Analysis and design

5.1 Introduction

Last chapter explained HAM system development approach waterfall model as software process model, Object Orient analysis and design methodology and Unified Modeling Language. Then identified developing language, and scope of the project.

This chapter first we talk about Analysis stage, then the design stage. The design stage includes all the Use-Cases, Activity, Sequence diagrams, Class diagrams, the Database design and the User interface design

5.2 Analysis Stage

Object Orient Analysis of this stage is identifying the existing system modules and initiate analysis from existing level. The existing system has requirements, Use-Cases, Use-Case descriptions and activity diagrams also. Table 5.1 show check list for this stage and figure 5.1 is the Use-Case for existing system.

5.2.1 Software Requirements for Existing System
Necessary Requirements

1. The system shall have a facility to select each site one by one (tree view).
2. The system shall have facility to search a given site whether it has alarms by site name and by Alarm code.
3. The system shall have facility to Query Alarm history of each site.
4. The system shall show alarms for Not-commissioned sites.
5. The system shall show alarms with same red colour.
6. The system shall play sound for every alarm occurring.
7. The system shall print current alarm details by site name and by Alarm code.

5.3 Check list for existing system

Use Case	Software Requirement	Use-Case Description	Activity Diagram
Show Alarms	1, 4, 5	1.0	1
Alarm sound play	6	5.0	5
Query Alarms History	3	2.0	2
Search Alarms	2	3.0	3
Print Alarms	7	4.0	4

Table 5.1- Existing system check list

5.3.1 Use-case Diagram for existing System

There are five cases identified for the analysis, Show alarms, alarm sound play, query alarm history, search alarms and print alarms. A "show alarms" is the main alarm interface, which shows all the alarms with red colour. Once alarm are generated the system gives alarm sound, it plays until manually mute or acknowledge the alarm. Query alarm history is a history option to query alarms from history databases.As there are more than hundred sites for each server, additionally search alarm option is given. If alarms are found on search operation they can print by local or network printer.
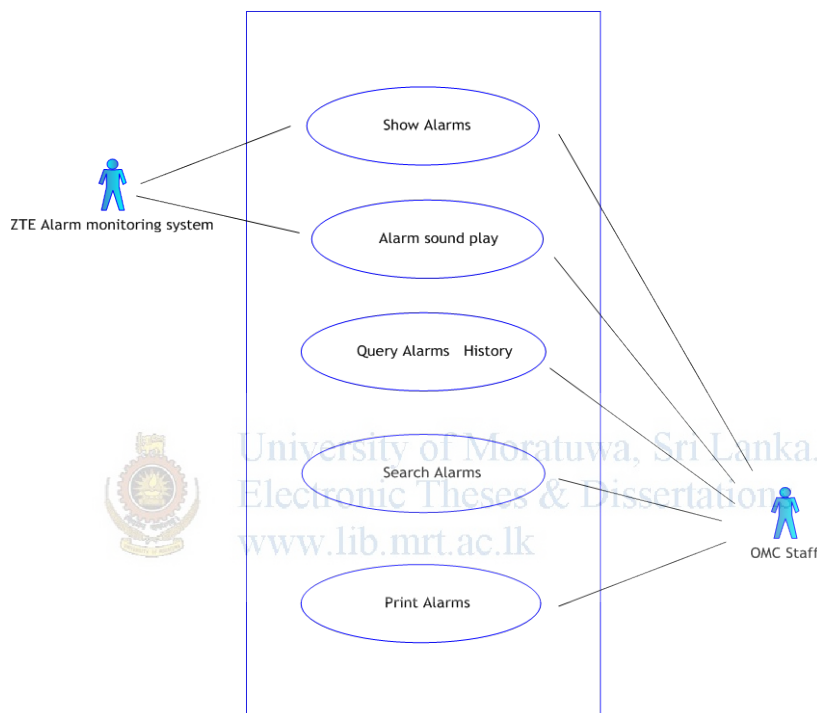

Figure 5.1 – Use-Case diagram existing

5.3.2 Use-case description for Use Cases

Name	1.0 Show Alarms
Actor	OMC Staff ,System
Pre-Conditions	User already know site ID for each Site Name.
Post Condition	User must close selected site Alarm view.
Flow	User moves to selected client machine.
	System shows Alarm interface.
	User clicks on selected site on the tree view interface.
	System shows an option list.
	User selects the Alarm option.
	User sends "OK".
	System gives Alarms of selected site.
	User closes the site's Alarm window.
Exception	

Name	2.0 Query Alarm History
Actor	OMC Staff
Pre-Conditions	User already know site ID for each Site Name.
Post Condition	User must close selected site Alarm view.
Flow	User moves to selected client machine. System shows Alarm interface. User clicks on selected site on the tree view interface. System shows an option list. User selects the Alarm History option. System shows Date option Box User select date range User sends "OK". System gives History Alarms of selected site. User closes the site's Alarm window.
Exception	

Name	3.0 Search Alarms
Actor	OMC Staff
Pre-Conditions	Input Alarm code or site name must be known.
Post Condition	
Flow	User clicks on the Search Alarms. System Shows Interface If user selects search by Alarm code. System shows list box as preference. User selects the Alarm code from the list. User presses Enter on OK button. System shows Alarms for given particular code.
Exception	If user selects the search by Site name and selects a site from the list box. System shows Alarms for given particular Site.

Name	4.0 Print Alarms
Actor	OMC Staff
Pre-Conditions	Input Alarm code or site name must be known.
Post Condition	
Flow	User clicks on the print Alarms. System Shows print option Interface If user selects print by Alarm code System shows list box as preference.

	User selects the Alarm code from the list.
	User presses Enter on OK button.
	System shows print preview.
	System prints Alarms for given particular code.
Exception	If user selects the print by Site name and selects a site from the list box.
	System displays and prints Alarms for given particular Site.

Name	5.0 Alarm sound play
Actor	System , OMC Staff
Pre-Conditions	Failure alarm must be existing
Post Condition	
Flow	Server receives failure alarm
	Server send Alarms to Alarm box
	Alarm Box play Alarm sound
	User mute the Alarm sound
	Alarm box stop playing the Alarm
	If user not mute Alarms, it continuously play Alarm sound
Exception	If user mute Alarms, sound stops

5.3.3 Activity Diagrams – Show Alarms

Here "Show Alarms" is very difficult process as user moves to each client machine and search Alarms one by one from each site. Figure 5.2 show the activity diagram.
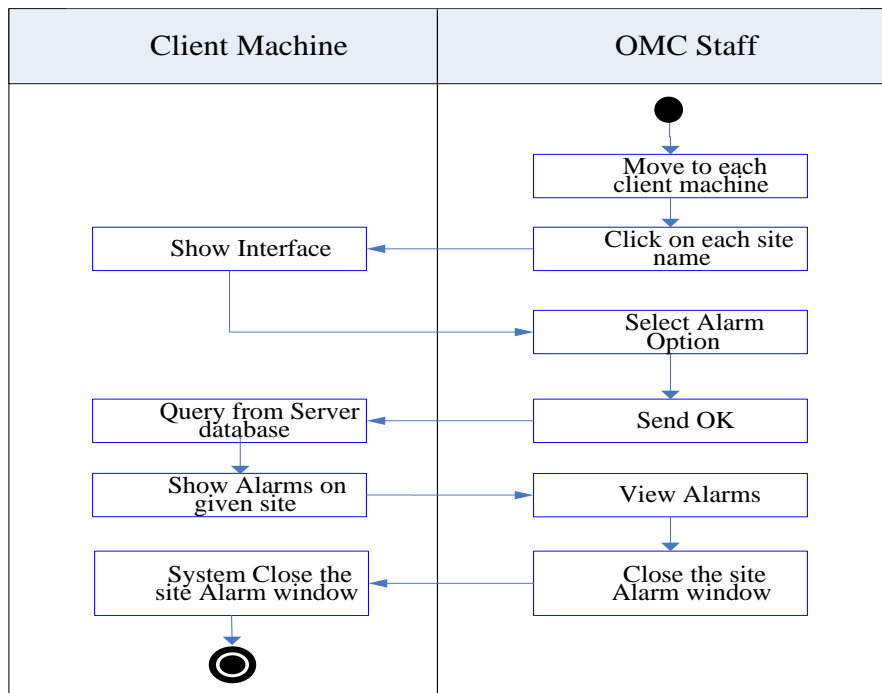
Figure 5.2 – Show Alarms

Please refer to the Activity Diagrams for the existing system in Appendix B for more information.

5.4 Design Stage
5.4.1 Software Requirements

5.4.1.1 Functional and Necessary Requirements
1. The system shall have a facility to view Different alarms in different colours with colour selection option.

Critical Alarms	Cell breaks Alarm	Red colour
	All LAPD link failure	Red colour
	TRx Blocked	Red colour
Major Alarms	Power failures	Light Blue colour
	Temperature Alarms	Purple colour
	Fan Alarms	Yellow colour
	SWR Alarm	Pink colour
Minor Alarms	PA over Temperature	Brown
	Master and slave communication link failure	Ash colour
	Standby CMM board abnormal	Ash colour
	Other Minor Alarms	Light Green colour

Table 5.2- Standard Colours

2. The system shall have a facility to give a colour indication for current alarms with the duration of each alarm as

   If lower than 1hour – green colour
   Between 1 and 2hours – orange colour
   Greater than 2hours – red colour
   If duration greater than 3days – no colour indication

3. The system shall have a facility to add new alarm codes.

4. The system shall have facility to search a given site whether it has alarms.

5. The system shall have facility to show BSC power alarms and BTS power alarms with different colours

   BTS Power failures   - Light Blue colour
   BSC Power failures   - Red colour

6. The system shall have option to change alarm colours as desires.

7. The system shall have facility to input commissioned sites with battery bank capacity and most probable alarm cause for each site.

8. The system shall have facility to input not-commissioned sites.

5.4.1.2 Functional and Desirable Requirements
9. The system should have a facility to give cause of "Site out of service" alarm with comparing history of that particular site.

10. The system should print current alarm details.

11. The system should send SMS for relevant engineers with informing the alarms.

5.4.1.3 Non-Functional Requirements

12. The system shall not play alarm sounds unnecessarily.

13. The system shall not give wrong alarms.
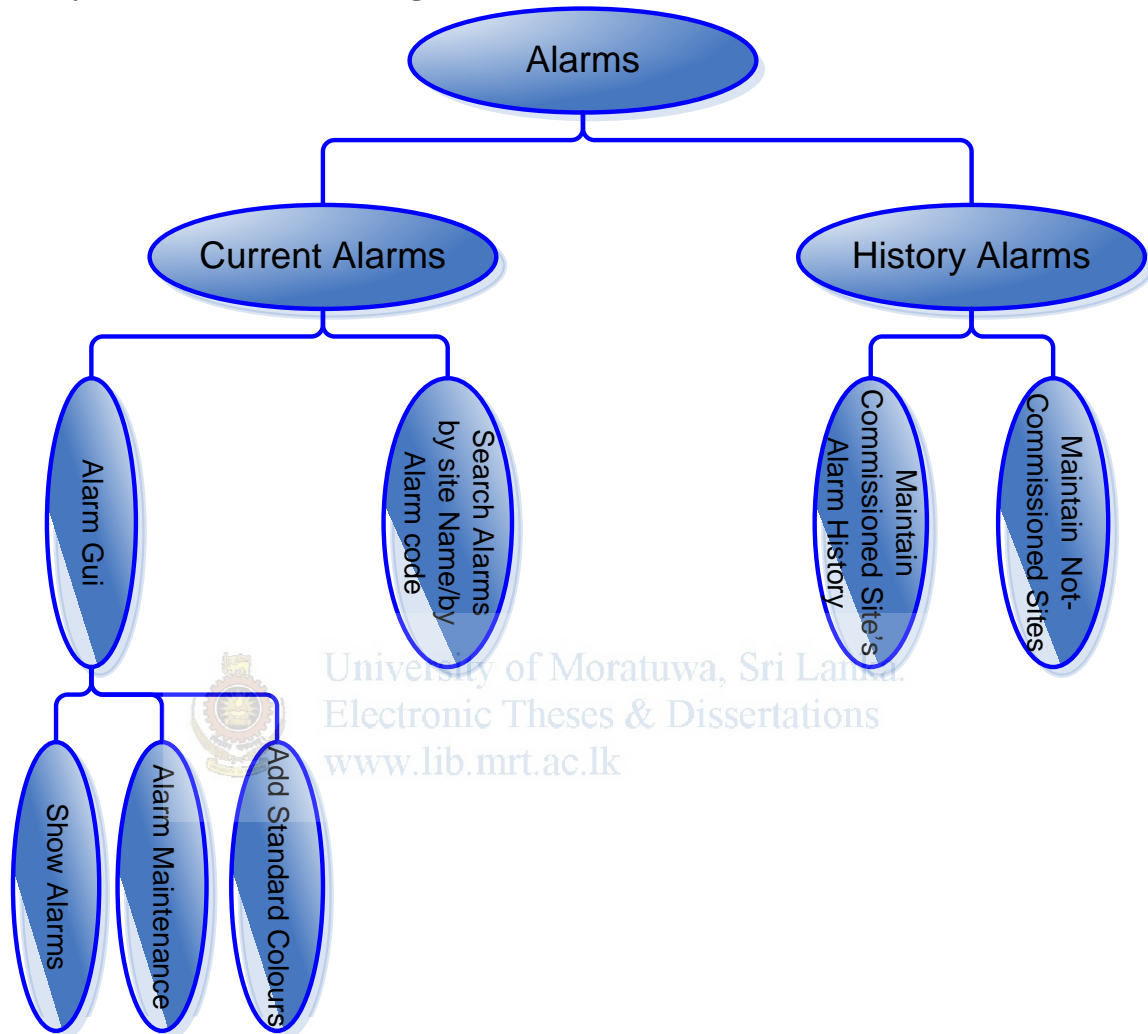
5.5 System Architectural Design

Figure 5.3 – System Architectural Design

Proposed HAM system basically divided into two parts as Current Alarms and History Alarms. The Current Alarms again divided into Alarm GUI and Search Alarm by Site Name/ by Alarm Code. The Alarm GUI has Show Alarm, Alarm Maintenance and Add Standard Colours interfaces.

History Alarm consists of Maintain Not-Commissioned sites and Commissioned sites Alarm History Maintenance interfaces. Figure 5.3 shows above details and Figure 5.4 shows the Overview of the proposed system.

5.6 Proposed System Overview

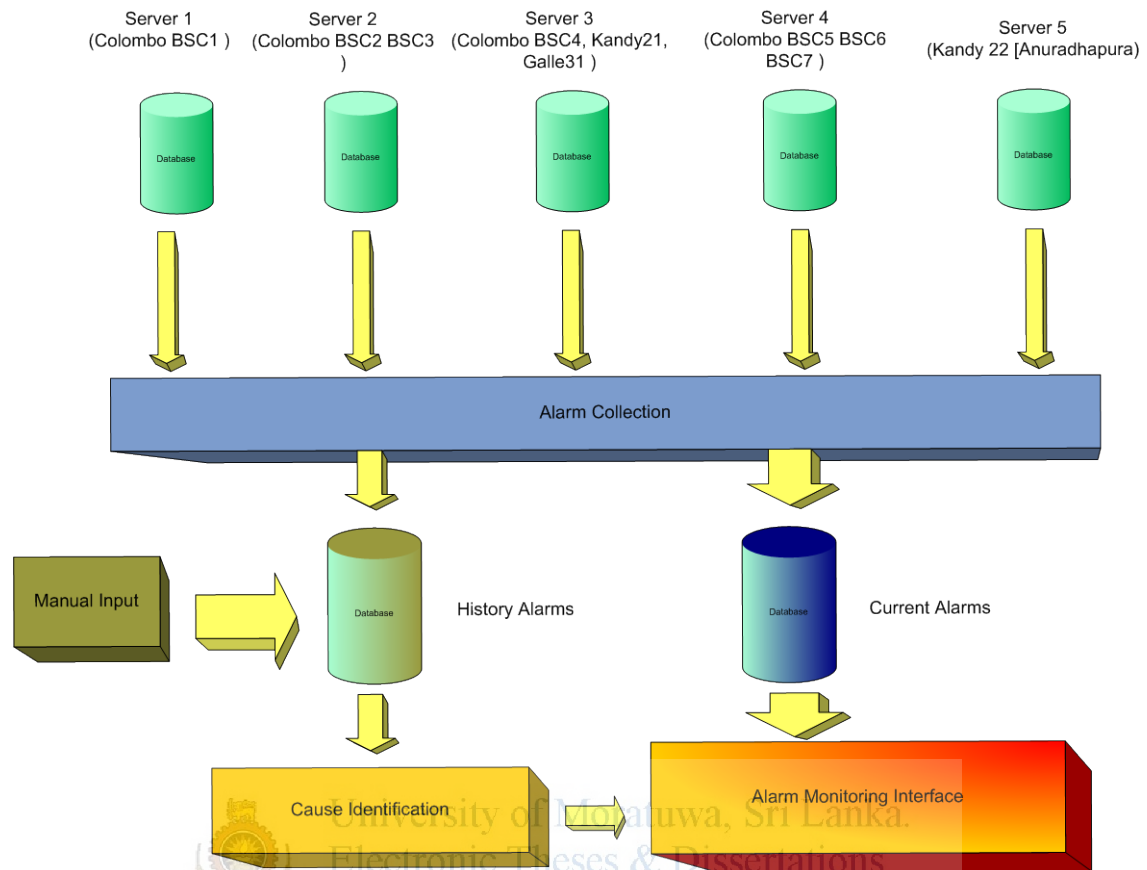Figure 5.4 – Proposed System Overview

Figure 5.4 shows the proposed system Overview. There are five databases from all five Alarm Servers. "Alarminfo" database of each server are access by proposed system using connection strings with continuous clock events at every second. Interval of the clock can decide at implantation stage after several tests.

All the collected Alarms are buffered at "Alarm collection". They are showing on Alarm Grid Graphical User Interface on "Alarm Monitoring Interface". Alarms are categorized in to two groups.

1. Current Alarms
2. History Alarms

    Alarms History can add and modify using manual input hence decide the Alarm cause.

After "cause identification" the Alarms are shown on the "Alarm Monitoring Interface" .

5.7 Check list for proposed system

Use Case	Software Requirement	Use-Cse Description	Activity Diagram	Sequence Diagram	User Interface	Test Case
Show Alarms	1,2,5,9, 12, 13	1.0	Figure 5.6, 5.8	Figure 5.7, 5.9	Figure F.1	Table 7.1
Alarm Maintenance	3, 6	2.0	Figure C.1	Figure D.1, D.2, D.3, D.4	Figure F.3	Table 7.2, G.1, G.2, G.3
Standard Colours	1	3.0	Figure C.2	Figure D.5	Figure F.4	G.4
Not-Commissioned Site Maintenance	8	4.0	Figure C.3	Figure D.6, D.7, D.8, D.9, D.10	Figure 5.20	G.5, G.6, G.7, G.8, G.9
Commissioned Site's Alarm History Maintenance	7	5.0	Figure C.4	Figure D.11, D.12, D.13, D.14, D.15	Figure F.2	G.10, G.11, G.12, G.13, G.14
Search Alarms by Site Name/ by Alarm Code	4, 10	6.0	Figure C.5	Figure D.16	Figure F.5	G.15, G.16

Table 5.3- Check list for proposed system

5.7.1 Use-case Diagram for proposed System

For the Design level there are 6 cases identified. Show Alarms, Alarm Maintenance, Add Standard Colours, Not-Commissioned Site Maintenance, Commissioned Site's Alarm History Maintenance and the Search Alarms by Site name/by Alarm Code.

Show Alarms is the Main Alarm Interface, which shows all the current alarms on single viewer. This use case is includes query all the databases, hide not commissioned sites, show commissioned sites with their alarms, reason with tool tip text, different colours for different alarms and real-time update.

Alarm Maintenance is a use case for input and modifies all the alarm codes with their background and font colours. User interface of this use case includes add, modify and delete all the alarm codes for the Alarm, Colour and priority databases.

Add Standard Colours is the use case for modify or add alarm code colours with standard template. When users modify the alarm code colour, there is an option to modify all the standard alarm codes with given specific colour template, which is identified in software requirement specification.

Not- Commissioned Site Maintenance is a maintenance use case for add, modify and delete option for not-commissioned sites. Additionally this use case includes an option to move not-commissioned site to commissioned status.

Commissioned Site's Alarm History Maintenance is a maintenance use case for add, modify and delete option for commissioned sites. This use case is use to input alarm history reason and battery bank duration for maintenance purpose. Additionally this use case includes an option to move commissioned site to not-commissioned status

Search Alarms by Site Name/ by Alarm Code do 2 main functions

1. Search alarms
2. Show alarms on crystal Report viewer and Print Alarms

Search alarms is little complex as it can search by Site name or Alarm code. If numeric input given system treats as Alarm Code and else Site Name. Here search done for number of databases, in this scenario only two servers are query for the alarms.

Show alarms on Crystal Report viewer and print is totally developed on crystal repots.
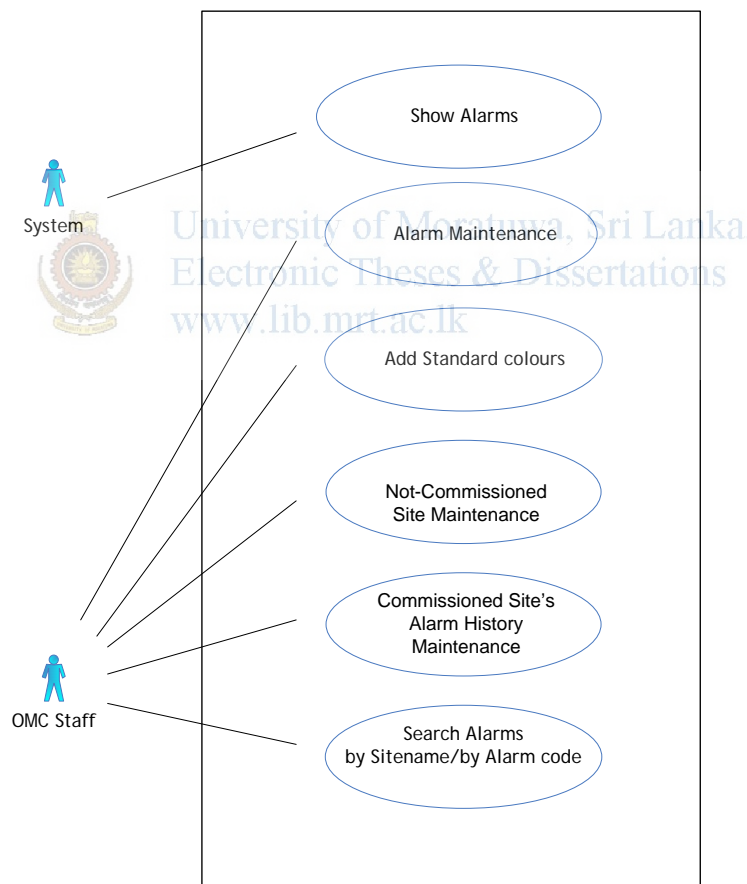

Figure 5.5 – Proposed Use-Case Diagram

Proposed Use-Case diagram consists with five use-cases. They are

1. Show Alarms
2. Alarm Maintenance
3. Add Standard Colours
4. Not-Commissioned Site Maintenance
5. Commissioned Site's Alarm History Maintenance
6. Search Alarms by Site Name/ Alarm Code

"Show Alarms" is the main GUI for the alarm monitoring. Show Alarms give the Real-time monitoring interface." Alarm Maintenance" is for add alarm codes with colours, Alarm Code, Alarm Name and alarm code priority level to the database for future use. "Add Standard Colours" is predefined colour template for upload once change the colour configuration for each alarm." Not-Commissioned Site Maintenance" is add Not-Commissioned Sites to the data base. "Commissioned Site's Alarm History Maintenance" is Alarm history information adding interface to the data base which includes battery bank duration, Alarm history details and Site Name for future use." Search Alarms by Site Name/ Alarm Code" is Alarm searching interface by Site Name or Alarm Code for all the servers by one single search.

5.7.2 Use-Case description for the Use Cases

Name	1.0 Show Alarms
Actor	System, OMC Staff
Pre-Conditions	System already know Alarm code for each specific Alarm. System must know specific colour for each Alarm code. System must have commissioned sites Details (Battery backup details and common failure cause). System must have Not-commissioned sites database.
Post Condition	Give Real Time Alarm Monitoring GUI
Flow	System Select 1st Alarm. If site is commissioned then insert Alarm duration. Insert colour as selected Alarm code. Insert colour as Alarm duration. If Alarm Code is "8196" and Alarm code "3862" exist for same site, and then give failure cause history as "Suspect Power failure and Battery drain". Display the Alarm to OMC Staff. If not at the end of Alarms go to Next Alarm.
Exception	If selected site Not-commissioned return to Next Alarm. If Alarm Code is "8196" and Alarm code "3862" not exists then insert failure cause history. If Alarm Code is "8196" and history not exists, insert 8196 code details given by Server.

Name	2.0 Alarm Maintenance
Actor	OMC Staff
Pre-Conditions	Must already know Alarm code for each specific Alarm.
Post Condition	The system will be updated according to the entered data.
Flow	User clicks on the Add Alarms link. System Shows Alarm input Interface User input the Alarm Codes in the input boxes and Edit

	colours.
	User selects "Add Alarm".
	If numeric data System saves to the Database.
	User presses Enter on OK button.
	System saves to the Database.
Exception	Else if User select "Modify Alarm".
	If numeric data System saves to the Database.
	Else User selects "Delete Alarm".
	If numeric data record delete from the Database.
	If the non numerical data entered system will send an error message saying "Please enter numeric value for the Alarm Code"

Name	**3.0 Standard Colours**
Actor	OMC Staff
Pre-Conditions	Must already know Alarm code for each specific Alarm.
Post Condition	The system will be updated according to the entered data.
Flow	User clicks on the Alarm Code with Standard Colours link.
	System Shows Standard Colours Interface
	User presses Apply button.
	System saves to the Database
Exception	

Name	**4.0 Not-Commissioned Site Maintenance**
Actor	OMC Staff
Pre-Conditions	Must already know sites give Alarms, But are not commissioned yet.
Post Condition	The system will be updated according to the entered data.
Flow	User clicks on the Not-Commissioned sites menu.
	System Shows Interface
	User does modification for input box.
	If user select "Add Record".
	System data add and saves to the Database.
Exception	If user select "Modify Record".
	Modify record, and update database
	If user select "Commissioned".
	Modify record, and update database
	If user select "Delete Record".
	Delete record, and update database

Name	**5.0 Commissioned Site's Alarm History Maintenance**
Actor	OMC Staff
Pre-Conditions	Must already know sites frequent failure cause and Battery bank duration.
Post Condition	The system will be updated according to the entered data.
Flow	User clicks on the Maintain Commissioned Site's Alarm History link. System Shows Interface User do modification on Site Name, Frequent failure cause, Battery bank capacity(Hours) input boxes If user select "Add Record". System data add and saves to the Database.
Exception	If user select "Modify Record". Modify record, and update database If user select "Not-Commissioned". Modify record, and update database If user select "Delete Record". Delete record, and update database

Name	**6.0 Search Alarms by Site Name/ by Alarm Code**
Actor	OMC Staff
Pre-Conditions	Input Alarm code or site name must be known.
Post Condition	System Displays Alarms
Flow	User clicks on the Search Alarm by Site Name/by Alarm Code. System Shows Interface If user select Site Name from drop down list box. User presses "Apply" System shows Alarms for given particular code.
Exception	If user input Alarm Code in the list box. And user presses "Apply" System shows Alarm records equal to Alarm Code.

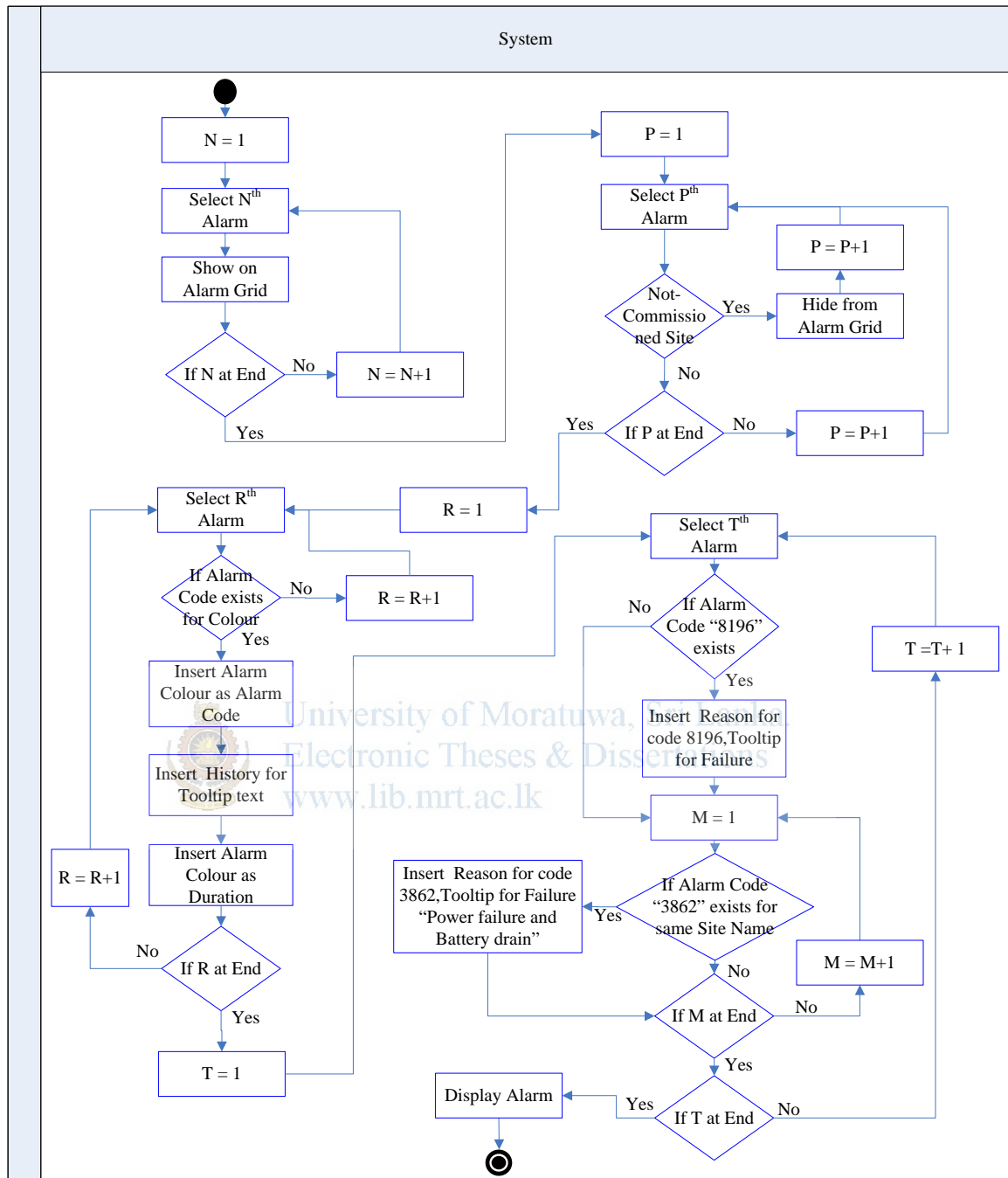## 5.7.3 Activity Diagrams for the Proposed HAM System

Figure 5.6 –"Show Alarms" Activity Diagram

Activity Diagram(Figure 5.6) include with four main activities they are populate grid, Hide Not-Commissioned sites, Insert Alarm Colour and Insert failure cause using history records. With colour inserting activity another two sub activities running they are add Tool tip text and add colour indication for Alarm duration from current time.

Please refer to the Activity Diagrams for the proposed system in Appendix C for more information.

5.7.4 Grammatical Analysis

Grammatical analysis basically goes through all the documents referring for alarm monitoring, Software Requirement Specification and Use-Case descriptions. Finally decide what are the Nouns and verbs which can use as methods. Nouns are Classes or Attributes.

	Nouns	Category
1	Not-Commissioned Sites	Class
2	Commissioned Sites	Class
3	SaveToTheDatabase	Method
4	CheckPowerFailure	Method
5	SaveToThedatabase	Method
6	GiveFailureReason	Method
7	Sites	Class
8	Sitname	Attribute
9	Colour	Class
10	CID	Attribute
11	CName	Attribute
12	AlarmCodeColour	Class
13	SelectColour	Method
14	MatchDuration	Method
15	NumericCheck	Method
16	SavetoThedatabase	Method
17	AlarmDurationColour	Class
18	CountDuration	Method
19	Alarmdatabase	Class
20	Query current Alarms	Method
21	Query Database	Method
22	Get Details from Database	Method
23	AlarmCode	Attribute
24	Sitename	Attribute
25	AlarmTime	Attribute
26	AlarmCodeDetails	Attribute
27	SiteAlarms	Class
28	GetRecord	Method
29	CheckCommissionedStatus	Method
30	InsertColour	Method
31	InsertAlarmDetails	Method
32	SiteSearch	Class
33	SearchbySiteName	Method
34	PrintbySiteName	Method
35	SearchbyAlarmCode	Method
36	PrintByAlarmCode	Method
37	SendSiteName	Method
38	SendAlarmCode	Method
39	SendToPrinter	Method
40	Printer	Class
41	Alarms Interface	Class
42	RequestInputAlarmInterface	Method
43	RequestEditAlarmInterface	Method

44	RequestInputNot-CommissionedSitesInterface	Method
45	RequestInputCommissionedSitesInterface	Method
46	Request Alarm Search	Method
47	Not-Commissioned Sites Interface	Class
48	RequestNot-CommissionedSites	Method
49	SelectInput	Method
50	InputSitename	Method
51	Commissioned Sites Interface	Class
52	RequestCommissionedSites	Method
53	SelectInput	Method
54	Input Sitename and Details	Method
55	InputAlarmInterface	Class
56	RequestToInputAlarmCode	Method
57	InputAlarmCode	Method
58	SelectColour	Method
59	EditAlarmInterface	Class
60	RequestToEditAlarmCode	Method
61	SelectAlarmCode	Method
62	SelectEdit	Method
63	SelectColour	Method
64	SearchInterface	Class
65	RequestSearch	Method
66	Select option by SiteName	Method
67	Select SiteName	Method
68	RequestPrint	Method
69	Select option by AlarmCode	Methods
70	Select AlarmCode	Method
71	SelectToPrint	Method

Table 5.4- Grammatical Analysis

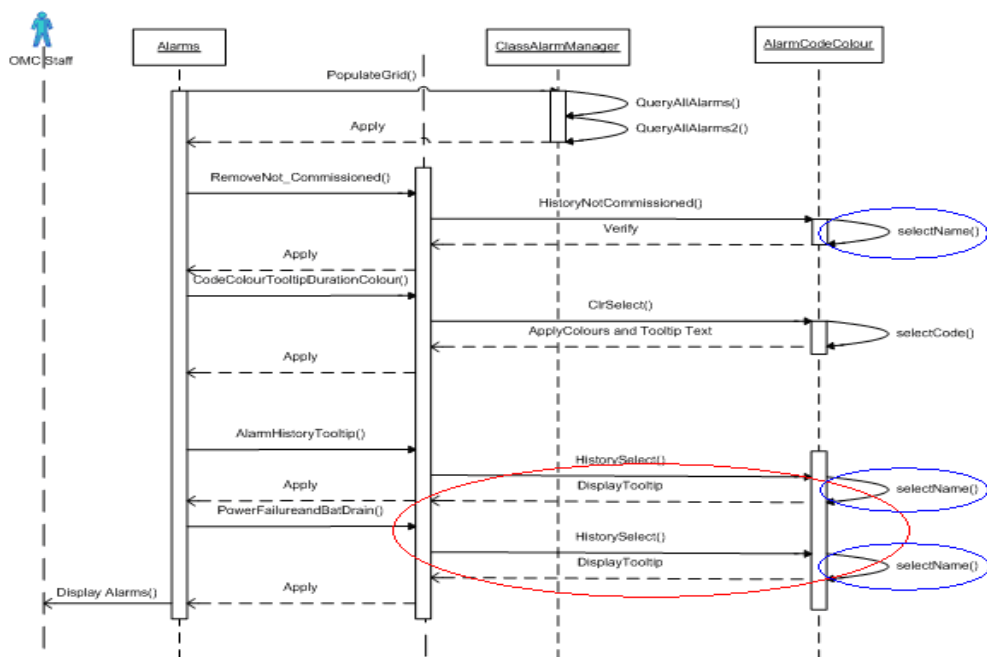## 5.7.5 Sequence Diagrams for the Proposed HAM System

Figure 5.7 –"Show Alarms" Sequence diagram

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Design stage is very important and may identify errors easily. Above Sequence Diagram (figure 5.7) the "HistorySelect()" method pass from "Alarm" Class to "AlarmCodeColour" class twice and use same method "selectName()".This may reduce the system speed and allocate more space for unnecessary coding. These errors can easily correct on design stage. See Figure 5.8 and Figure 5.9. This new modification results modify Activity diagram, use-case description sequence diagram only. Class diagram (Figure 5.10) never does this mistake as it does not repeat same method at single class. Please refer to the Sequence Diagrams for the proposed system in Appendix D for more information.
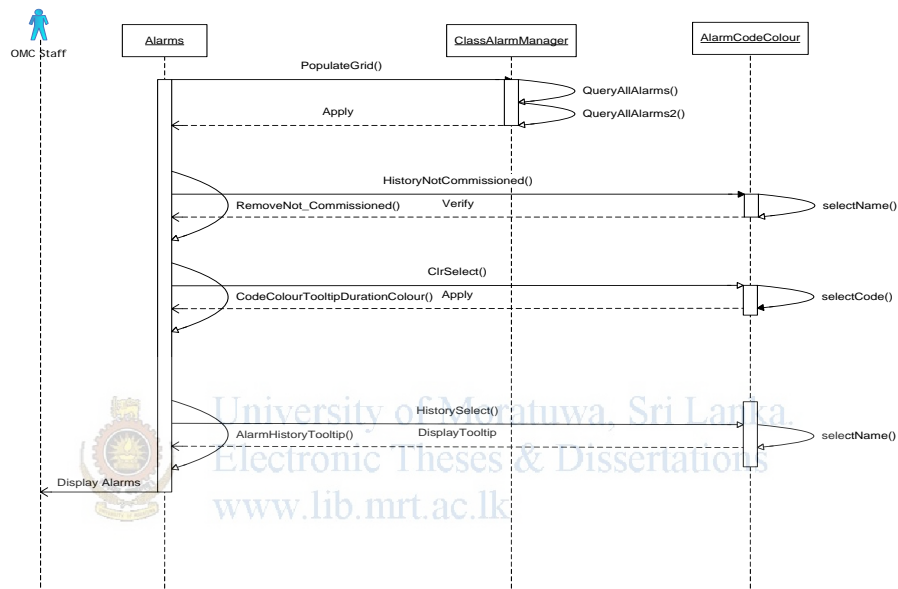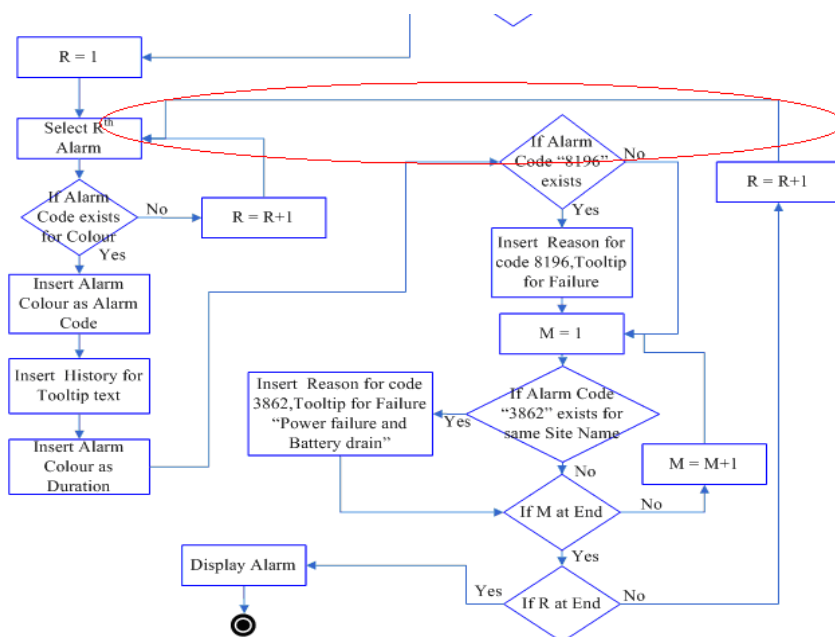

Figure 5.8 – Corrected Sequence diagram

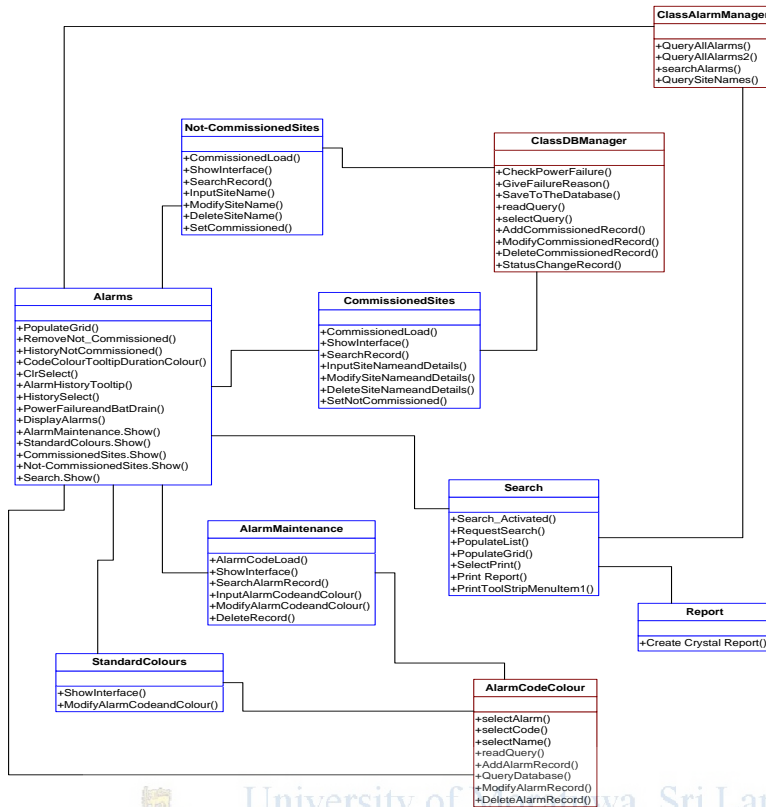Figure 5.9 – Corrected Activity diagram

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5.7.6 Class Diagram

ClassAlarmManager
+QueryAllAlarms()
+QueryAllAlarms2()
+searchAlarms()
+QuerySiteNames()

Not-CommissionedSites
+CommissionedLoad()
+ShowInterface()
+SearchRecord()
+InputSiteName()
+ModifySiteName()
+DeleteSiteName()
+SetCommissioned()

ClassDBManager
+CheckPowerFailure()
+GiveFailureReason()
+SaveToTheDatabase()
+readQuery()
+selectQuery()
+AddCommissionedRecord()
+ModifyCommissionedRecord()
+DeleteCommissionedRecord()
+StatusChangeRecord()

Alarms
+PopulateGrid()
+RemoveNot_Commissioned()
+HistoryNotCommissioned()
+CodeColourTooltipDurationColour()
+ClrSelect()
+AlarmHistoryTooltip()
+HistorySelect()
+PowerFailureandBatDrain()
+DisplayAlarms()
+AlarmMaintenance.Show()
+StandardColours.Show()
+CommissionedSites.Show()
+Not-CommissionedSites.Show()
+Search.Show()

CommissionedSites
+CommissionedLoad()
+ShowInterface()
+SearchRecord()
+InputSiteNameandDetails()
+ModifySiteNameandDetails()
+DeleteSiteNameandDetails()
+SetNotCommissioned()

Search
+Search_Activated()
+RequestSearch()
+PopulateList()
+PopulateGrid()
+SelectPrint()
+Print Report()
+PrintToolStripMenuItem1()

AlarmMaintenance
+AlarmCodeLoad()
+ShowInterface()
+SearchAlarmRecord()
+InputAlarmCodeandColour()
+ModifyAlarmCodeandColour()
+DeleteRecord()

Report
+Create Crystal Report()

StandardColours
+ShowInterface()
+ModifyAlarmCodeandColour()

AlarmCodeColour
+selectAlarm()
+selectCode()
+selectName()
+readQuery()
+AddAlarmRecord()
+QueryDatabase()
+ModifyAlarmRecord()
+DeleteAlarmRecord()

Figure 5.10 – Proposed system Class Diagram

Figure 5.9 shows the "corrected Activity diagram" respect to the "Activity diagram" given in figure 5.6.

Figure 5.10 is the Final Class Diagram which includes six interface classes, three Entity classes

Interface classes are
1. Alarms
2. Not-CommissionedSites
3. CommissionedSites
4. AlarmMaintenance
5. Search
6. StandardColours

Entity classes are
1. ClassAlarm Manager
2. ClassDB Manager
3. AlarmCodeColour

Appendix D gives more detailed Class Diagram at page 78.

5.8 Database design

Database designing is consists of a number of steps which will be carried out by the database designer. Not all of these steps will be necessary in all cases. Usually, the designer must: [12]

- Determine the data to be stored in the database
- Determine the relationships between the different data elements
- Superimpose a logical structure upon the data on the basis of these relationships.

For The Alarm Monitoring System Databases (Figure 5.11) were created by Data Modeling [1].

CommissionedSite	Colour	Alarm
• SiteID	ColourID	AlarmCode
• SiteName	RColour	AlarmName
• B_BankDuration	GColour	ColourID
• AlarmHistory	BColour	P_ID
• Status	RColourfont	Priority
	GColourfont	P_ID
	BColourfont	Priority

5.8.1 ER Diagram

Figure 5.11 - ER Diagram

The relational model is named because it is based upon the mathematical structures known as relations. Figure 5.12 shows Relational tables with 3rd Normal Form [1].

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5.8.2 Relational Tables
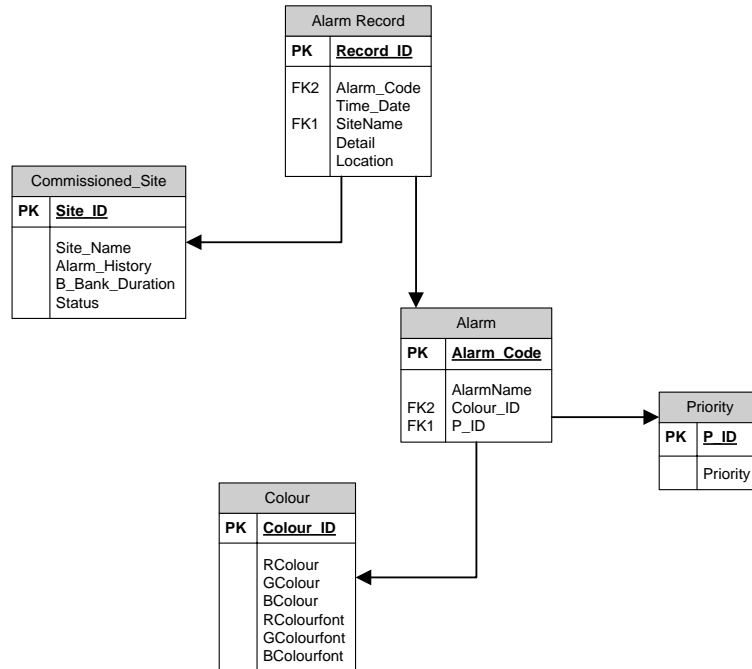
Figure 5.12 - Relational tables with 3rd Normal form

In an Object database the storage objects correspond directly to the objects used by the Object-oriented programming language used to write the applications that will manage and access the data. The relationships may be defined as attributes of the object classes involved or as methods that operate on the object classes.

There are several ways that the database design makes unsuccessful [10]

1. Poor design/planning
2. Ignoring normalization
3. Poor naming standards
4. Lack of documentation
5. One table to hold all domain values
6. Not using SQL facilities to protect data integrity
7. Not using stored procedures to access data
8. Lack of testing

The Database Tables, Views and Stored Procedures are used to Add, Modify, Delete and View data for the Application.

Why Alarm Records search "Commissioned Site" table with SiteName? Why not SiteID? Because there are many "Alarm Record" tables like Alarm Record1, Alarm Record2 and Alarm Record3. Each table may have same SiteID but never have same SiteName.Then the SiteName is unique for "Commissioned Site" table.

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5.8.3 ColourID decide

What is the combination of ColourID? Is it Double or bigint?

ColourID	RClr	GClr	BClr	RClrfont	GClrfont	BClrfont
125200200121050	125	200	200	12	10	50
125200200121050	125	200	200	121	0	50

Table 5.5 – ColourID select as row

Unable to use colour values one after another as it cause misread the colours colourID
Let's assume Data Type is integer?

ColourID	RClr	GClr	BClr	RClrfont	GClrfont	BClrfont
12520020072	125	200	200	12	10	50
12520020072	125	200	200	10	12	50

Table 5.6 – ColourID select as Add

Unable to use addition of colour values, because there may be same combination for
different colour values.
Then it is easy to move data Type as string.

ColourID	RClr	GClr	BClr	RClrfont	GClrfont	BClrfont
125D200D200D12D10D50	125	200	200	12	10	50

Table 5.7 – ColourID select as Type varchar

5.8.4 Design Decisions

Finally Data type is decided as "varchar(50)" for the ColourID field. Then the
ColourID is defined as RClr & "D" & GClr & "D" & BClr & "D" & RClrfont & "D" &
GClrfont & "D" & BClrfont

Figure 5.13 shows the view use to select and show colour codes for the Application.

Figure 5.13 - View_ColourRecordQuery

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5.8.4 Stored Procedures

Stored procedures (Figure 5.14) are used to query records and it enable to reuse same "Stored procedure" for several query condition at different stage of the program.

Figure 5.14 - Stored Procedure (AlarmColour_Insert)

Please refer to the other Stored Procedures in Appendix E for more information.

5.8.5 Database Script

Database script (Figure 5.15) is very important as it store the setup of a basic database. It allows to easily transferring data structure to another server.

Figure 5.15 - Sample-Database script

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5.9 User interface Design

   User interfaces should use design standards. System gets information through interfaces since user interaction with system is handled by the user interfaces. Because of that user interface should be well structured and it should be user friendly.

5.9.1 Overview of user interface design

The objective of the interface design is to provide the best way for people to communicate with computer. It is important to have good interfaces because it impact on most people. Since computer is a part of people's normal work and nowadays people spent their most of the time with computers this impact is increasing. Because of that their output and satisfaction is depends on the good interfaces.

One of the most important activities in the system design is improving interaction between computer and people. To do this need to have good interfaces which use good design standards.

There are many ways to estimate a good interface. One is to find out how user-friendly the interface is. The interface should be helpful, useful, tolerant and adaptable. Also user should be happy and confident to use it. Next one is robustness. Prevent interface errors from the system is called as robustness. Usability is another important feature of the user interface. Means how easy it is to use an interface.

5.9.2 User interface descriptions

   All the interfaces have the same building blocks. Fonts, font styles, font sizes are standardized and a common template is used for the interfaces. Every interface has a header which shows the company logos (Hutch Logo).

The system will be used by different users and their preferences may different. Therefore limited colors are used in interface designing. Resolution of the monitor was considered while the interfaces were designing. The resolution used in interface designing was 1024 by 768 pixels.

5.9.3 List of graphical user interfaces

Splash Screen interface with Hutch Logo

- Splash Screen

About Interface for System introduction

- About box

Message boxes

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Input and search Interface for Not-Commissioned Sites
- Not-Commissioned Site Maintenance

Main Alarm Interface for monitoring alarms
- HAM Alarm Monitor

Input and search Interface for Alarm Code and Colour management
- Alarm Maintenance

Input and search Interface for Commissioned Sites
- Commissioned Site's Alarm History Maintenance

Input and Modify Interface for Standard Alarm Codes
- Standard Colours

Search and Print Interface by Alarm Record or by Site Name
- Search

5.9.4 Sample user interfaces

Figure 5.16 - Splash Screen

Figure 5.16 shows the Splash Screen of HAM (Hutchison Alarm Monitoring) System. It is include with The Hutchison Logo at the Top-right of the picture.

Top-Middle of the picture "Welcome" message added.

Picture shows a Transmission Tower on bottom-left and mobile phones on bottom-right side. On mobile phones there is a Sunflower.

Right side of the Splash Screen dedicated for labels.

1. The top label shows "Hutchison Alarm Monitoring System".
2. Bottom label shows "Copyright: Hutchison Telecommunication Lanka (Private) Limited."

| Control Name	Type	Width	Height	Back Colour	Text	Font	Font Colour
SplashScreen	Form	496	303	_	_	_	_
MainLayoutPanel	Picture box	496	303	Welcome picture	_	_	_
Applicationtitle	Label	247	212	Lemon Chiffon	"Hutchison Alarm Monitoring System"	MS Sans Serif font size 18	Black
DetailsLayoutPanel	Label	247	79	Lemon Chiffon	"Copyright: Hutchison Telecommunications Lanka (Private) Limited"	MS Sans Serif font size 9	Black

Table 5.8 - Splash Screen
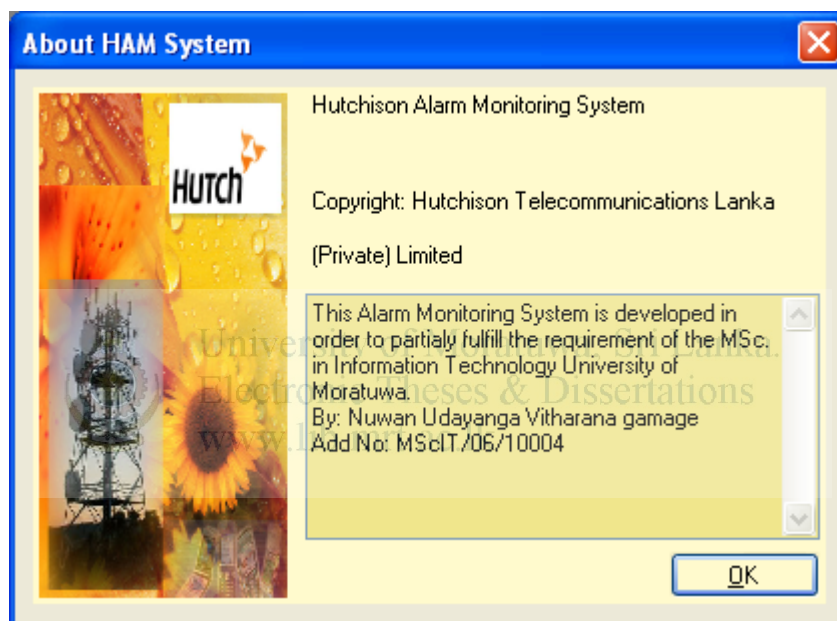
Figure 5.17 - About Box

Figure 5.17 shows the About Box of HAM System. It is include with the same picture for the "LogoPictureBox" at the Left of the form. Right side of the form dedicated for labels, "TextboxDescription" and for the "Ok" button

Control Name	Type	Width	Height	Back Colour	Text	Font	Font Colour
AboutBox	Form	420	308	Control	_	_	_
LogoPictureBox	Picture Box	124	252	Welcome picture	_	_	_
LabelProductName	Label	257	17	Lemon Chiffon	"Hutchison Alarm Monitoring System"	MS Sans Serif font size 8.25	Black
LabelCopyright	Label	257	17	Lemon Chiffon	"Copyright: Hutchison Telecommunications Lanka (Private)	MS Sans Serif font size 8.25	Black

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					Limited"		
TextBoxDescription	Text Box	257	123	Khaki	Description:	MS Sans Serif font size 8.25	Black
OKButton	Button	75	23	Lemon Chiffon	"Ok"	MS Sans Serif font size 8.25	Black

Table 5.9 - About Box

5.9.5 Colour selection and fonts

Colours must be select carefully as color perception is varying between every two users. From Colour wheel (Figure 5.18) I select "LemonChiffon" as Back ground colour and with 180^0 angle, Colour "Blue" is the opposite colour of light yellow(LemonChiffon). Blue or Black is selected as Font colour.

Figure 5.18 – Colour wheel

For The Title of the Form Background colour slightly changed for highlighting purpose. Title background is "Khaki" yellow and Font colour again selected as Blue and Title Font is "Times New Roman", Font size 14 and Bold. Buttons remains the same colour as background" LemonChiffon. Other Text input boxes and labels are "White" colour for background and font remains "Ms San Serif" black color.
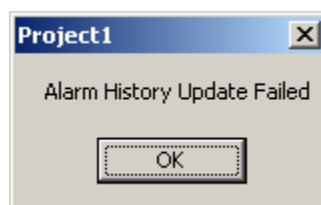
5.9.6 Message Boxes

Figure 5.19 – Message box

- Message box is 5cm height and width is depending on the length of the message.

- Font type of message box is "Ms san serif" and font size is 8.

- Font colour is given as black.

- Message box background colour is standard windows theme colour.

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5.9.7 Not-Commissioned Site Maintenance - GUI

Figure 5.20 – Not-Commissioned Site Maintenance

Figure 5.20 shows the "Not-Commissioned Site Maintenance" of HAM System. It is include with Picture box with the Title bar at the top of the form. Right-bottom end of picture box is the Hutch Logo. Left side of the form is a list box which shows added records. Each selection of the list box is data query event and selected record from the database is shown on the right side text boxes of the form.

Right-Bottom of the form there are buttons for Add records, Modify Record, Commissioned, Delete Record and Exit from the form window.

- When selecting the "Commissioned" button selected record is edited as Commissioned site and it will not shown on the "Not-Commissioned Site Maintenance" GUI anymore. It is shown on the "Commissioned Maintenance" GUI only.

- Delete button position is slightly lower than other buttons to avoid deleting important records by mistakes

- The Top text box is for "SiteID" and it is Read-only Back colour is "Control".

- The Status of the site text box also is Read-only and back colour again same colour "Control" (ash).

Control Name	Type	Width	Height	Back Colour	Text	Font	Font Colour
Not-CommissionedSites	Form	449	499	Lemon Chiffon	–	–	–
TitlePictureBox	Picture Box	416	72	Logo1 Picture	–	–	–
LabelTitle	Label	312	22	Lemon Chiffon	"Not-Commissioned Site Maintenance"	Times New Roman font size 14.25 Style Bold	Blue
ShowGrid	List Box	165	374	Window	–	MS Sans Serif font size 8.25	Black
GroupBox1	Group Box	237	108	Khaki	–	–	–
txtSiteID	Textbox	200	20	Control	SiteID	MS Sans Serif font size 8.25	Black
LabelSiteName	Label	65	13	Khaki	"Site Name"	MS Sans Serif font size 8.25 Style Bold	Black
txtSiteName	Textbox	141	20	Window	SiteName	MS Sans Serif font size 8.25	Black
LabelStatus	Label	43	13	Khaki	"Status"	MS Sans Serif font size 8.25 Style Bold	Black
txtStatus	Textbox	103	20	Control	"Not Commissioned "	MS Sans Serif font size 8.25	Black
LabelMsg	Label	118	13	Lemon Chiffon	" "	MS Sans Serif font size 8.25	Black
btnAddRecord	Button	119	29	Lemon Chiffon	"Add Record"	Times New Roman font size 11 Style Bold	Blue
btnModifyRecord	Button	119	29	Lemon Chiffon	"Modify Record"	Times New Roman font size 11 Style Bold	Blue
btnCommissioned	Button	119	29	Lemon Chiffon	"Commissioned"	Times New Roman font size 11 Style Bold	Blue
btnDeleteRecord	Button	119	29	Lemon Chiffon	"Delete Record"	Times New Roman font size 11 Style Bold	Blue
BtnExit	Button	119	29	Lemon Chiffon	"Exit"	Times New Roman font size 12 Style Bold	Blue

Table 5.10 – Not-Commissioned Site Maintenance

Please refer to the Other User Interfaces in Appendix F for more information.

5.10 Summary
This chapter discussed with Analysis and Design Stage includes database design and User

Interface Design. Next Chapter is for implementation of all the modules designed.