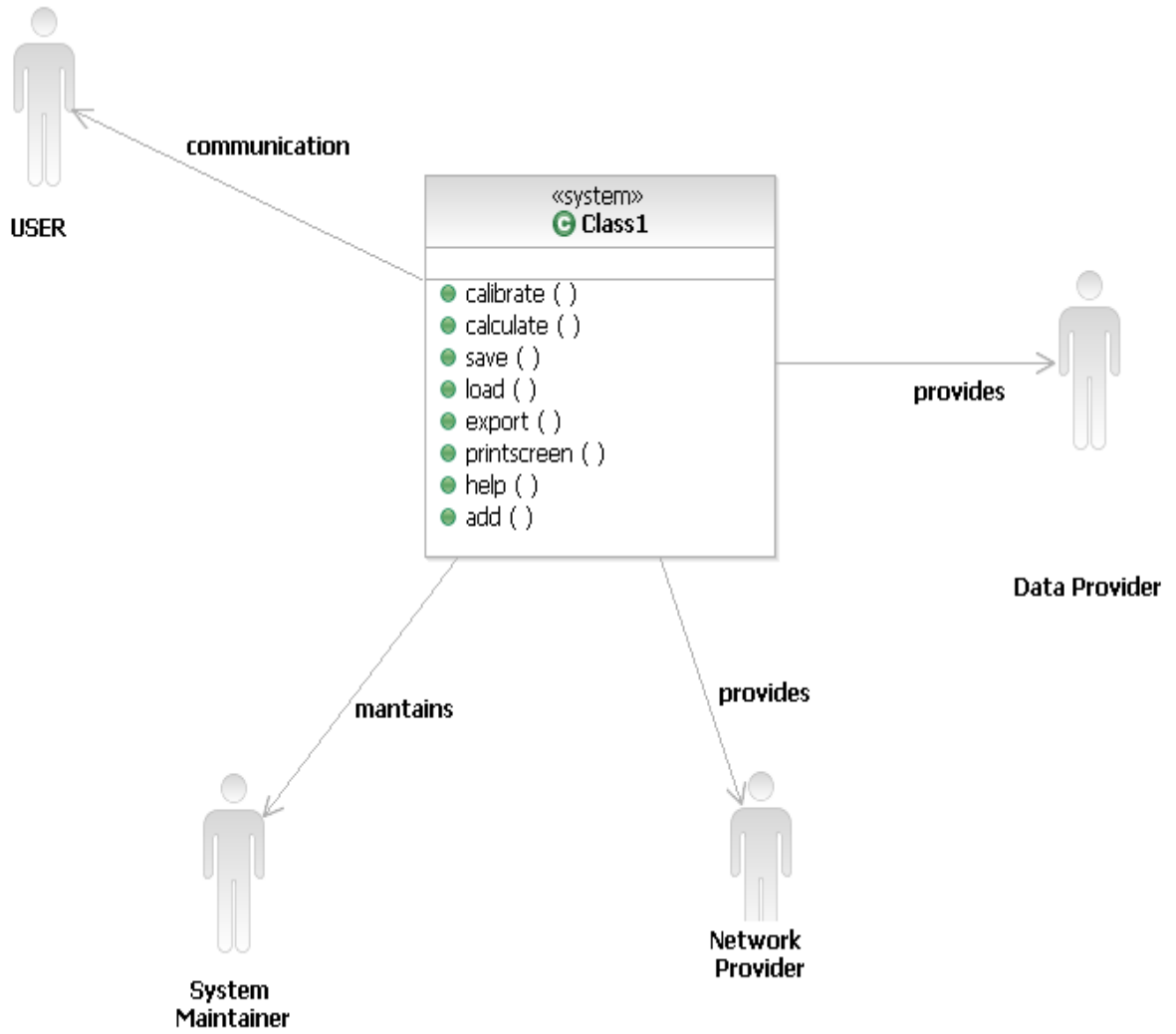


Figure 1: - Information Model

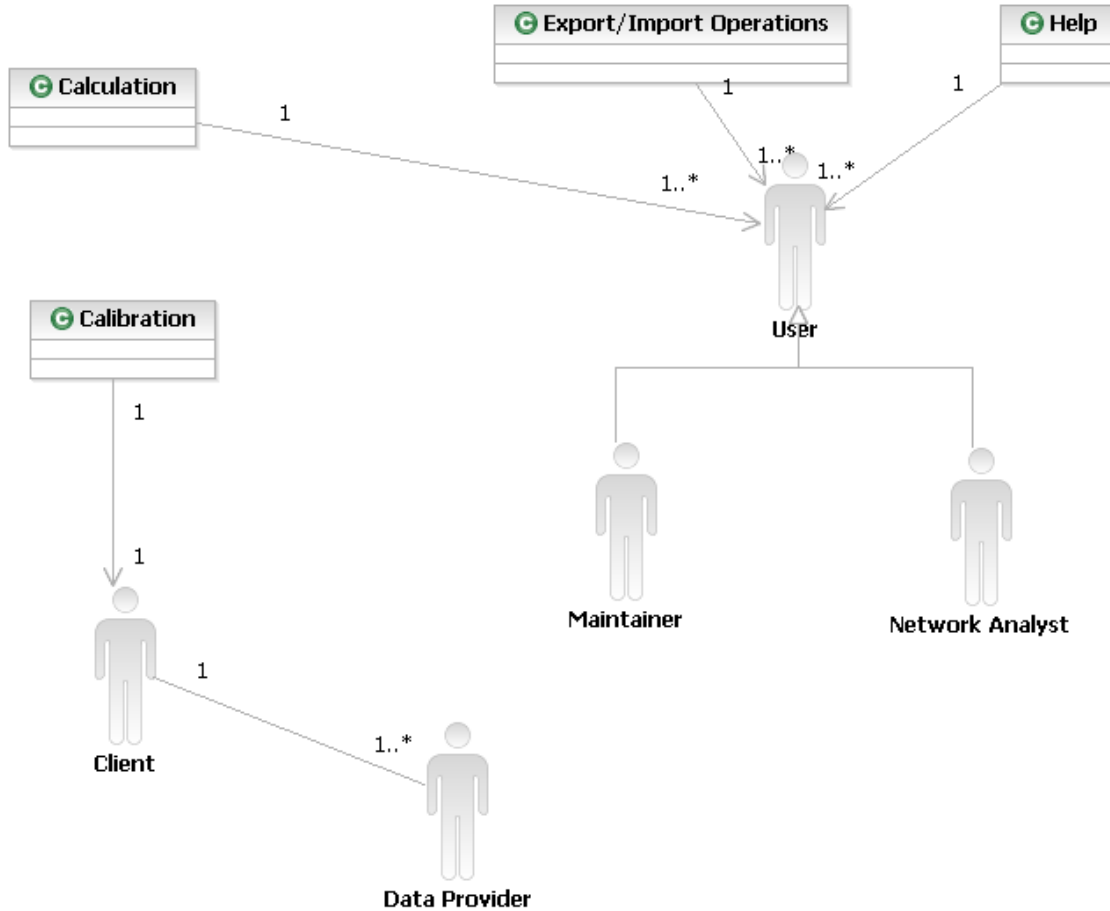


Figure 2: - Class Diagram

2.1.1 System

This subsection describes the system’s role, purpose and responsibilities. This subsection is immediately followed by sections that identify and provide details for the actors of the proposed system.

2.1.1.1 Role

The role of the USC CONIPMO tool is to help network security analysts accurately calculate network security cost estimation.

2.1.1.2 Purpose

The purpose of the System is to provide better network security estimation, resulting in network-critical systems being allocated resources in a better, more efficient way.

2.1.1.3 Responsibility

The responsibility of the System is to ensure proper utilization of resources in Network Infrastructure Protection.

The system provides the following major services:-

- <<service>>*Calculate_Cost()*
The System is able to calculate network security cost estimation by the formulas provided by the client, Reifer Consulting Inc. If the calibration option is not chosen, then the default constants will be used.
- <<service>>*Calibrate_Constants()*
Depending on the previous project's data loaded into the system, the tool will calibrate the constants on the variation between estimated & actual costs.
- <<service>>*Modes_of_Operation()*
The system provides different modes of operation, depending on the user's requirements – calibration & calculation mode , and maintenance mode.
- <<service>>*Help()*
The system provides a context sensitive help to the user, depending on the help topic searched for or selected by the user.
- <<service>>*Export_to_Excel()*
The system provides a feature to the user through which the user can export the data he entered and the results he got to an MS Excel Spreadsheet.
- <<service>>*Print_Screen()*
The system provides an option for the user to print all the screens on a connected printer
- <<service>>*Load_Project()*
The System is able to provide a capability of loading a new project file into the tool.
- <<service>>*Save_Project()*
The System is able to provide a capability of saving a new project file into the XML DBMS.

2.1.2 Actors

2.1.2.1 Actor 1: System Maintainer/ Client

Role	System Maintainer
Purpose	To Maintain the overall system including the database system, the actual cost model, Calibration tool.
Responsibility	To Maintain and update the system.
Services	<ol style="list-style-type: none"> 1. Provide Maintenance. 2. Perform updating of system 3. Provide User's Manual. 4. Provide Database Clean - up
Processes	<ol style="list-style-type: none"> 1. Troubleshooting 2. Database maintenance. 3. Updating the system.

Table 1 – System Maintainer's Role Description

2.1.2.2 Actor 2: Users

Role	Users
Purpose	To use the system for calculating the cost of protecting the network infrastructure
Responsibility	Provide the input parameters to the cost estimation model
Services	<ol style="list-style-type: none"> 1. Provide Input Data 2. Provide Calibration Data
Processes	<ol style="list-style-type: none"> 1. Gathering input parameters 2. Updating input 3. Calibration inputs 4. Printing Results

Table 2 – USER Role Description

2.1.2.3 Actor 3: Data Providers

Role	Data Providers
Purpose	To provide the calibration data for USC CONIPMO
Responsibility	Provide the previous year's network infrastructure protection cost information
Services	Provide Calibration Data
Processes	Gathering Previous Projects Information

Table 3 – Data Provider Role Description

2.1.2.4 Actor 4: Developers

Role	Developers
Purpose	To develop the Visual Basic Tool for USC CONIPMO
Responsibility	To ensure development of USC CONIPMO tool is completed as per schedule and provides maximum client satisfaction.
Services	<ol style="list-style-type: none"> 1. Develop Project within Schedule 2. Provide Satisfaction to Client
Processes	<ol style="list-style-type: none"> 1. Gather Project Requirements

Table 4 – Developer Role Description

2.2 Artifacts & Information

This subsection describes the details of the artifacts (documents, products, resources, etc.) used and manipulated by the system. This subsection also explains the inspection rules that are applied on these artifacts and relations between the artifacts.

The proposed system 'USC CONIPMO' is for estimating the cost of protecting a network infrastructure. It has following artifacts

1. XML File

The XML data storage (DBMS) file stores all the input data, output data and the calibration data in the system.
2. Calibration Files

These are the files, which store the calibrated data that comes from processing the data entered by the users in the calibration tool.
3. Project Files

The Project files store the network data entered by user for cost estimation, as well as the results calculated from the system, so that it can be restored later by the user.

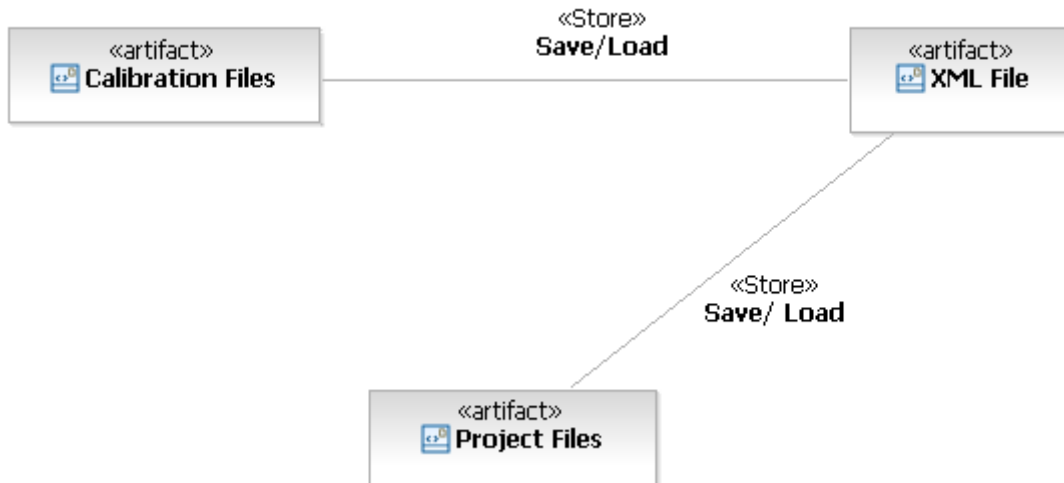


Figure 3: - Artifact Diagram

2.2.1 Artifact 1: XML DBMS File

Identifier	Artifact-1
Role	XML Data Storage file.
Purpose	Used to store the input and output and calibration data
Responsibilities	Provide the consistent data storage
Relevant Capabilities/Levels of Service	CR-2

Table 5 – Database File Description

2.2.2 Artifact 2: Calibration Files

Identifier	Artifact-4
Role	Calibration files
Purpose	Calibrate the CONIPMO constants according to the previous project data provided by data providers.
Responsibilities	<ol style="list-style-type: none"> 1. These files calibrate the constants after being loaded into the system. 2. Provide better accuracy, by updating constants based on actual project data.
Relevant Capabilities/Levels of Service	CR-1

Table 6– Calibration files

2.2.3 Artifact 3: Project Files

Identifier	Artifact-5
Role	Project files
Purpose	Let the user save his progress in a file which can be restored/loaded later for further operations.
Responsibilities	<ol style="list-style-type: none"> 1. Provide Help to the users as per their requirements. 2. Provide information of various features and their usage.
Relevant Capabilities/Levels of Service	CR-1

Table 7– Calibration files

2.3 Behavior

This subsection describes the details of processes that the system uses to accomplish the capabilities described in the OCD (Operational Concept Description). For each process actors are identified, the artifacts and the information used, manipulated or processed are explained.

2.3.1 Processes

Network Analyst/Cost Analyst Use Case

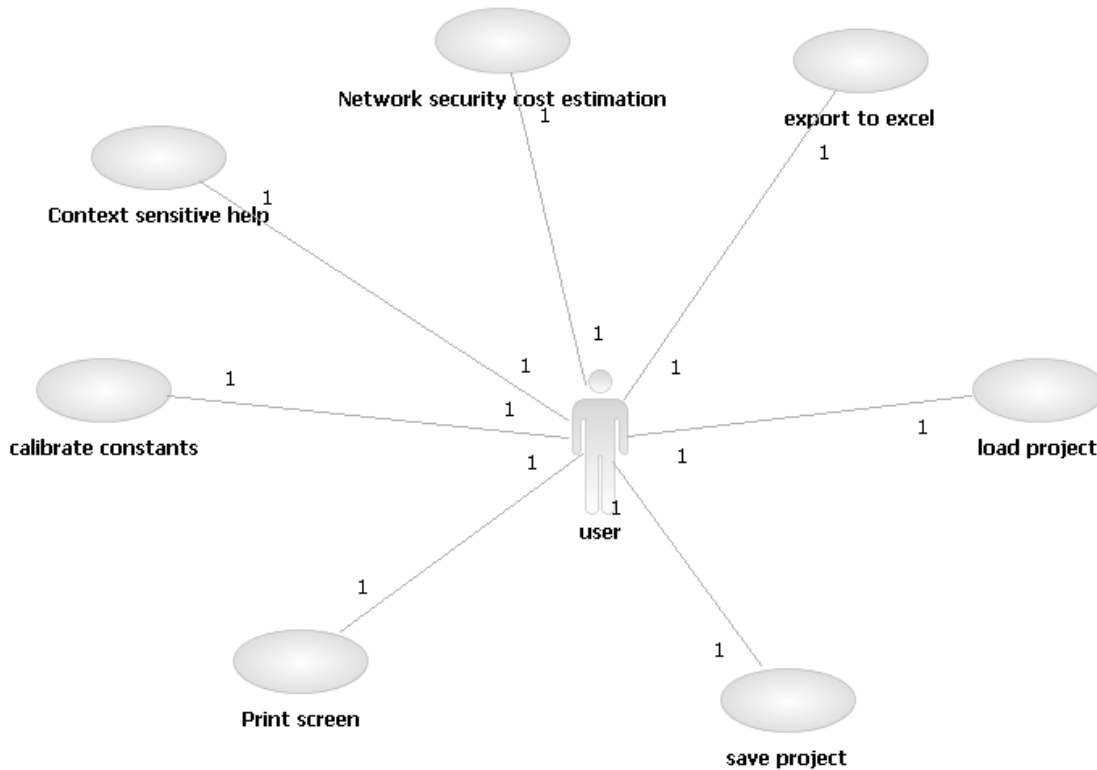


Figure 4: - Use Case Diagram

The general users in USC CONIPMO will be Network Analysts & Cost Analysts. The following 7 processes are the actions that they will be able to perform in the Tool.

2.3.1.1 Process 1: Network Security Cost Estimation

Identifier	P-01
Use-Case Name	Estimate Network Security Cost
Abstract	No
Purpose	This process is used to provide Cost estimation of network security using USC CONIPMO tool.
Actors	User
Priority	Must Have
Capabilities	OC-1
Requirements	CR-3
Risks	USC CONIPMO tool is having risk of interface because the Model is still not finalized yet by the Client
High-Risk?	Yes
Architecturally Significant?	Yes
Development Status	LCO
Overview	The client is interested in cost estimation tool which efficiently estimate cost of network security..
User Interface	ScreenName1, ScreenName2, Figure 7 (Of the Prototype Document)
Pre-conditions	The user has entered the network security information in the USC COCOMO tool.
Post-conditions	<ol style="list-style-type: none"> 1. Proper cost estimated using formulas given by client 2. Other wise error should be displayed.
Specializes	NA
Includes	UC-2
Extends	NA
Extension Points	NA

Table 8– Process 1 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on Calibrate -> Compute button	
2.		Provides screens for network information inputs
3.	The user fills data in the provided screen	
4.		Validate reasonability of data
5.		The system calculates and displays the Network Security cost estimation data.

Alternate Course of Action: None**Exceptional Course of Action: Incorrect Input Parameters**

Seq. #	Actor Actions	System Response
1.	The user clicks on Calibrate -> Compute button	
2.		Provides screens for network information inputs
3.	The user fills data in the provided screen	
4.		Validate reasonability of data
5.		The system displays error message if the data provided is not reasonable.

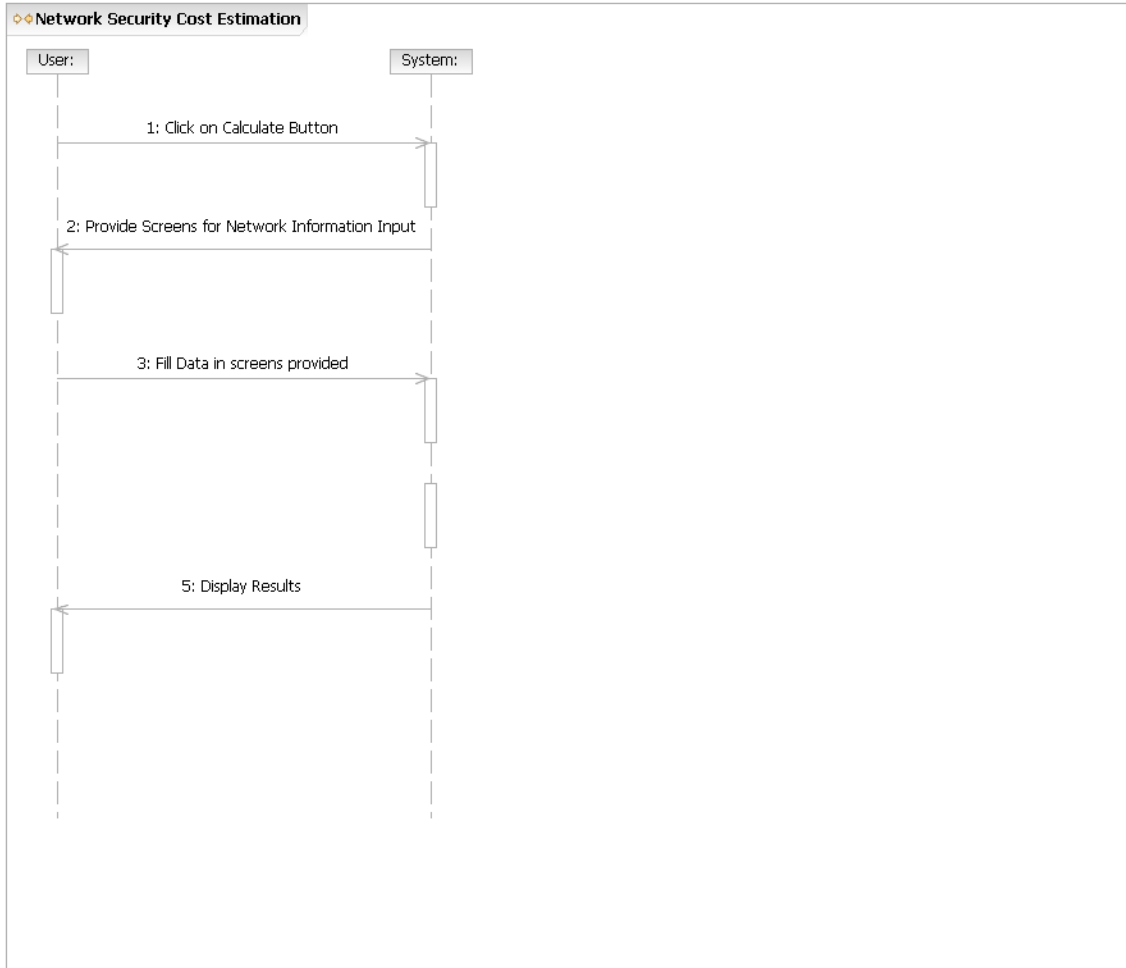


Figure 5: - Sequence Diagram of Calculate Process

2.3.1.2 Process 2: Calibration of USC CONIPMO Constants

Identifier	P-02
Use-Case Name	Calibration of USC CONIPMO Constants
Abstract	No
Purpose	This process is used Calibrate constants according to loaded data
Actors	User
Priority	Must Have
Capabilities	OC-2
Requirements	CR-1
Risks	If there is wrong data is wrong then it will affect constants, hence final result will be affected.
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	The user is interested in Calibration of the constant use in USC CONIPMO according to previous projects data loaded by the users..
User Interface	Figure 7, Figure 8
Pre-conditions	User has available the previous projects data required to calibrate CONIPMO constants.
Post-conditions	The USC CONIPMO constants are calibrated according to the actual previous project's data provided by users.
Specializes	NA
Includes	None
Extends	UC-01
Extension Points	NA

Table 9– Process 2 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	User clicks on the calibrate -> file load button.	
2.		Provides screen to browse and load projects files
3.	User selects projects to load	
4.		System check if data in project is reasonable
5.		CONIPMO constants are calibrated according to data provided in the loaded project file.

Alternate Course of Action: None**Exceptional Course of Action: Incorrect Input Parameters**

Seq. #	Actor Actions	System Response
1.	User clicks on calibrate -> file load button.	
2.		Provides screen to browse and load projects files
3.	User selects projects to load	
4.		System check if data in project is reasonable
5.		The input parameters are wrong and Error message displayed

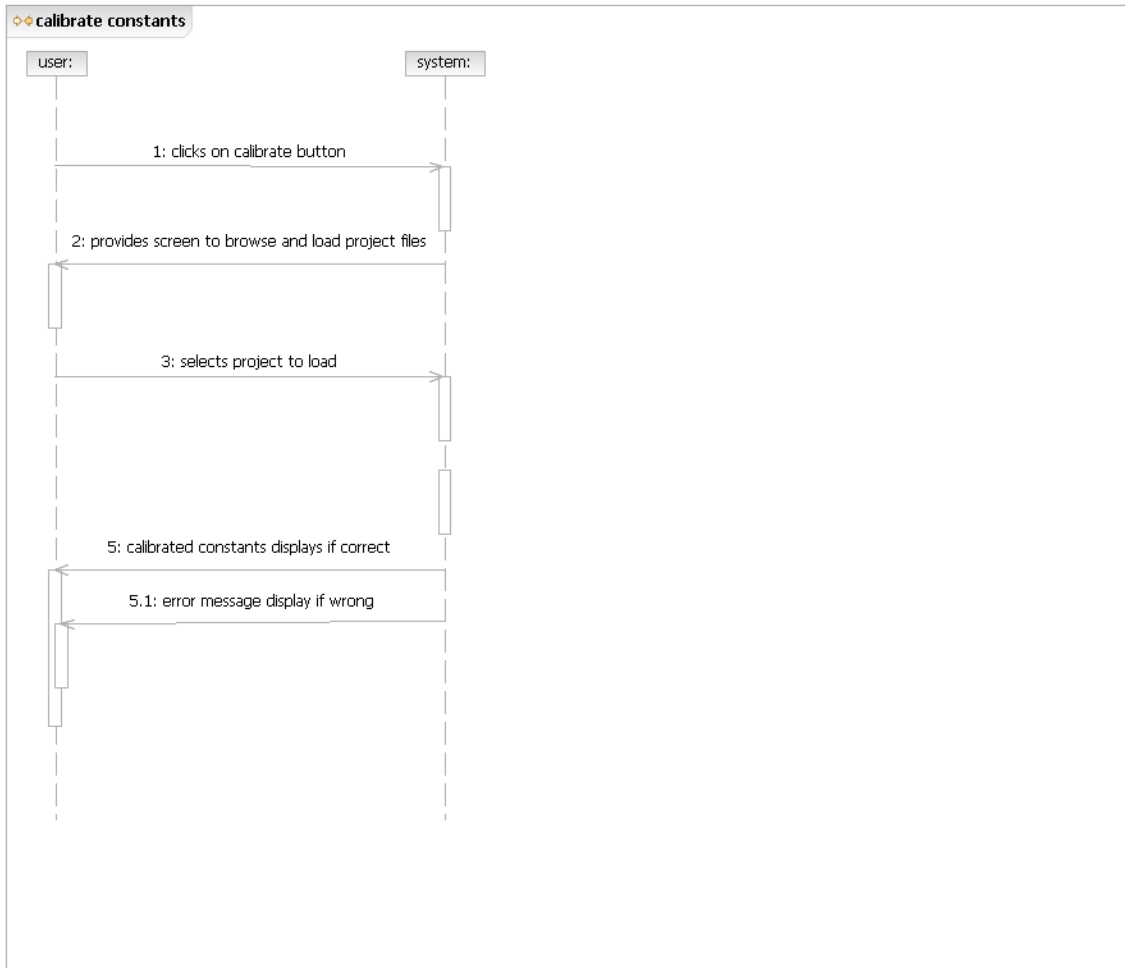


Figure 6: - Sequence Diagram of Calibrate Process

2.3.1.3 Process 3: Save Data

Identifier	P-03
Use-Case Name	Save Project
Abstract	No
Purpose	This process is used to save project after estimation input/output of the system for future reference.
Actors	User
Priority	Must Have
Capabilities	OC-06
Requirements	CR-6
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	The user wants to store the effort estimation data displayed after computation
User Interface	Figure 2, Figure 4
Pre-conditions	Cost estimation output has been generated and supporting data is resident in memory.
Post-conditions	The project data is saved in the database files.
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 10– Process 3 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - >Save Project button	
2.		The Project at that state is saved in the database.

Alternate Course of Action: None

Exceptional Course of Action: Database connection error

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - >Save button	
2.		Database error is encountered and a proper error message is displayed.

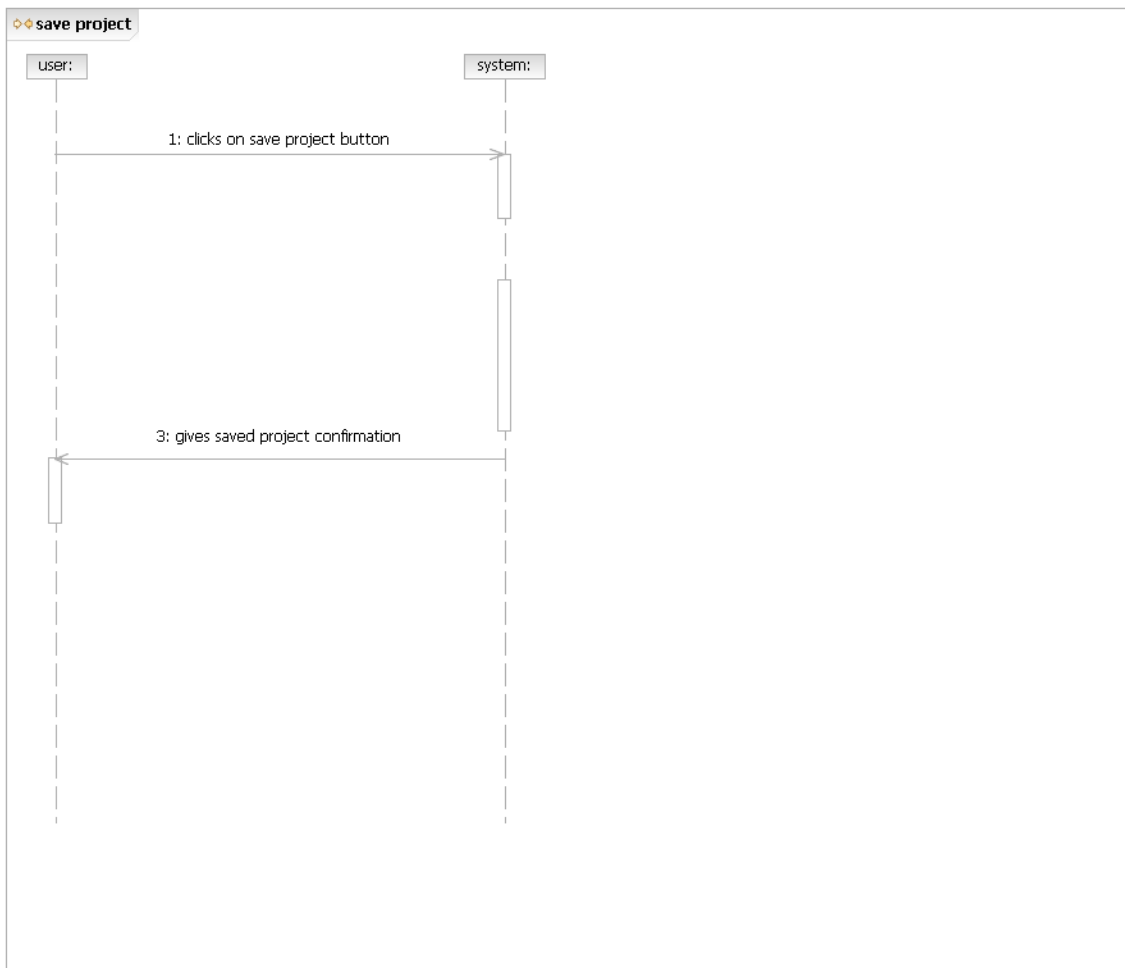


Figure 7: - Sequence Diagram of Save Process

2.3.1.4 Process 4: Context Sensitive Help

Identifier	P-04
Use-Case Name	Context Sensitive Help
Abstract	No
Purpose	This process is used to provide a help about any part of projects
Actors	User
Priority	Must Have
Capabilities	OC-8
Requirements	CR-4
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	The system displays context sensitive help when user click help button.
User Interface	Figure 10
Pre-conditions	USC CONIPMO tool is running.
Post-conditions	The parameter help is should guide in right direction
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 11– Process 4 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response

1.	The user clicks on the Help - > USC CONIPMO contents button on the input screen	
2.		The context sensitive help topics are displayed.
3.	User selects help topic	
4.		System displays Help.

Alternate Course of Action: None

Exceptional Course of Action: None

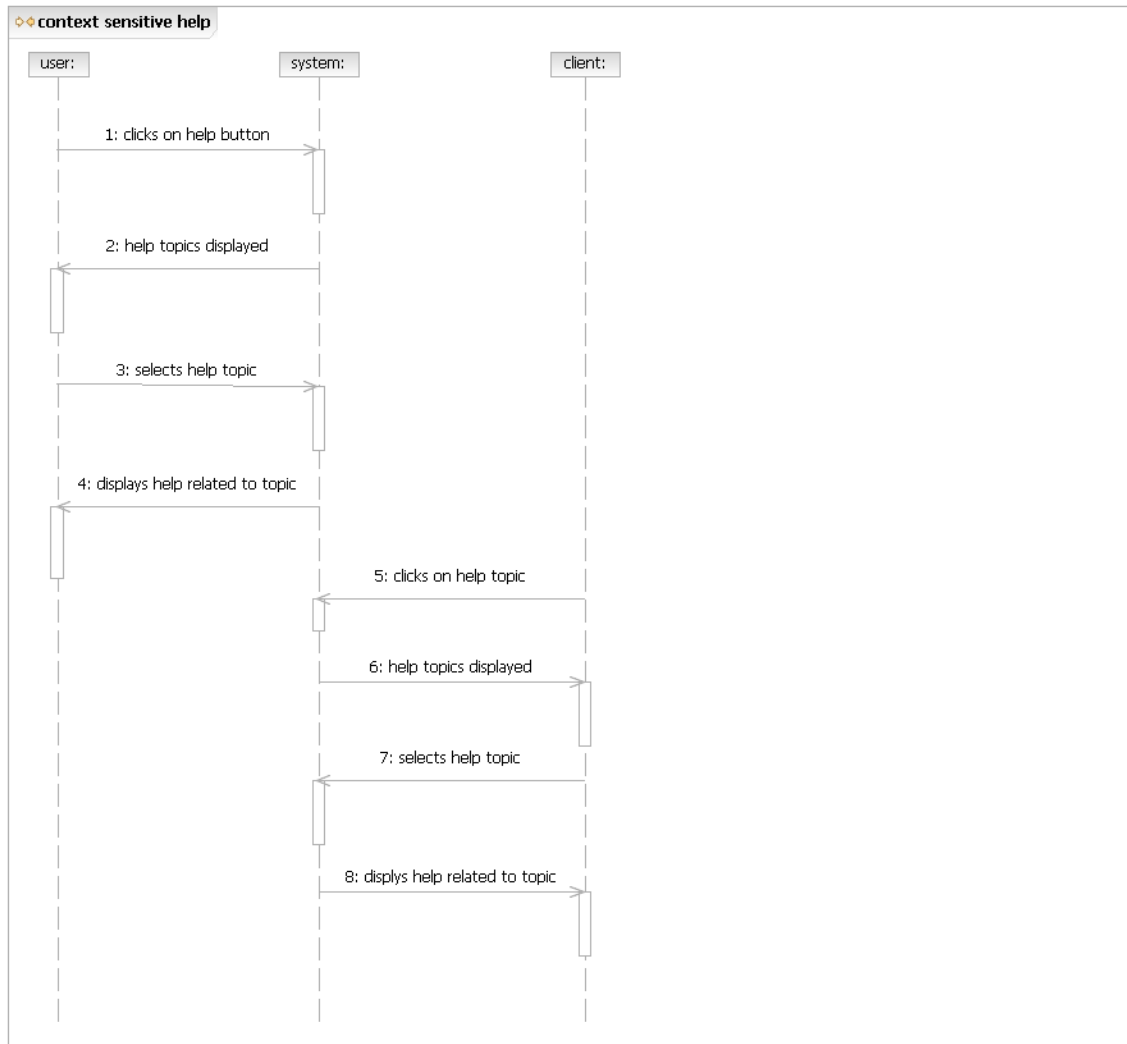


Figure 8: - Sequence Diagram of Help Process

2.3.1.5 Process 5: Load Project

Identifier	P-05
Use-Case Name	Load Project
Abstract	No
Purpose	This process is used to load the previously stored input parameters for the saved project.
Actors	User
Priority	Must Have
Capabilities	OC-05
Requirements	CR-6
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	User seeks to load the previously stored input parameters for the saved project.
User Interface	Figure 3
Pre-conditions	User is at the main application screen.
Post-conditions	The project data is loaded and can be modified or used for re estimation.
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 12– Process 5 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - > Open Project button on the main application screen	
2.		The system displays the project list
3.	The user selects the project	
4.		The system loads project data.

Alternate Course of Action: None**Exceptional Course of Action: Database Error**

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - > Open Project button on the main application screen	
2.		The system displays the project list
3.	The user selects the project	
4.		Database error occurs while loading saved data and correct error message is displayed.

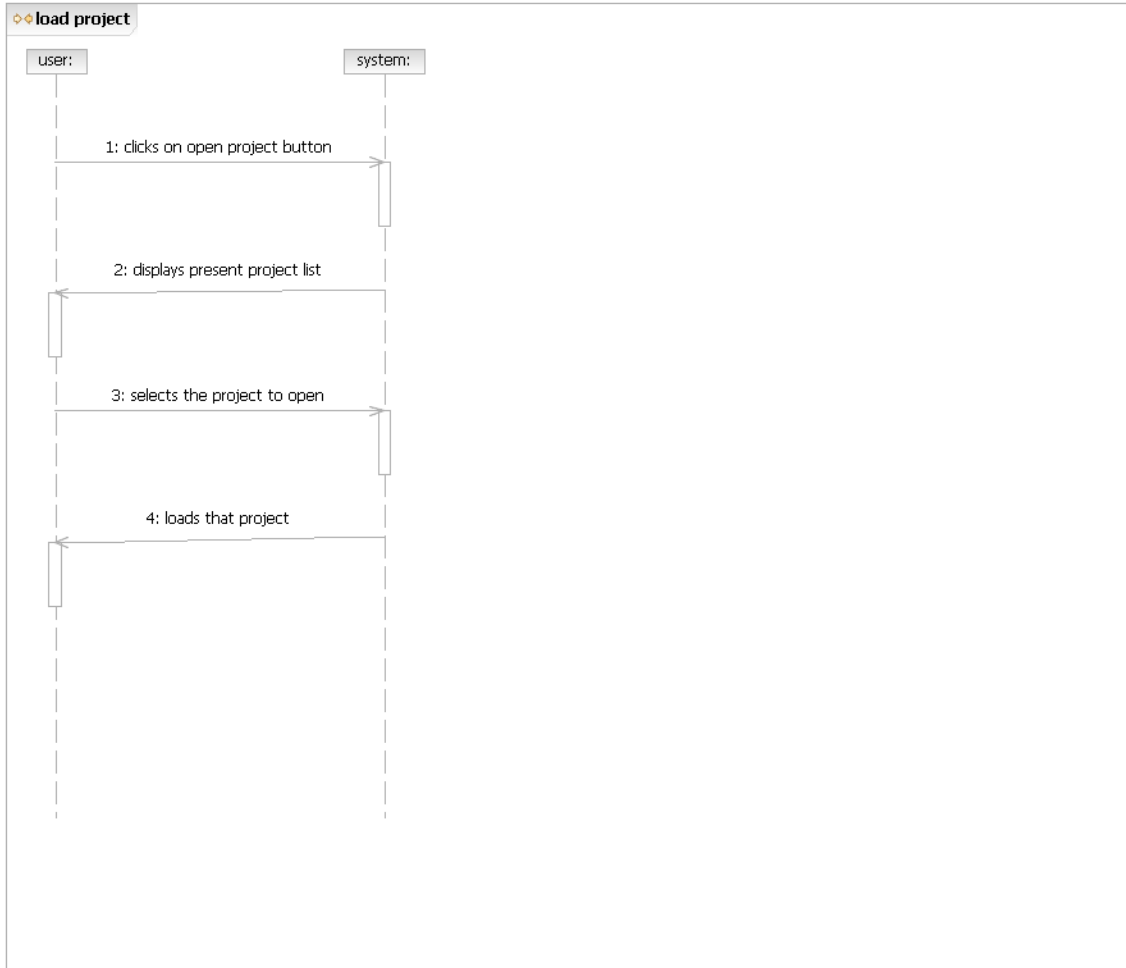


Figure 9: - Sequence Diagram of Load Project Process

2.3.1.6 Process 6: Export to Excel

Identifier	P-06
Use-Case Name	Export to Excel
Abstract	No
Purpose	This process is export the user entered information and the calculated results into an MS Excel Spreadsheet
Actors	User
Priority	Must Have
Capabilities	OC-04
Requirements	CR-7
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	User seeks to export the entered information and the calculated results into an MS Excel Spreadsheet
User Interface	Will be included in LCA prototype
Pre-conditions	<ol style="list-style-type: none"> 1. User is at the main application screen. 2. User needs to export data to Excel
Post-conditions	The project data is exported to an Excel sheet, and is ready for manipulations.
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 13– Process 6 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	User clicks on File -> Save Screens button.	
2.		Provides screen to save as excel file
3.	User enters name for excel file	
4.		System saves the excel sheet.

Alternate Course of Action: None

Exceptional Course of Action: None

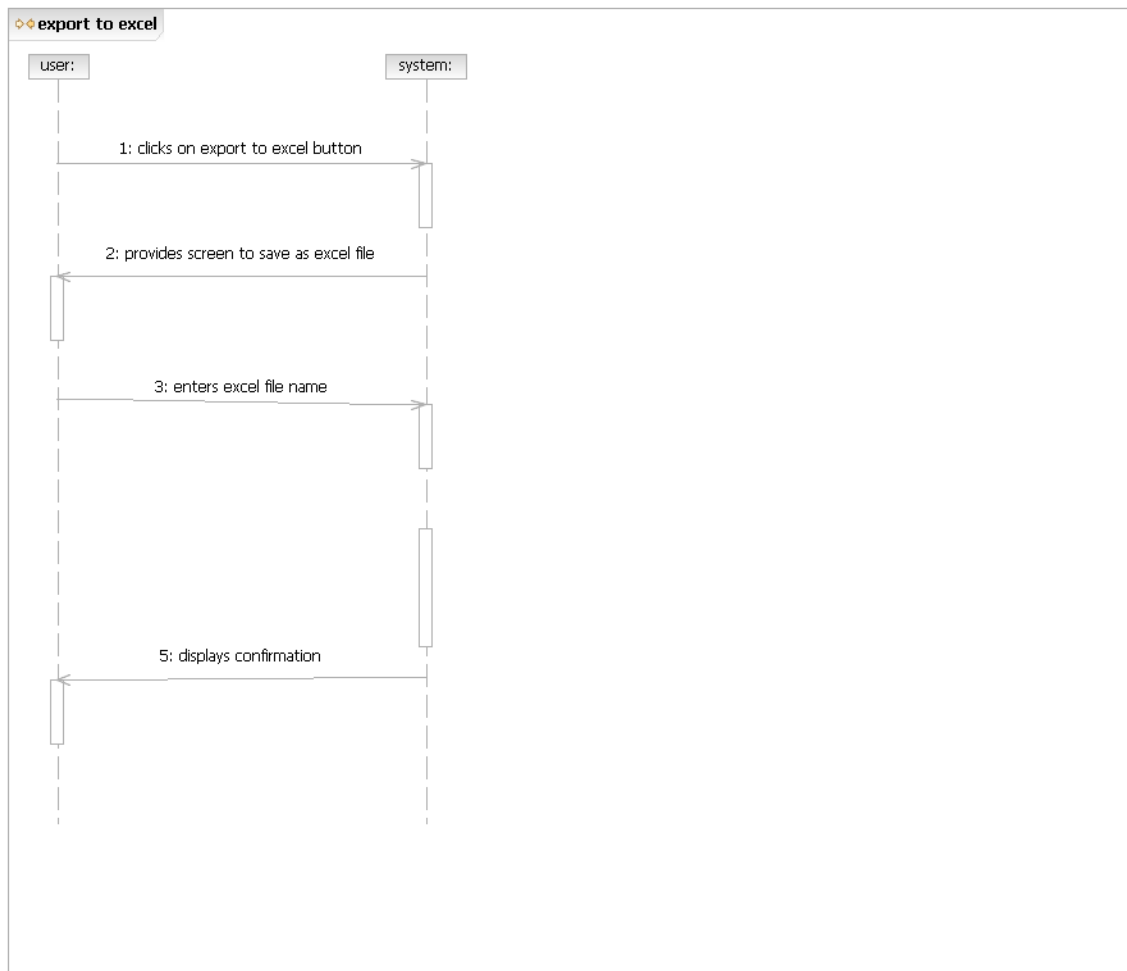


Figure 10: - Sequence Diagram of Export to Excel Process

2.3.1.7 Process 7: Print Screens

Identifier	P-07
Use-Case Name	Print Screens
Abstract	No
Purpose	This process is print the screens on a connected printer
Actors	User
Priority	Must Have
Capabilities	OC-07
Requirements	CR-5
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	User seeks to print screens for later reference
User Interface	Figure 2
Pre-conditions	1. User is at the main application screen.
Post-conditions	The project data screens are printed on a connected printer
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 14– Process 7 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	User clicks on File -> print screen button.	
2.		Prints Screens on connected printer

Alternate Course of Action: None

Exceptional Course of Action: None

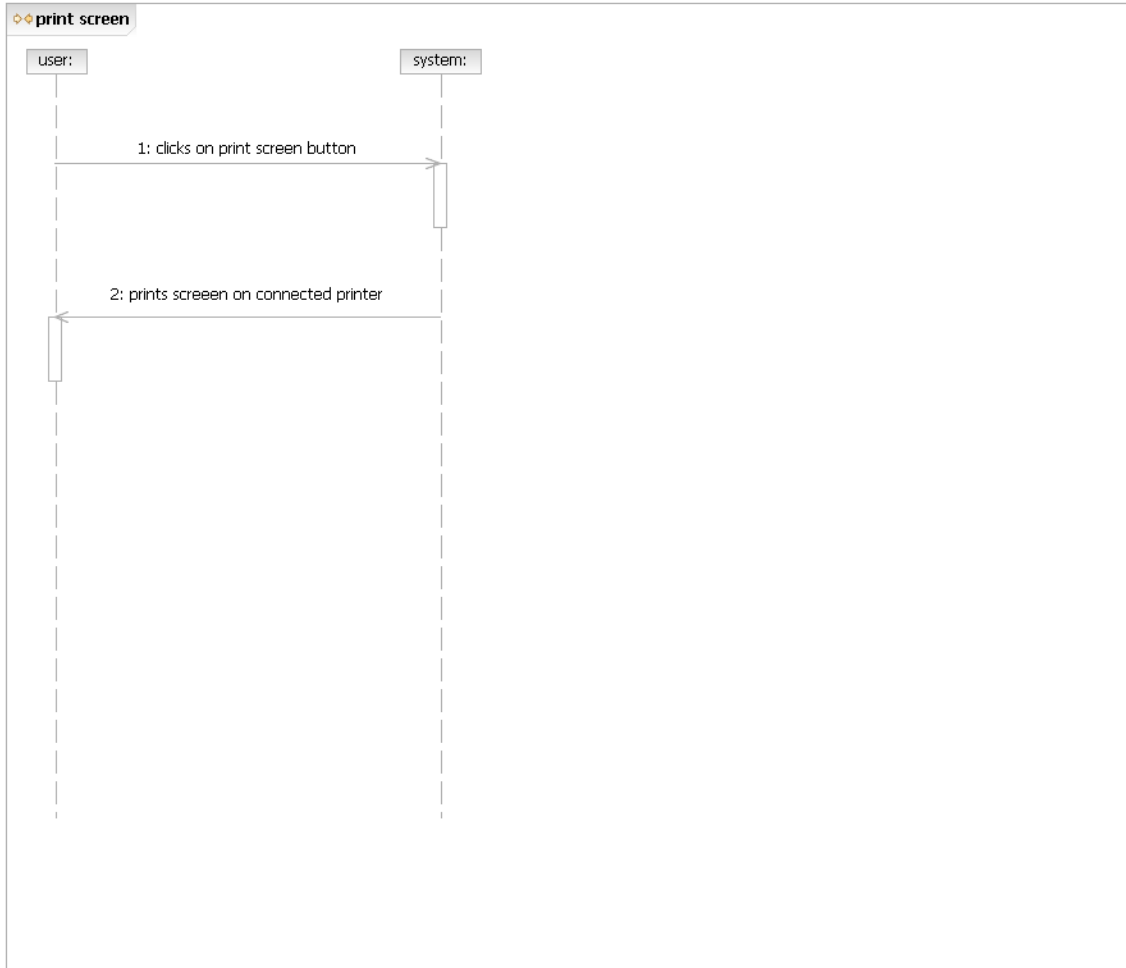


Figure 11: - Sequence Diagram of Print Screen Process

3. Platform/Technology-Independent Model

For the proposed system of “USC CONIPMO” the client has a requirement that the system should be built and run on Microsoft Windows XP/ Vista operating system. The following section explains why the developers have chosen to develop the tool using MS Visual Basic, XML, and MS Excel. Thus, we are building a Technology Specific Model (TSM) and Platform Specific Model (PSM). We discuss high level platform specific architecture details in SSAD section 4.

4. Platform/Technology-Specific Model

Design Rationale:

1. Visual Basic chosen for GUI Development, because of the following factors
 - All Project Team Members are well experienced in Visual Basic, so development of the software will be able to be completed on time & as per requirements.
 - The Project Schedule limited to 24 weeks
 - Levels of Service needs to be Reliable & Fully Functional
 - The tool must be compatible with MS Windows XP, MS Windows Vista
 - Client Requirements state clearly that a self-Installing file should be provided to Customer on a CD, which is viable in Visual Basic.
 - Client Requirements also state that the tool should Run on a 128 MB RAM system
2. XML for database storage is a hard client requirement
3. The Export to Excel feature similar to USC COCOMO is also a hard client requirement, so MS Excel has to be used for the system.

4.1 Structure

This section provides a brief description of the hardware and software components of the system and the connections among the components and actors.

The Presentation Layer will be implemented in Visual Basic API. The Database Layer will be implemented using an XML File. The connectivity between the front end and back end will be provided by JDBC drivers. XML queries will be used to retrieve data from the database.

The hand coded component classifier; User Interface forms/Pages will be implemented using Visual Basic Code. The implementation of other software component like MS Excel, whose connectivity between the front end and back end will be provided by JDBC drivers.

4.1.1 Hardware Classifier Model

The hardware used for the system is a Windows machine that supports MS Office and has Visual Basic runtime environment. The machine as well as the system as a whole will be a standalone application. The computer will need to be connected to a printer in order for the print-screen process to work on the tool. So, there should be compatibility between the two devices.

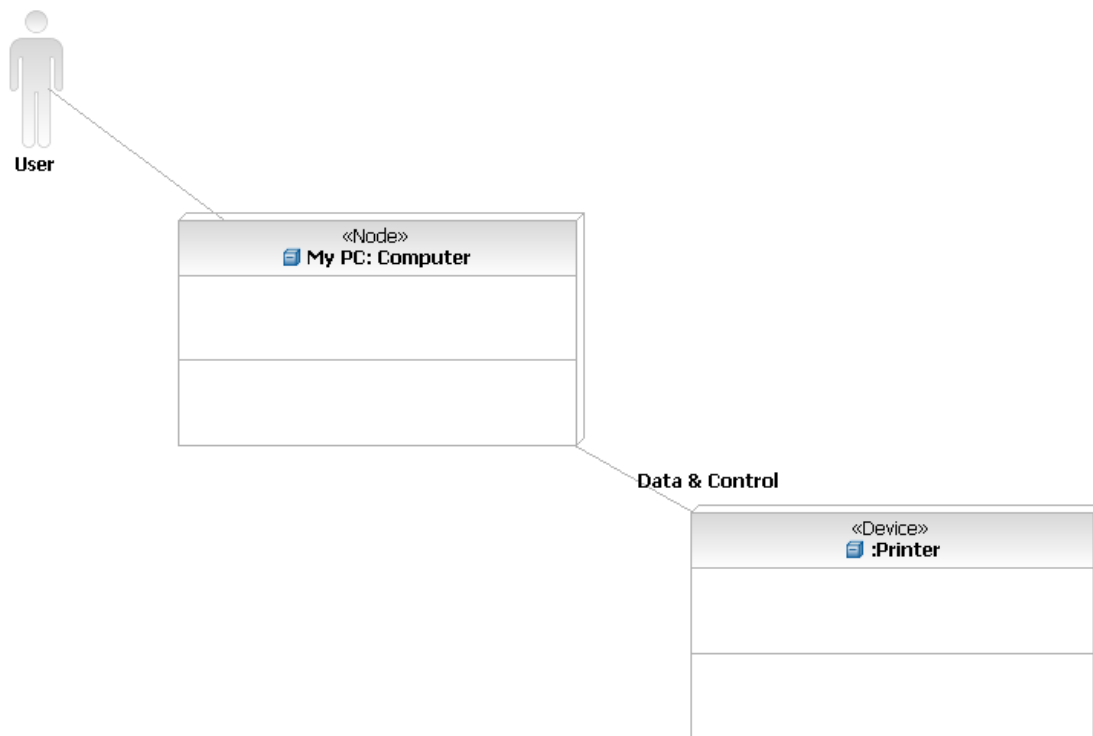


Figure 12: - TSM Hardware Classifiers

4.1.2 Software Classifier Model

There are several software components that are part of the system including

- Visual Basic Application Programming Interface
- VB Runtime Environment
- XML Database
- MS Excel Spreadsheet

1. Visual Basic Application Programming Interface:

The Visual Basic Application Programming Interface represents the software component that will implement all application logic of the system

2. VB Runtime Environment

It is the executable environment that the USC CONIPMO tool runs in. It is essentially the tool's "platform," which includes the CPU hardware, operating system and other system programs

3. XML Database

All the data needed for the USC CONIPMO tool will be stored in an XML file, that can be retrieved by XML queries.

4. MS Excel Spreadsheet

In order to provide the export to/import from features in the tool, a connection has to be made to an MS Excel file.

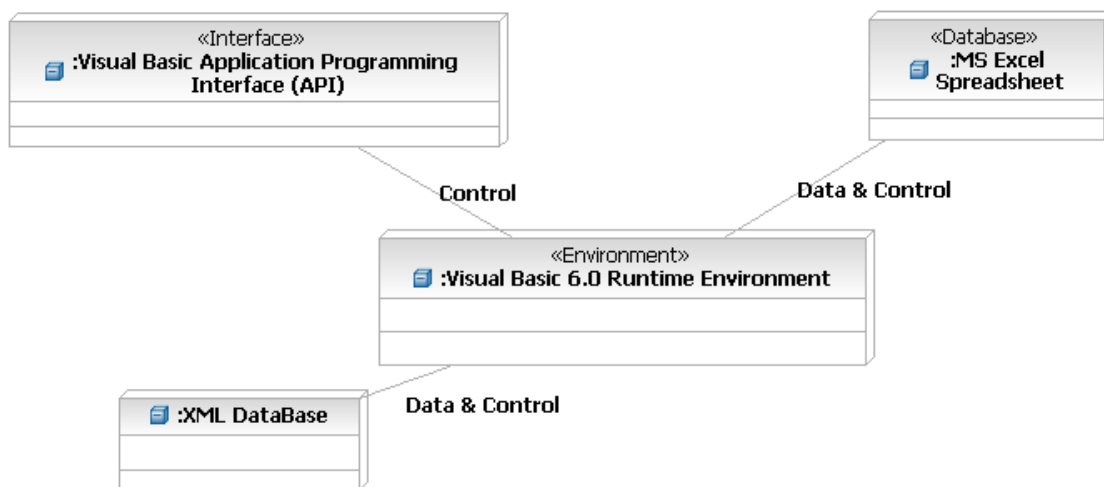


Figure 13: - TSM Software Classifiers

4.1.3 Deployment Model

The system should be deployed and installed in the client’s workstation. It is necessary to train the clients and other users (coaches, support staff) regarding the use of the system. This is done by a user manual, which is provided as part of the installation package. The client gets more familiar with the system with the help of the user manual, which is provided.

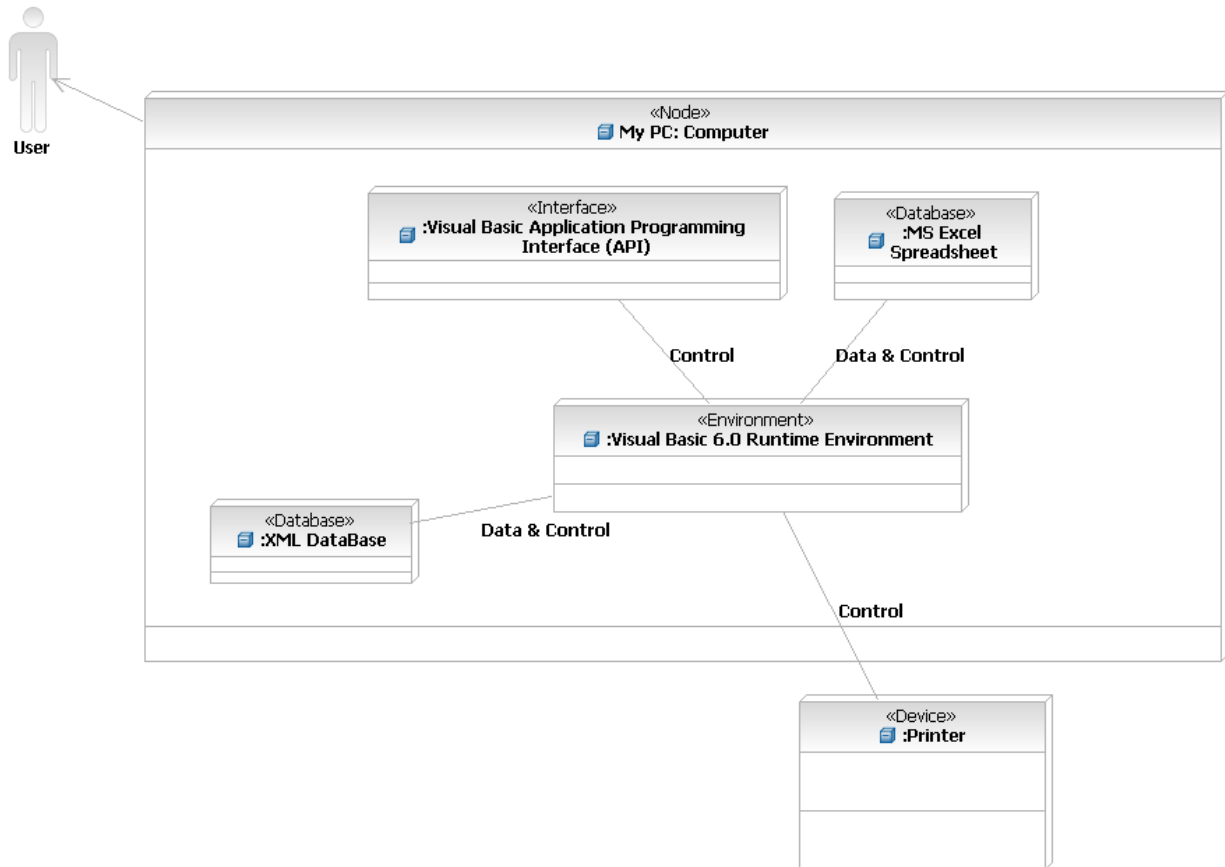


Figure 14: TSM Deployment Model

4.1.4 Hardware Component Classifiers

The following subsection provides a brief discussion of purpose and Capability requirements (SSRD 5) that apply to each hardware component classifier defined in Hardware Classifier Model (SSAD 4.1.1).

4.1.4.1 Component Classifier 1 – Computer Node (HWC 1)

4.1.4.1.1 Purpose

This is the hardware platform on which the system is installed and implemented. It is a standalone machine that satisfies all the hardware software requirements of the system.

4.1.4.1.2 L.O.S Characteristic Goals

There is no hardware specific LOS for this hardware component classifier

4.1.4.2 Component Classifier 2 – Printer (HWC 2)

4.1.4.2.1 Purpose

This is the printer that will be connected to the computer in order for the print-screen process to work on the tool. There should be compatibility between the two devices.

4.1.4.2.2 L.O.S. Characteristic Goals

There is no hardware specific LOS for this hardware

4.1.5 Hardware Connector Classifiers

4.1.5.1 Connector Classifier 1: Computer-Printer Link (XHCON 1)

4.1.5.1.1 Purpose

The computer will need to be connected to a printer in order for the print-screen process to work on the tool. So, there should be compatibility between the two devices.

4.1.5.1.2 L.O.S. Characteristic Goals

There is no hardware specific LOS for this hardware

4.1.6 Software Component Classifiers

4.1.6.1 Component Classifier 1: Visual Basic API (XSWC-1)

Identifier	XSWC-1
Purpose	The Visual Basic Application Programming Interface represents the software component that will implement all application logic of the system
Interface(s)	The VB API interfaces with the User, and the VB Runtime environment.
Feature Set	The operation performed by this component are as follows <ul style="list-style-type: none"> • Provides application logic for the tool • Interfaces with VB runtime to provide application support to tool.
Parameters	N.A
Behavior	This component will represent the software component that will implement all application logic of the system.
Process	P-01, P-02, P-03, P-04, P-05, P-06, P-07 (logic support)
Modes	Operational Mode
Constraints	N/A
System Capabilities	N/A

Table 15– Component Classifier 1 Description

4.1.6.2 Component Classifier 2: Visual Basic Runtime Environment (XSWC-2)

Identifier	XSWC-2
Purpose	It is the executable environment that the USC CONIPMO tool runs in. It is essentially the tool's "platform," which includes the CPU hardware, operating system and other system programs
Interface(s)	The VB Runtime environment interfaces with the User, the VB API, the Printer, XML Database, & MS Excel Data File
Feature Set	The operation performed by this component are as follows <ul style="list-style-type: none"> • Provides User Interface

	<ul style="list-style-type: none"> • Interfaces all other components • Handles the Operating System (Windows) in efficiently running the tool.
Parameters	N.A
Behavior	This component will represent the software component that will implement all application logic of the system.
Process	P-01, P-02, P-03, P-04, P-05, P-06, P-07 (interface support)
Modes	Operational Mode
Constraints	N/A
System Capabilities	N/A

Table 16– Component Classifier 2 Description

4.1.6.3 Component Classifier 3: XML Database (XSWC-3)

Identifier	XSWC-3
Purpose	It is the file in which all the data needed for the USC CONIPMO tool will be stored in. It is an XML file, that can be retrieved by XML queries.
Interface(s)	The XML File interfaces with the VB runtime environment.
Feature Set	<p>The operation performed by this component are as follows</p> <ul style="list-style-type: none"> • Stores all the data needed for calculations • Stores all the data needed for calibration. • Stores all results • Stores the project files
Parameters	N.A
Behavior	This component will store all the data that will implement all application logic of the system.
Process	P-01, P-02, P-03, P-04, P-05 (database support)
Modes	Operational Mode
Constraints	N/A
System Capabilities	N/A

Table 17– Component Classifier 3 Description

4.1.6.4 Component Classifier 4: MS Excel Database (XSWC-4)

Identifier	XSWC-4
Purpose	It is an MS Excel file in which all the data needed for the USC CONIPMO tool can be exported into. Also, we

	can later import the data from the same excel file if required.
Interface(s)	The MS Excel File interfaces with the VB runtime environment.
Feature Set	The operation performed by this component are as follows <ul style="list-style-type: none"> • Stores the results generated by the tool
Parameters	N.A
Behavior	This component will store all the results generated by the tool
Process	P-06 (database support)
Modes	Operational Mode
Constraints	N/A
System Capabilities	N/A

Table 18– Component Classifier 3 Description

4.1.7 Hardware Components

This subsection describes each hardware component defined in Hardware Classifier Model (SSAD 3.1.1)

4.1.7.1 Component 1 – Computer Node

Identifier	XHW-1
Classifier	Computer Node
Purpose	This is the hardware platform on which the system is installed and implemented. It is a standalone machine that satisfies all the hardware software requirements of the system. The system has Windows XP operating system installed on it and has support for Visual Basic by means of the Visual Basic Runtime Environment (VBRE) .MS Excel will be installed on the client's machine.

Table 19– h/w Component 1 Description

4.1.7.2 Component 2 – Printer

Identifier	XHW-2
Classifier	Printer
Purpose	This is the printer that is connected to the computer node in order for the print-screen process to work on the tool. So, there should be compatibility between the two devices.

Table 20– h/w Component 2 Description

4.1.8 Software Components

4.1.8.1 Component 1: Visual Basic Application Programming Interface

Identifier	XSW-1
Classifier	XSWC-1 VB API
Purpose	The Visual Basic Application Programming Interface represents the software component that will implement all application logic of the system

Table 21– s/w Component 1 Description

4.1.8.2 Component 2: Visual Basic Application Programming Interface

Identifier	XSW-2
Classifier	XSWC-2 VB Runtime Environment
Purpose	It is the executable environment that the USC CONIPMO tool runs in. It is essentially the tool's "platform," which includes the CPU hardware, operating system and other system programs

Table 22– s/w Component 2 Description

4.1.8.3 Component 3: XML Database

Identifier	XSW-3
Classifier	XSWC-3 XML Database
Purpose	All the data needed for the USC CONIPMO tool will be stored in an XML file, that can be retrieved by XML queries.

Table 23– s/w Component 3 Description

4.1.8.4 Component 4: MS Excel File

Identifier	XSW-4
Classifier	XSWC-4 MS Excel File
Purpose	In order to provide the export to/import from features in the tool, a connection has to be made to an MS Excel file.

Table 24– s/w Component 4 Description

4.1.9 Information Classes

<<will be added in next version>>

4.2 Behavior

4.2.1 Process 1

Use Case 1 – Estimate Network Security Cost

Identifier	P-01
Use-Case Name	Estimate Network Security Cost
Abstract	No
Purpose	This process is used to provide Cost estimation of network security using USC CONIPMO tool.
Actors	User
Priority	Must Have
Capabilities	OC-1
Requirements	CR-3
Risks	USC CONIPMO tool is having risk of interface because the Model is still not finalized yet by the Client
High-Risk?	Yes
Architecturally Significant?	Yes
Development Status	LCO
Overview	The client is interested in cost estimation tool which efficiently estimate cost of network security..
User Interface	ScreenName1, ScreenName2, Figure 7 (Of the Prototype Document)
Pre-conditions	The user has entered the network security information in the USC COCOMO tool.
Post-conditions	<ol style="list-style-type: none"> 3. Proper cost estimated using formulas given by client 4. Other wise error should be displayed.
Specializes	NA
Includes	UC-2
Extends	NA
Extension Points	NA

Table 25– UCR 1 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on Calibrate -> Compute button	
2.		Provides screens for network information inputs
3.	The user fills data in the provided screen	
4.		Validate reasonability of data
5.		The system calculates and displays the Network Security cost estimation data.

Alternate Course of Action: None**Exceptional Course of Action: Incorrect Input Parameters**

Seq. #	Actor Actions	System Response
1.	The user clicks on Calibrate -> Compute button	
2.		Provides screens for network information inputs
3.	The user fills data in the provided screen	
4.		Validate reasonability of data
5.		The system displays error message if the data provided is not reasonable.

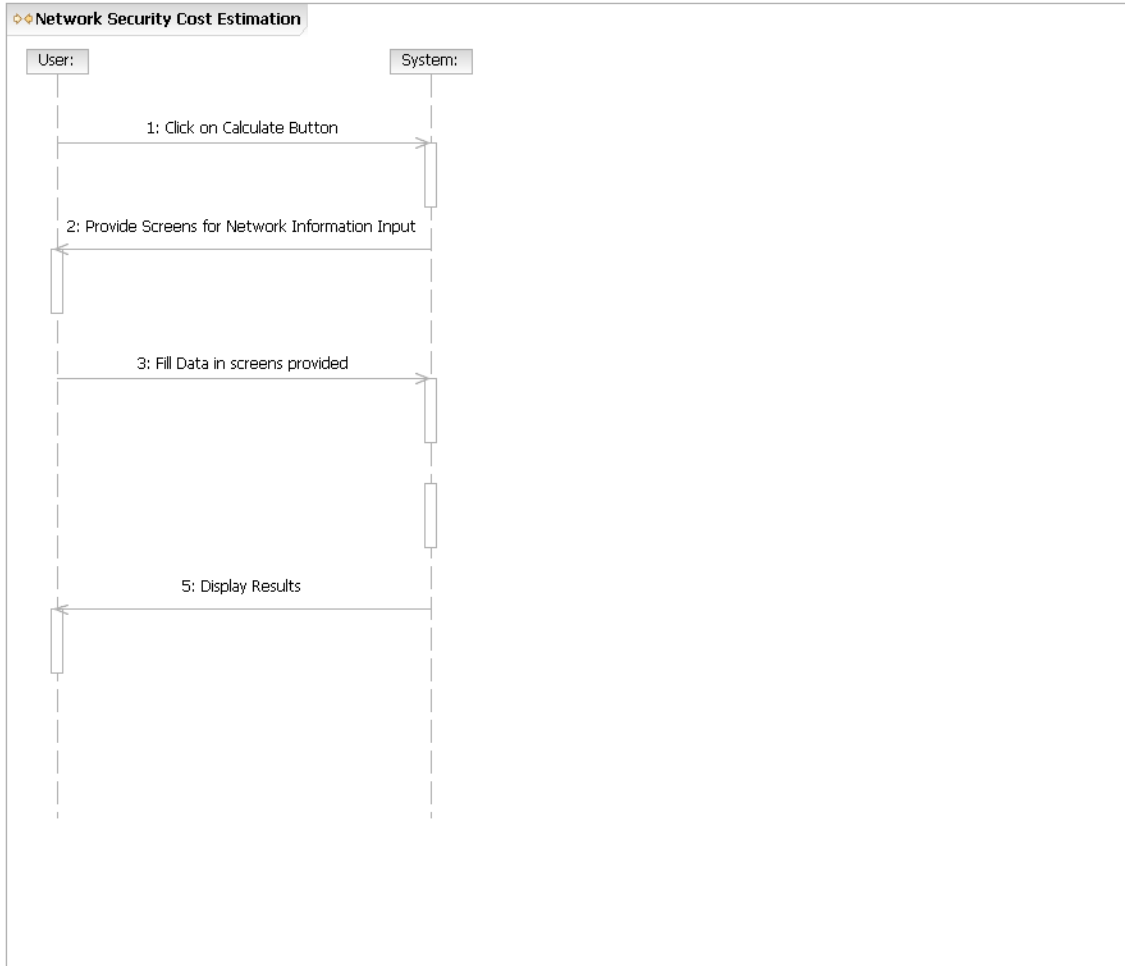


Figure 15: - UCR-1 Sequence Diagram (Calculate Process)

4.2.2 Process 2

Use Case 2 – Calibration of USC CONIPMO Constants

Identifier	P-02
Use-Case Name	Calibration of USC CONIPMO Constants
Abstract	No
Purpose	This process is used Calibrate constants according to loaded data
Actors	User
Priority	Must Have
Capabilities	OC-2
Requirements	CR-1
Risks	If there is wrong data is wrong then it will affect constants, hence final result will be affected.
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	The user is interested in Calibration of the constant use in USC CONIPMO according to previous projects data loaded by the users..
User Interface	Figure 7, Figure 8
Pre-conditions	User has available the previous projects data required to calibrate CONIPMO constants.
Post-conditions	The USC CONIPMO constants are calibrated according to the actual previous project's data provided by users.
Specializes	NA
Includes	None
Extends	UC-01
Extension Points	NA

Table 26– UCR 2 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	User clicks on the calibrate -> file load button.	
2.		Provides screen to browse and load projects files
3.	User selects projects to load	
4.		System check if data in project is reasonable
5.		CONIPMO constants are calibrated according to data provided in the loaded project file.

Alternate Course of Action: None**Exceptional Course of Action: Incorrect Input Parameters**

Seq. #	Actor Actions	System Response
1.	User clicks on calibrate -> file load button.	
2.		Provides screen to browse and load projects files
3.	User selects projects to load	
4.		System check if data in project is reasonable
5.		The input parameters are wrong and Error message displayed

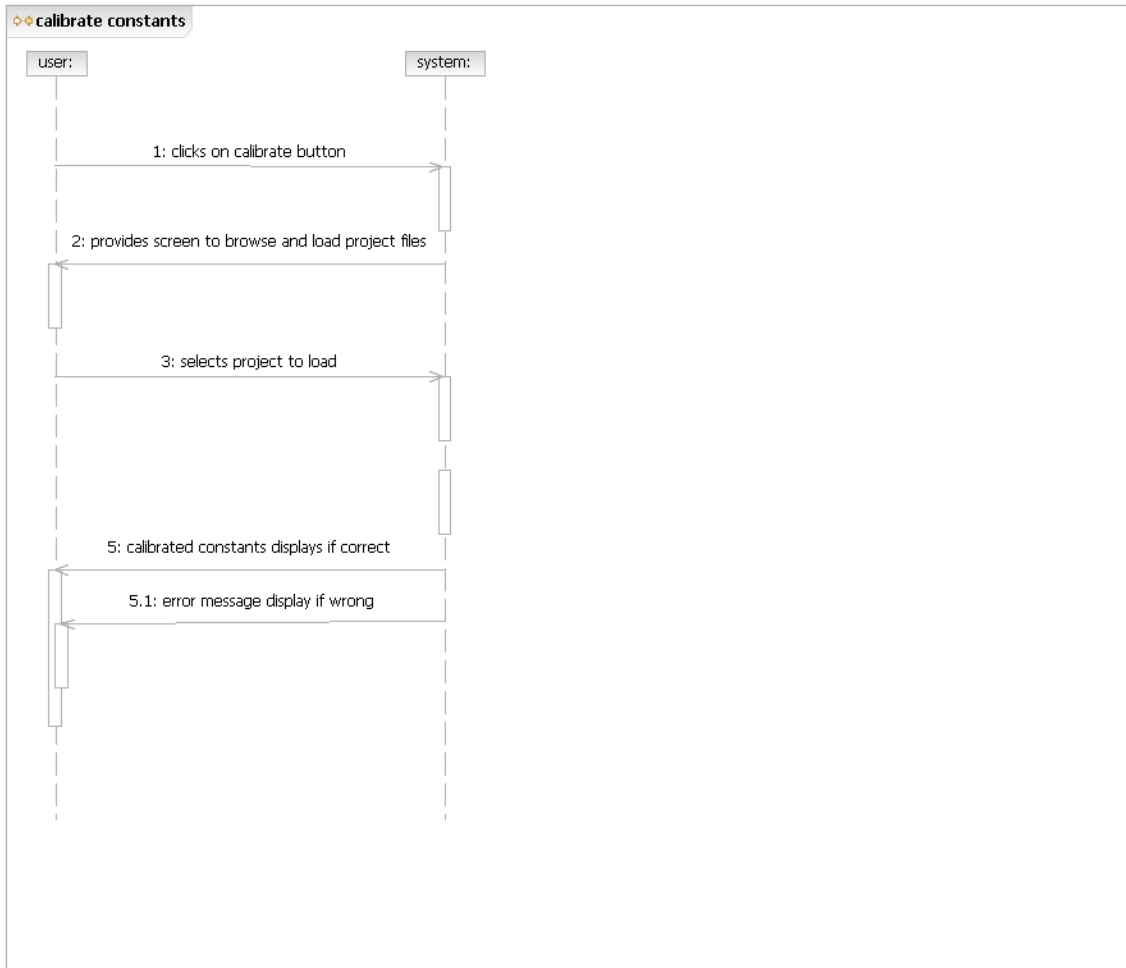


Figure 16: - UCR-2 Sequence Diagram (Calibrate Process)

4.2.3 Process 3

Use Case 3 – Save Data

Identifier	P-03
Use-Case Name	Save Project
Abstract	No
Purpose	This process is used to save project after estimation input/output of the system for future reference.
Actors	User
Priority	Must Have
Capabilities	OC-06
Requirements	CR-6
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	The user wants to store the effort estimation data displayed after computation
User Interface	Figure 2, Figure 4
Pre-conditions	Cost estimation output has been generated and supporting data is resident in memory.
Post-conditions	The project data is saved in the database files.
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 27– UCR 3 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - >Save Project button	
2.		The Project at that state is saved in the database.

Alternate Course of Action: None

Exceptional Course of Action: Database connection error

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - >Save button	
2.		Database error is encountered and a proper error message is displayed.

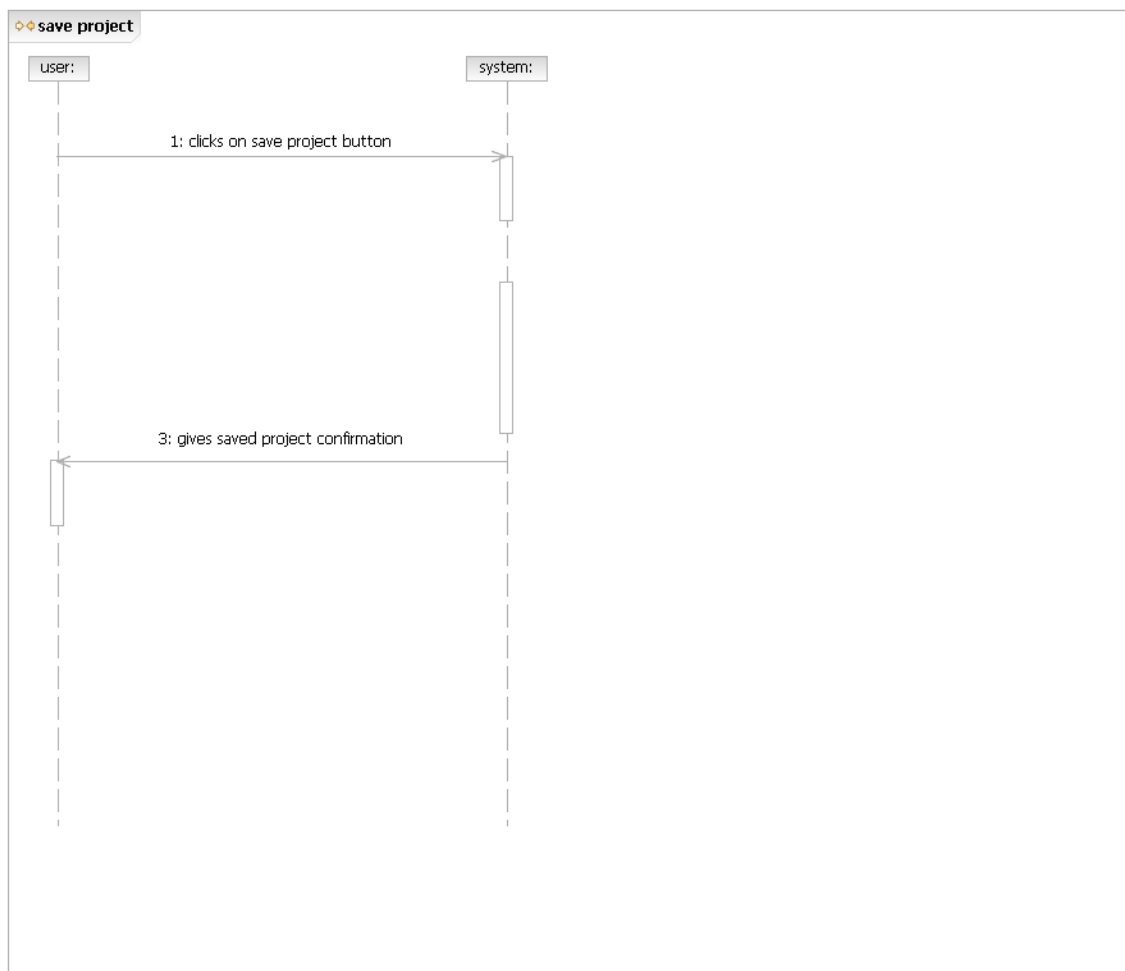


Figure 17: - UCR-3 Sequence Diagram (Save Process)

4.2.4 Process 4

Use Case 4 – Context Sensitive Help

Identifier	P-04
Use-Case Name	Context Sensitive Help
Abstract	No
Purpose	This process is used to provide a help about any part of projects
Actors	User
Priority	Must Have
Capabilities	OC-8
Requirements	CR-4
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	The system displays context sensitive help when user click help button.
User Interface	Figure 10
Pre-conditions	USC CONIPMO tool is running.
Post-conditions	The parameter help is should guide in right direction
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 28– UCR 4 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on the Help - > USC CONIPMO contents button on the input screen	
2.		The context sensitive help topics are displayed.
3.	User selects help topic	
4.		System displays Help.

Alternate Course of Action: None**Exceptional Course of Action: None**

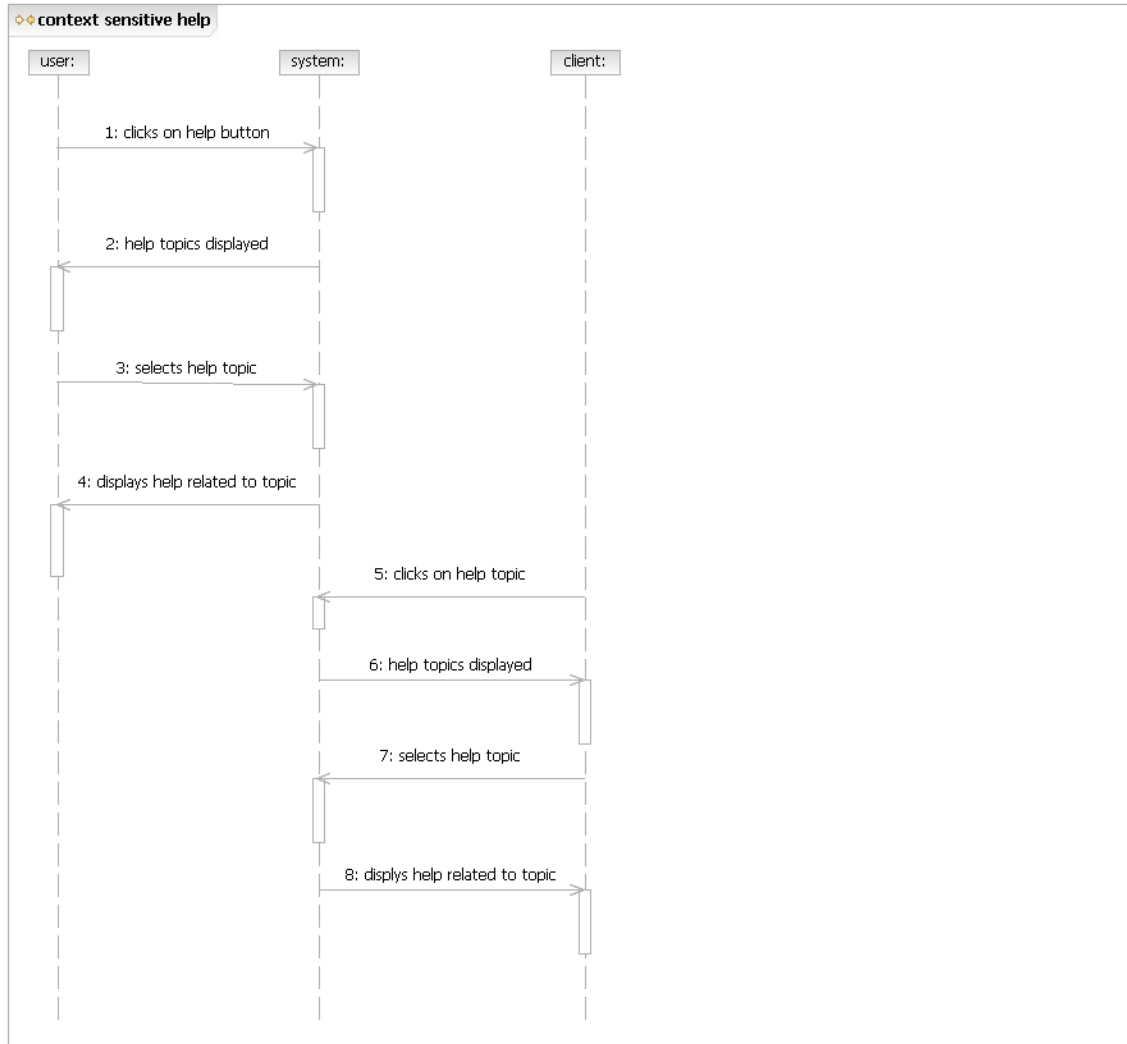


Figure 18: - UCR-4 Sequence Diagram (Help Process)

4.2.5 Process 5

Use Case 5 – Load Project

Identifier	P-05
Use-Case Name	Load Project
Abstract	No
Purpose	This process is used to load the previously stored input parameters for the saved project.
Actors	User
Priority	Must Have
Capabilities	OC-05
Requirements	CR-6
Risks	None

High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	User seeks to load the previously stored input parameters for the saved project.
User Interface	Figure 3
Pre-conditions	User is at the main application screen.
Post-conditions	The project data is loaded and can be modified or used for re estimation.
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 29– UCR 5 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - > Open Project button on the main application screen	
2.		The system displays the project list
3.	The user selects the project	
4.		The system loads project data.

Alternate Course of Action: None**Exceptional Course of Action: Database Error**

Seq. #	Actor Actions	System Response
1.	The user clicks on the File - > Open Project button on the main application screen	
2.		The system displays the project list
3.	The user selects the project	
4.		Database error occurs while loading saved data and correct error message is displayed.

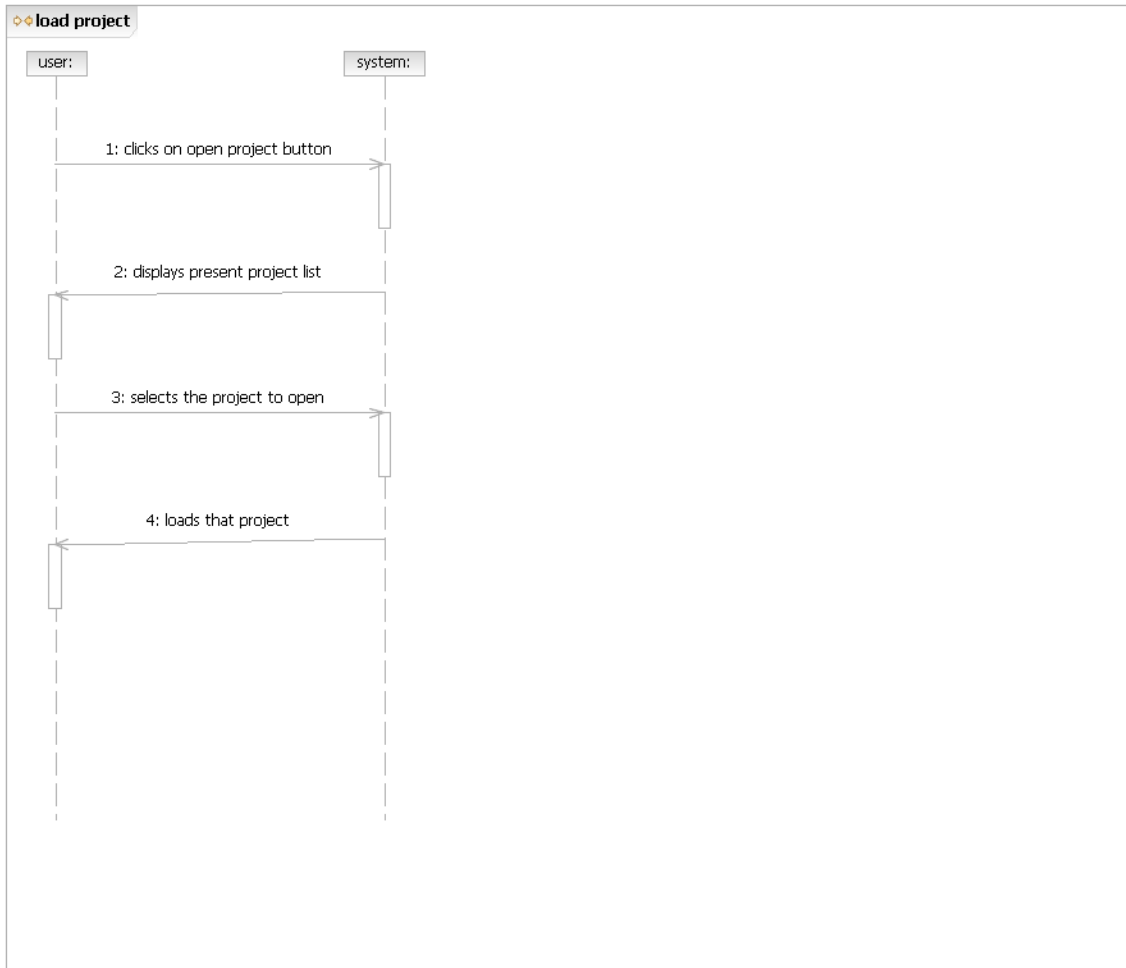


Figure 19: - UCR-5 Sequence Diagram (Load Project) Process

4.2.6 Process 6

Use Case 6 – Export to Excel

Identifier	P-06
Use-Case Name	Export to Excel
Abstract	No
Purpose	This process is export the user entered information and the calculated results into an MS Excel Spreadsheet
Actors	User
Priority	Must Have
Capabilities	OC-04
Requirements	CR-7
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	User seeks to export the entered information and the calculated results into an MS Excel Spreadsheet
User Interface	Will be included in LCA prototype
Pre-conditions	<ol style="list-style-type: none"> 3. User is at the main application screen. 4. User needs to export data to Excel
Post-conditions	The project data is exported to an Excel sheet, and is ready for manipulations.
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 30– UCR 6 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	User clicks on File -> Save Screens button.	
2.		Provides screen to save as excel file
3.	User enters name for excel file	
4.		System saves the excel sheet.

Alternate Course of Action: None

Exceptional Course of Action: None

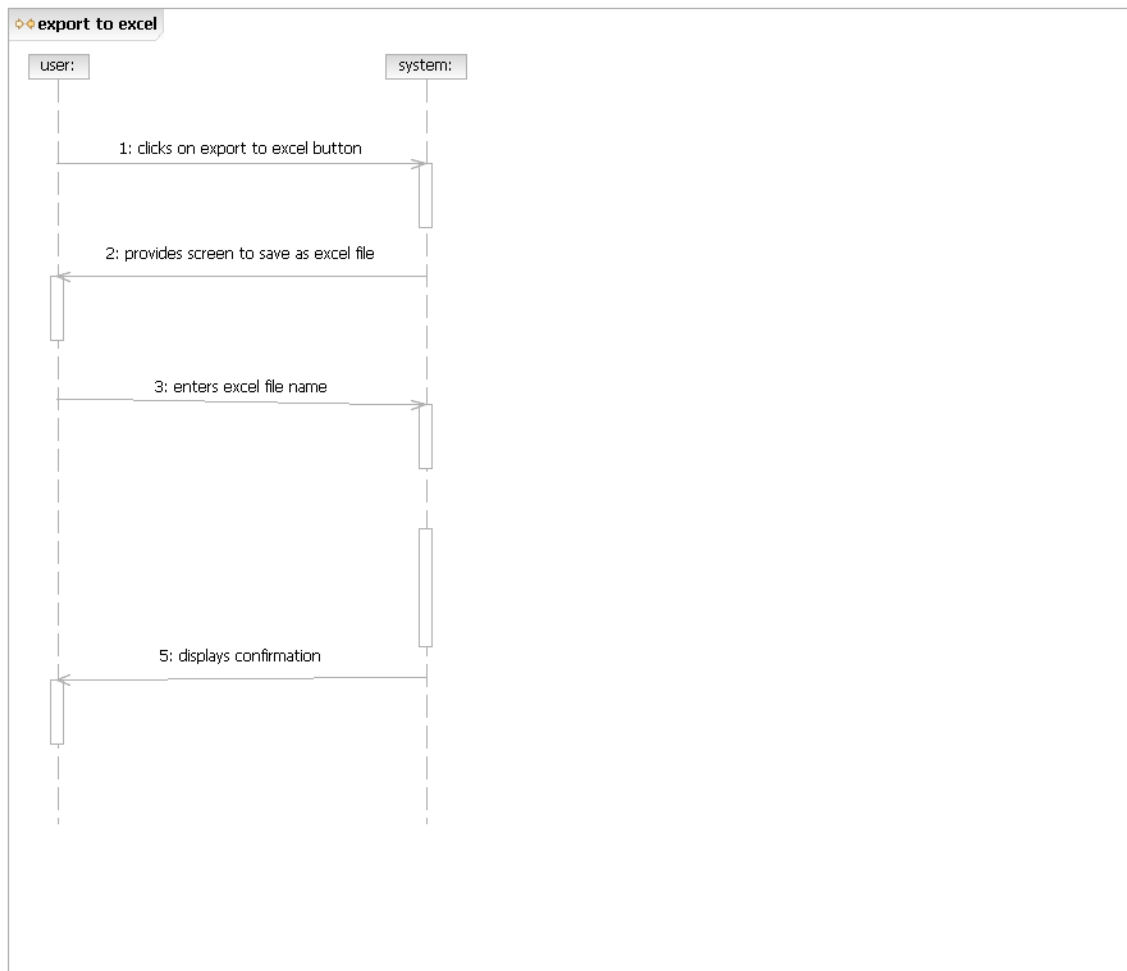


Figure 20: - UCR-6 Sequence Diagram (Export to Excel) Process

4.2.7 Process 7

Use Case 7 – Print Screens

Identifier	P-07
Use-Case Name	Print Screens
Abstract	No
Purpose	This process is print the screens on a connected printer
Actors	User
Priority	Must Have
Capabilities	OC-07
Requirements	CR-5
Risks	None
High-Risk?	No
Architecturally Significant?	Yes
Development Status	LCO
Overview	User seeks to print screens for later reference
User Interface	Figure 2
Pre-conditions	2. User is at the main application screen.
Post-conditions	The project data screens are printed on a connected printer
Specializes	NA
Includes	None
Extends	NA
Extension Points	NA

Table 31– UCR 7 Description

Typical Course of Action:

Seq. #	Actor Actions	System Response
1.	User clicks on File -> print screen button.	
2.		Prints Screens on connected printer

Alternate Course of Action: None

Exceptional Course of Action: None

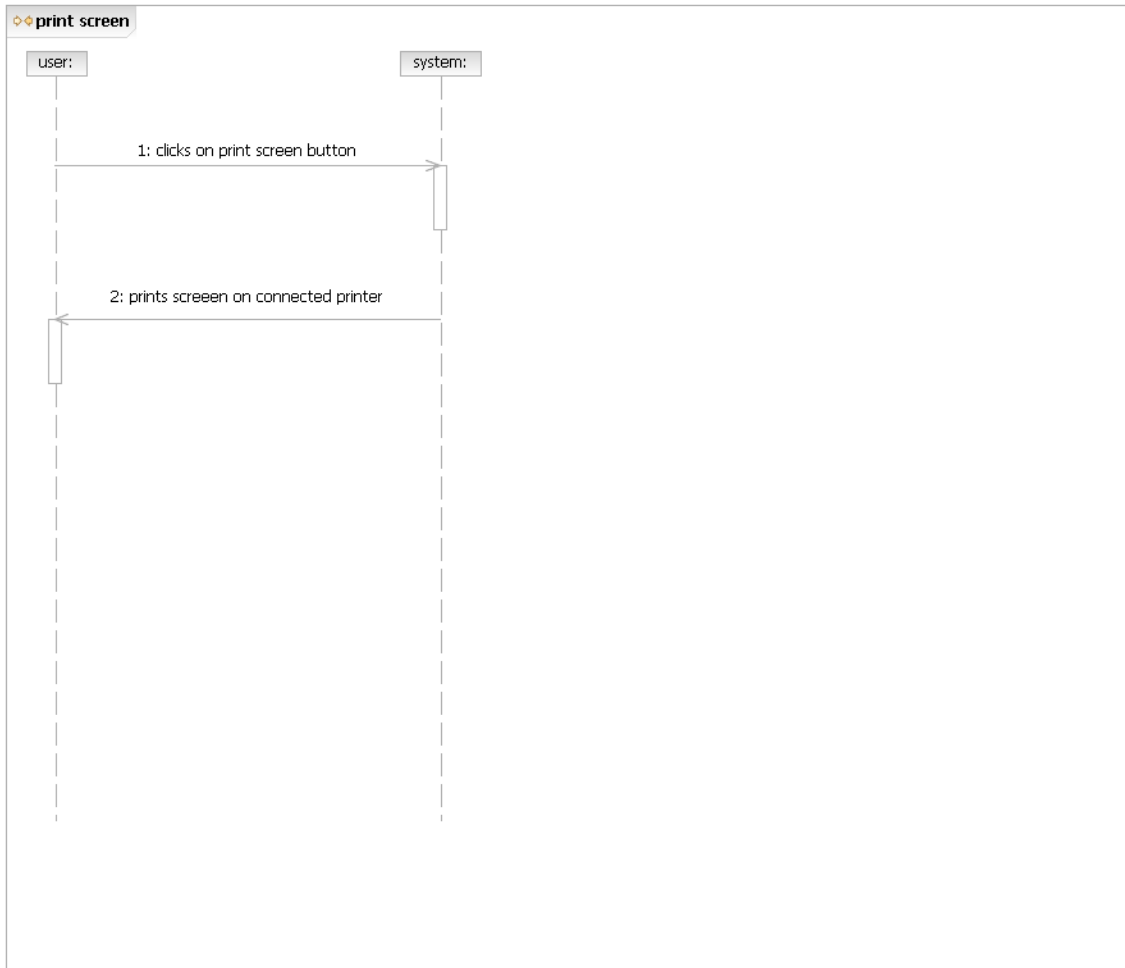


Figure 21: - UCR-7 Sequence Diagram (Print Screen) Process

4.3 Patterns & Frameworks

<<will be added in next version>>

4.4 Project Artifacts

<<will be added in next version>>

5. Glossary for System Analysis and Design

NA

6. Appendices

No appendices defined at this point.