# E-Road Management System

Submitted to:

Sri Lanka Institute of Information Technology

In partial fulfillment of the requirements for

Special Honors Degree of Bachelor of Science in Information Technology

October, 2011

We hereby declare that this project report and all the artifacts associated with it is our own work and is not copied. This was done according to the rules and regulations given by the lecturer in-charge.

Project Title: - E-Path Identifier

Project ID: - P2011-072

Project Supervisor: - Dr. Samantha Thelijjagoda

| DIT Number | Students' Name | Signature |
|---|---|---|
| DIT08C1-0215 | Premje P | |
| DIT08M3-1604 | Tharangini Y | |
| DIT08C1-0235 | Thivaharan V | |
| DIT08C1-0195 | Darshitha R | |

Supervisor : Dr. Samantha Thelijjagoda

Signature :.....

Co Supervisor : Mr. Buddhika Kasthuriarachchy

Signature :.....

Date : 26-October-2011

# Acknowledgment

The achievement of this project proved to be a considerable undertaking. We wish to acknowledge with grateful thanks the valuable contributions of the following persons in making this project a success.

First and foremost, our gratitude is extended to our parents who have made many sacrifices in providing us with the best things in life. The value of honesty, integrity, and perseverance that you have taught us both by advice and example is by far the best education.

We are grateful for the guidance, advice and indeed patience that were extended to us by Mr. Jayantha Amararachi as Project Manager throughout this year for his valuable feedback. He showed us that this project will be very important in the system of development industry.

Our gratitude is also extended to Dr. Samantha Thelijjagoda as our Project Supervisor. He always stood with us and gave us a complete guidance in order to make our project a success. And we are thank full to our co-supervisor also. Without their valuable advice and assistance the outcome of the project would have been quite different. We also take this opportunity to thank all our lecturers whose guidance and lectures throughout the course helped us to complete this project to our satisfaction.

# Abstract

As modern societies move toward fast growing and generalized World and more governments enact laws to protect each and every individual, the management and development of roads reach the higher place with the advancement of Information Technology in this World; the road management should take advantage to upgrade their management techniques.

In addition, the mobile nature of today's mobile administration requires immediate information access and total flexibility. This technology comes through as the optimal portable solution for information access, management and improved communication, while providing the strongest security measures in the market today.

Clients should be allowed to access the system anytime, anywhere and through mobile or through their personal computers. Administrator should be able to keep update the system through sending sms to the system or by accessing to the system through the internet or update through internet access able cell phones. Anyone should be able to share resources and exchange ideas through the internet.

The motivation for this research is to solve the traffic, road blocks, accident's, inform the Client about the pre-planned road blocks from the government, statistical graph generations, place descriptions and provide better transport services to the Client.

A system and method for real time vehicle guidance by Central Traffic Control Unit are presented.

The proposed E-Road Management System includes a unit equipped with Individual Mobile Units (position determining system adapted to determine their

present position) and communicatively linked to the E-Road Management System computer server.

The ERMS unit broadcasts the update traffic patterns in real time, thereby enabling the Clients to dynamically calculate the desired optimal travel paths. With regards to the above problems, our team comes across with the solution called E-Road Management System.

# Contents

# List of Figures

# List of Tables

# Acronyms and Abbreviations

| Abbreviation | Meaning |
|---|---|
| ERMS | E- Road Management System |
| EPI | E-Path Identifier |
| SRS | Software Requirement Specification |
| EDMS | E-Destination Management System |
| EMT | E-Mobile Tracker |
| MSSQL | MSSQL is the relational database management system (RDMS), which has more than 11 million installations. The program runs as a server providing multi-user access to a number of databases. |
| Web | A subnet of internet providing hypertext service. |
| HTTP | HyperText Transfer Protocol |
| Database | Information relating to the registered Client, logins, selected locations. |
| USDP | Unified Software Development Process |
| PDF | Portable Document Format |
| RAD | Rapid Application Development |

# Chapter 1

# INTRODUCTION

## 1.1 *Problem to be addressed*

Today's world is revolutionizing daily, because of that different types of requirements arise on different types of industrial field. To fulfil those requirements, people are always trying to be qualified than others.

So nowadays more than one vehicle need to one family to ultimately be successful in life. But this kind of mentality of people will make huge impact in Countries motor ways and we can't put stopping to these.

Still Srilanka is a developing Country; to a developing Country road motor way plays a huge role in the Countries development because it's very cost effective. If it is a developed Country they can find many other transports services. So relevant authorities have to find alternatives to these.

In Sri Lanka Injuries are the leading cause of hospital admissions (2000 per 100,000 population) (AHB, SL 2002). Injuries are the 10th leading cause of hospital deaths (AHB, SL 2002).

Road Traffic Injuries are the leading cause of injury related mortality and morbidity in Sri Lanka accounting for 25% to 30% of the burden (AS, SL 2004).

In the year 2000, 54,239 road traffic crashes were reported, killing 2,150 people and injuring 19,835 (TP data).

In Sri Lanka,

Daily - 6 people are killed.

Every hour - 2 are injured.

Every 10 minutes - a Road Traffic Crash is reported and 25% of fatal Road Traffics are not reported (Wooton J et al 1996).

To overcome this problems research needed,

- To identify causes.
- To interest policy makers.
- To plan and implement preventive programs.

The cause of this problem as mention before is increasing of vehicles at the mean time not much development in the traffic and road management.

EPI under ERMS proposed, in many ways EPI helps to solve this problem. Just like in a short time spilt the accident point identified, auto update the system, get auto generated notification about the road block or accident to relevant authorities (Hospitals, Police Stations...) and motorist can find the alternative path to the destination point.

Automotive technologies are gaining ground in modern road traffic-control systems, since the number of road vehicles and passengers is rapidly growing. There is a perpetual need for safety-critical traffic automation, and traffic engineering makes the dynamic or static analysis and the synthesis of automotive vehicle technologies possible. The main goal of engineering is the planning and management of traffic systems. The project supports the development of reliable and optimal control structures for urban traffic and for motorway systems. The intelligent and cooperative set-up of actuation and its linkage to the central control system is vital for avoiding traffic jams and accidents. Moreover, environmental costs (e.g. pollution) can be decreased.

One aspect of the project aims at developing a traffic control algorithm for future technology. The design of the traffic control system can be evaluated in two steps – synthesis and analysis. Several models and multiple control strategies exist, and engineers must decide between them using a priori knowledge of the

real system.

Previously collected information can help to choose the appropriate model, parameters, measurement and control methodologies to create the optimal solution. In many cases, control-related variables are almost inaccessible for design unless estimation techniques are applied. In a situation like this, the approximation, computer-based estimation of the variables could be useful.

Traffic simulations can be classified in several ways, including the division between microscopic and macroscopic, and between continuous and discrete time approaches. The methodologies of static and dynamic analysis of traffic systems are known. Several state variables, derived from the description of the dynamic system, can be used for operational and planning aspects. A newly emerged area is demand estimation through microscopic traffic modeling. The dynamic aspect of traffic simulation requires previously measured or estimated volumes of traffic. Since the measurement of certain variables in the dynamic description is rather costly, one tries to estimate them. For instance, the observation of constantly varying turning rates at a simple intersection is fairly costly.

However, the number of turning vehicles could be applied to traffic light harmonization, or generally speaking to traffic light control.

## 1.2 *Background Context*

Government of Sri Lanka and other responsible authorities starting considered implementing a well organized, tightly structured motor ways system, traffic preventions and more related to this for the country.

Road traffic injuries are the leading cause of injury related mortality and morbidity in Sri Lanka accounting for 25% to 30% of the burden (AS, SL 2004).

World Health Organization 2004 Report says "More than 20 million people are injured and killed from Road Traffic Injuries", Burden falls most heavily on developing Countries (particularly Asia),due to the rapid increase in the number of vehicles.

The Economic cost estimated as US $ 518 billion annually (TRL 2000) of this 12.5% or US $ 65 billion is accounted for by the developing Countries.

Globally, Road Traffic Injuries will increase by over 60%, 80% increase in low and middle income Countries and 30% decrease in high income Countries.

## 1.3 *Research Gap*

### 1.3.1 Focus

In Sri Lanka most of the roads in the country especially the national Highway network have been built long time back and it has passed the useful life of these roads. But now the Countries status has changed population increased, no of vehicles increased, more roads were building and etc.

Based on this traffic and accidents also increased. The selection of projects for this rehabilitation has been based preliminary on the following.

Traffic Level

Road Condition

Connectivity

ERMS mainly focus in efficient road usage in peak hours, predict future motorway along with the population, destination services to inbound tourist and others and mobile accessibility to reach the users hand deeper. E-Path Identifier mainly focuses on identify traffic location, provide alternative paths to the user with the help of Google Map and provide automated emergency services.

EPI will have a better relationship with motorist, with the more accurate information's can provide better services, improved road management information , faster processing of services details , the users will get the outcome with the help of the Google Map.

### 1.3.2 Current Procedure

Road traffic injuries are the leading cause of injury related mortality and morbidity in Sri Lanka accounting for 25%to 30% of the burden. And the global burden more than 20 million people are injured and killed annually. Burden falls most

heavily on developing countries (particular Asia), due to the rapid increase in the no of vehicles. So this is the biggest challenge in world widely. For that through feasibility studies we have found many traffic monitoring systems all around the world. Traffic was monitoring and collecting and getting data, information's are done manually in Sri Lanka now. And no devices (Camera) to monitor the road situations and all. This is the main problem having in Sri Lanka to develop the traffic monitoring system. But nowadays in Sri Lanka using helicopters to get traffic information's in the peak time from some particular roads.

Sri Lankan Governments Vision & Mission in Road Development is...

Vision: Provision of accessibility for prompt and safe transportation of people and goods through a high standard National Highway Network.

Mission: To provide safe road accessibility facilities to the people Through road development, maintenance and providing legal provisions through an optimum road network constructed by efficient utilization of resources.

In current small unmanned vertical takeoff and landing vehicles are used to provide the eye-in the-sky alternative to monitoring and regulating traffic dynamically. Spatial-temporal visual data are collected in real time and they are used to generate traffic-related statistical profiles, serving as inputs to traffic simulation models. Generated profiles, which are continuously updated, are used to calibrate traffic model parameters, to obtain more accurate and reliable simulation models, and for model modifications. This method overcomes limitations of existing traffic simulation models, which suffer from outdated data, poorly calibrated parameters because of outdated data, questionable accuracy and poor predictions of traffic patterns. In some other country the real-time traffic monitoring is controlled with UAV VIDEO DATA. But in Sri Lanka the traffic monitoring is controlled by manual like human interruption (Traffic police). This is inefficient methods to get fast information's.

### 1.3.3 What is eliminated by system?

EPI is going to radically change the way the Traffic control, transport services, as the will be input directly into the computer in this function. This solution will also provide the following non quantifiable benefits.

- Better relation with Clients.

- More accurate motorway history and information.
- Improved management information.
- Faster processing of staffs and services details.
- This solution will provide e-mail and internet facilities to all staffs of the ERMS.

And the system minimizing the workload, eliminating the inconvenience of getting road and traffic rates. By logging on to this system the user will be able to see the traffic congestions in cities especially during the peak hours and will be able to see the alternative paths to particular places..

By viewing these graphs the users of this application will be able to manage their time and prevent unwanted delays. E-Road Management system minimizing the unwanted delay times In addition to this an auto generated mail will be sent to the users to advise them on special occasions such as Kandy Perahara, Nuwara-Eliya season Anuradhapura season, Kataragama and Thalavila feast May Day and visit of Heads of states and State functions. System will also send alert messages to the users about the accidents, road blocks, fire, explosions and other disasters. So the users can plan their programs ahead and avoid the unexpected circumstances related to traffic.

## 1.4 *Research Questions*

- How to notify the System (EPI) in a short time about the road block or accident point?

A EPI application which running on 3G mobile phones get the current location latitude and longitude and with a short description through a SMS send to the send.

- How the system find the nearest emergency service providers?

The EPI database contains all the information's about Hospitals, Police Station and Other with their Geo Coordinates. When system gets a accident point soon after it starts to search the nearest emergency service providers and automatically system send alert messages and to their mail system sends a mail with the

description on the point and routers.

# Chapter 2

# Body Of The Report

## 2.1 *Addressing the Literature*

Description of the project;

The deliverable product is referred to as E-Road Management System (ERMS).A more enhanced system with lots of new features is proposed. The existing ERMS is also considered when designing the system as it already facilitates some of the administration process. Thus the proposed system is going to be used in the environment as an integrated system, using the facilities provided by other existing systems as well.

Problem Specification;

The typical users of the system are Travelers, Administrator of ERMS & Administration staffs. There are number of operations that are to be supported through the proposed system. Some of them are indicate accidents, road blocks, traffic in Google map and a calendar it carries the pre-planned road blocks by the Government in addition to this the system will provide an alternative path to the Client by using the Google map by graphically

The other problem which was brought to attention was, how an Administrator update the system in a short predate of time, to this problem SMS function is used. So it's sufficient to change the approach according to the current situation in the World.

Solution Outline;

The vision of the project is to provide the client with an accurate and efficient system to solve the existing problem domain. Automate their day-to-day functions by a web based system, and a mobile based web with more features such as each and every day relevant person can update the system by just login to their account through the website, and they can easily keep track of the details of roads through the proposed system.

To make their existing website more user friendly, we decided to use Google map, send SMS to update the system. The other introducing feature is auto generate graphs, this will help to get a brief idea about the past in road vs. traffics time, road vs. no of vehicles uses a particular road, accidents per year and population vs. vehicles. This is more helpful to the government to take the decisions and other to get some idea. Also we are going to introduce a simulator.

By using this simulator we can get what will happened in the future when no of vehicles increase, when population increase and when road conditions change what will happen. We think this is little challenge for us. Hence satisfying all the requirements specified the project is going towards the goal of developing a reliable and easy to use tool for the ERMS.

## 2.2 *Methodology*

### 2.2.1 Project Approach

The waterfall approach is a popular version of the system development life cycle model in software engineering. Waterfall model is often considered as classic approach to the system development which describes a development method that is linear and sequential as figure2 shows.

The advantage of waterfall development is that it allows for departmentalization and managerial control.

The disadvantage of waterfall development is that it does not allow reflection or revision. Once an application is in the testing stage, it is difficult to go back and make changes. The final stage of the cycle can lead to either deployment

or project cancellation.

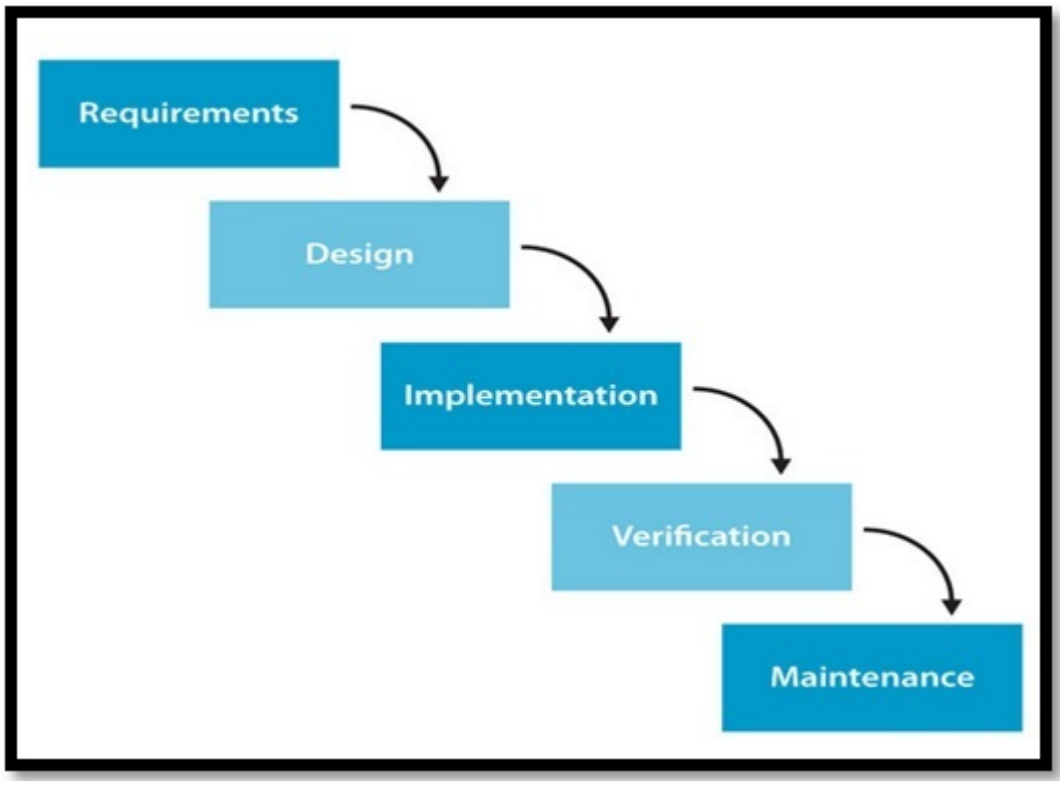



Figure 2.1: Waterfall model

Alternatives to the waterfall method include iterative and incremental approach which incorporates prototypes at the end of each phase. The iterative method allows the user to change the requirements. This method can be suitable for any project as it gets constant feedback from the stakeholder at the end of each stage. In the incremental or iterative approach each phase is visited iteratively until the stakeholder is satisfied.

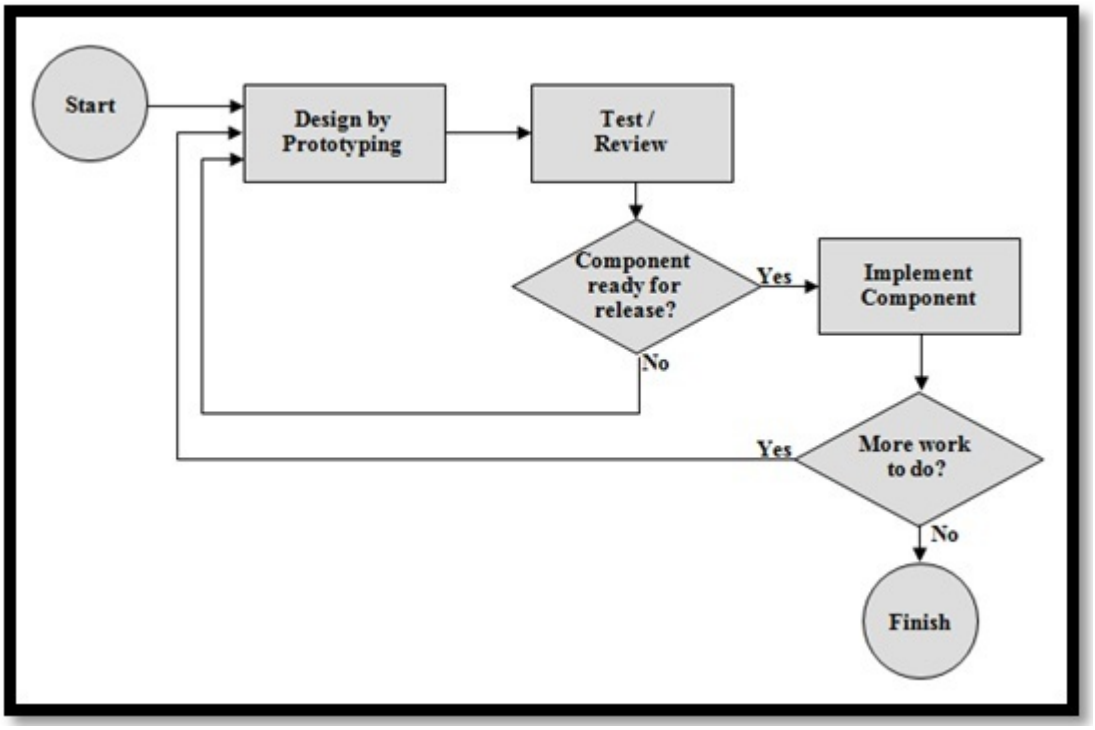



Figure 2.2: Iterative Approach

### 2.2.2 Agile methods and Non Agile methods

Agile is an iterative and incremental approach to software development which is performed in a highly collaborative manner by self organising teams within an effective governance framework that produces high quality solutions in a cost effective and timely manner which meets stakeholder's changing needs. Agile development allows the developer to communicate with the customer directly till the end, so the customer expectations are fulfilled throughout the project. Non agile processes enforce proper planning and minimize the changes.

As the agile methods are flexible for changing requirements and short lifecycles for system development, it is appropriate to apply agile methodology for the work life balance system. For instance the author can start developing the system with the basic requirements gathered through the literature review. New changes and the stakeholder's expectations can be achieved through the iterations.

### 2.2.3 Research Methodology Study

A methodology is a system of organizing principles underlying an area of study. It is a form of standardization or framework that allows continuous review, refine and validate the findings, until knowledge that is as accurate. Methodology includes the methods, techniques, and procedures which are used to collect and analyze information.

#### 2.2.3.1 Rapid Application Development

Rapid Application Development (RAD) is a development lifecycle designed to give much faster development and higher quality results. Rapid Application Development is far more than a simple management strategy or methodology. RAD is an alternative approach to software development that helps create software prototype in much shorter time. With the implementation of powerful software tools, RAD becomes a practical and realistic method for faster and efficient software development.

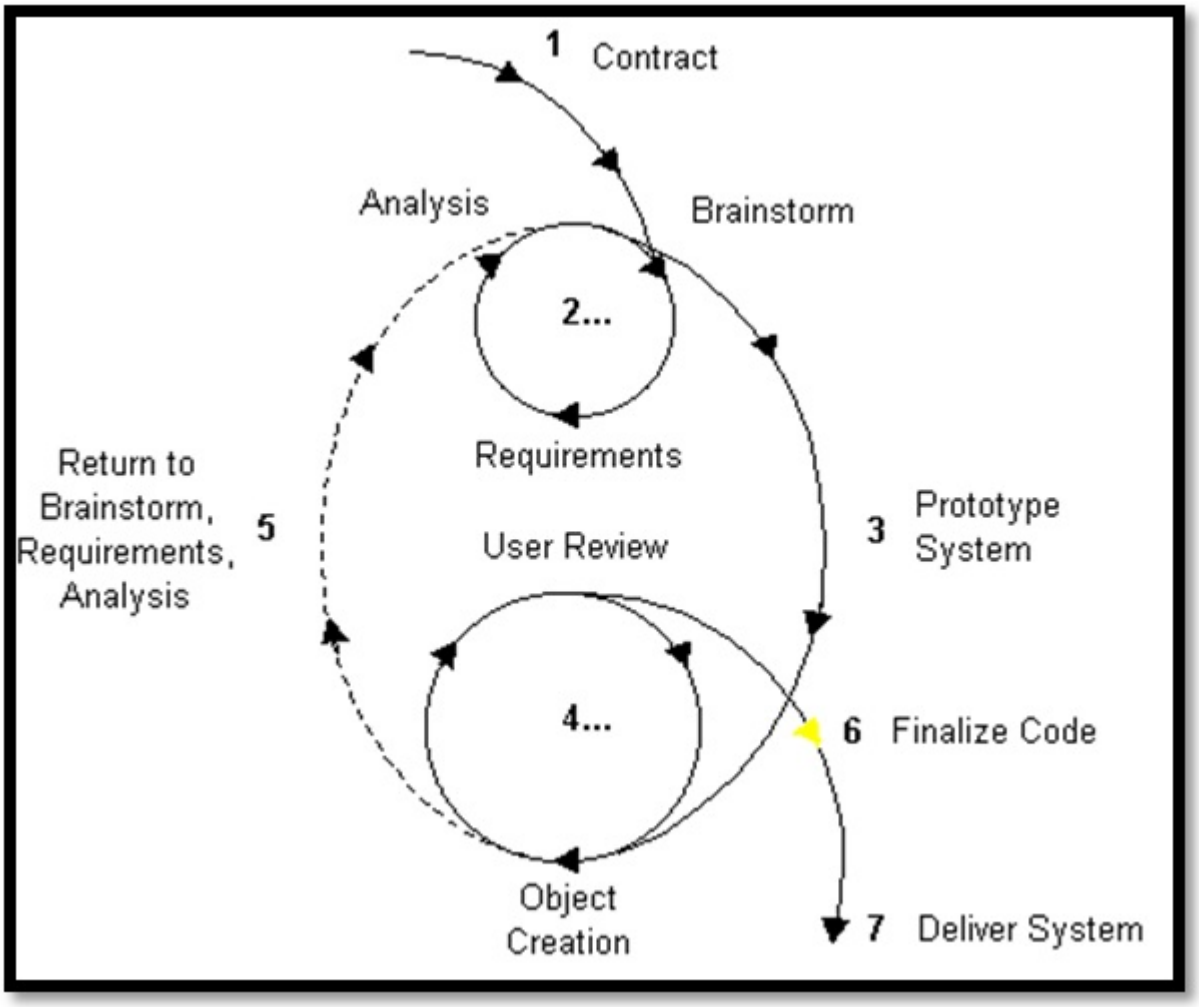



Figure 2.3: Rapid application development methodology

RAD also goes through a series of phases that actively engage users and analysts, in order to quickly produce the desired system. First, they identify the requirements of the system. Then, they quickly design and refine working prototypes through iterative workshops. Finally, test and implement the final product for its intended use. Figure 1 shows how prototyping is used to practically demonstrate the system based on the requirements gathered, discrepancies are rectified utilizing reusable components such as code generators which reduces manual coding (Cockburn, 2006). However there are some disadvantages in RAD such as users may be contempt to prematurely adopt a working prototype as the finish product and analyst may be tempted to rush the product, skipping important planning and design consideration (Wyster, 2008).

#### 2.2.3.2 Dynamic Systems Development Method (DSDM)

DSDM is a type of framework where it takes a software development from beginning to the end by adopting its characteristics and principles to deliver a fit-for-its-purpose system. DSDM focuses on delivery of the business solution, rather than just team activity. Prototyping is one of the characteristics of DSDM which is used to have a clear picture of all aspects of the system. Since the users are actively involved in the development of the system, meeting stakeholder requirements and expectations are possible by adapting to DSDM methodology. System is delivered on time and on budget within DSDM.

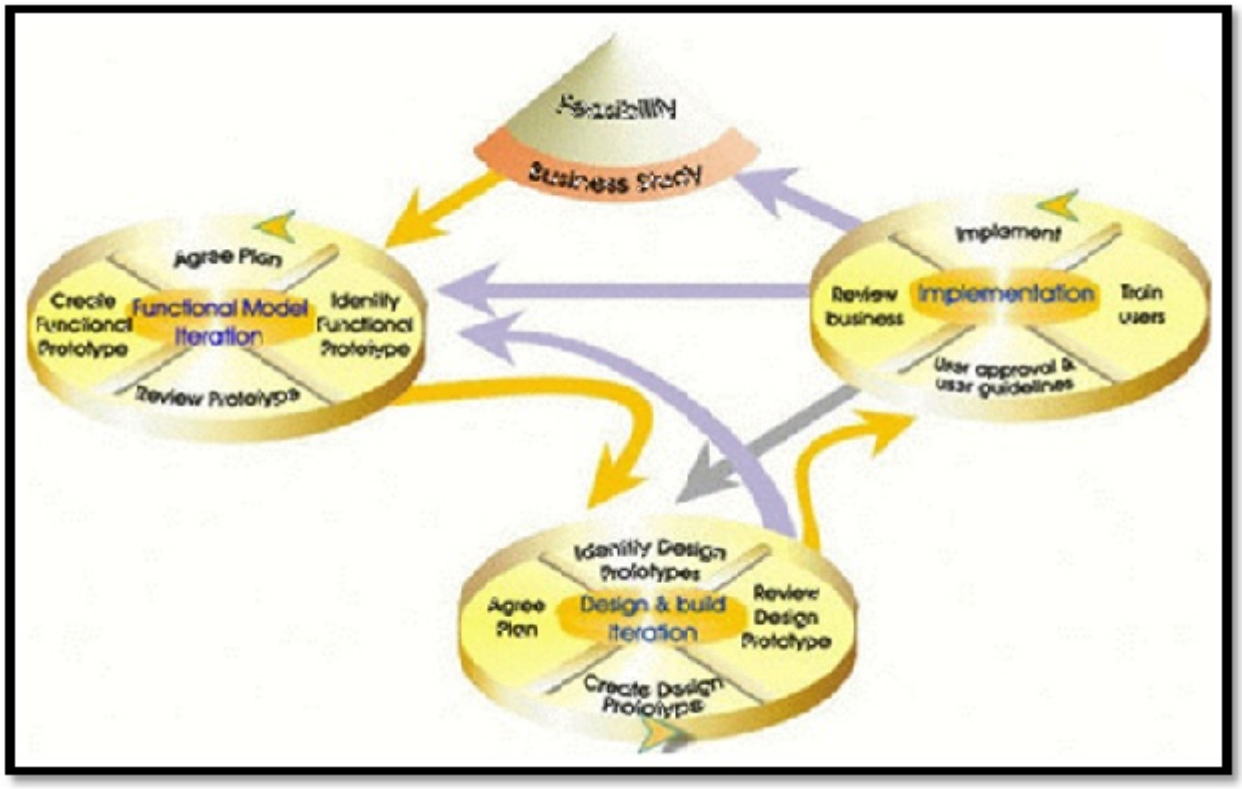



Figure 2.4: Dynamic system development methodology approach

#### 2.2.3.3 Unified Software Development Process [USDP]

USDP [Unified Software Development Process] is a generic software engineering process which has to be customized for each project. Key elements to USDP are use case driven, architecture centric, iterative and incremental. Iteration is like a mini project including planning, analysis and design, integration and test, and internal and external release. Iterations contain workflows and organized into phases.

Decisions are taken about the architecture of the system at an early stage, to provide the framework around which the system should be developed. This means that the development activity has a clear model for its construction. The process employs use case specification which provides clear means for identifying how the requirements will be structured and modelled (Massimo, 2003).

#### 2.2.3.4 Choice of Methodology

The author finds DSDM as the most appropriate approach because of the characteristic time boxing effectiveness. Time boxing gives the opportunity to break the tasks into subtasks and set dates to complete those tasks within a period. In DSDM, prototyping helps to ensure that the system is designed correctly and the stakeholders can get to know how it will work. In addition, using MoSCoW rules to prioritize the tasks to determine which tasks are most important to be completed first. So the important tasks will be completed before any unexpected situations such as lack of time.

The author prefers this method rather than using other methodologies because this method is particularly useful for the system to be developed in short time span and where the requirements cannot be frozen at the start of the system development. Whatever requirements are known at a time, design can be developed and can be incorporated into system. For instance system development can be start right after the literature survey and changes can be made according to the requirement gathering process later.

DSDM allows user testing all through the development process and allows getting feedback on the usability and suitability of the system. As shown in the figure 6 analysis, design, and development phase can overlap.

### 2.2.4 Summary

Iterative or incremental methodologies provide a cyclic approach to software development, which is especially useful for this particular project where requirements change often and response need to be quick. There are several iterative methodologies have been discussed above, including RAD, DSDM, and USDP. DSDM has been chosen to carry out this project as it allow designing from the early stage of requirement gathering.

Changes can be incorporated into the system according to the requirement gathering process. DSDM also allow prototyping which helps to ensure that the system is designed correctly and the stakeholder expectations are met. In addition, using DSDM helps to deliver the product within the time frame.

### 2.2.5 The techniques and tools for project development

This Heading involves identifying suitable techniques and tools for the development of a ERMS. It is essential to chose proper tools to model the gathered requirements. This chapter will outline the tools and techniques used to gather requirements, analyze the requirements, and model the requirements for this project. Software development tools are also indicated here. All the chosen tools and techniques are justified by the author.

#### 2.2.5.1 Specific Techniques Applied

Given below is the description of specific tools and techniques that will be used for this particular project. Justification for the tools and techniques (why author chosen these particular techniques) also discussed below.

**Use Case Modelling**

The use case modeling provides detailed information about the behaviors of the system or application. It contains use case diagrams and activity diagrams that describe how users interact with the system. The use case model identifies the requirements of the system in terms of the functionality that must exist to achieve the goals set out by the author or to solve a problem identified by the author. Use cases illustrate the activities that are identified through requirement gathering process and it describe the results of the activities which will be received by the user.

They do not describe how the system operates internally (Larman, 2001). Actors are the users of the system who interacts with the system directly. Use case diagrams depict the relationships between the uses cases and actors.

This diagram can be refined iteratively until the requirements of the system are fully understood. Author prefers use case modelling as use cases are

powerful technique for capturing and communicating functional requirements for system development.

The author finds this methodology the most appropriate to ERMS to work with the stakeholders to identify the initial ideas of the system, model those ideas, and use that conceptual model to have stakeholder validate the requirements.

**Sequence Diagram**

Sequence diagrams will be used to map the scenarios described by a use case in step by step detail to define how objects collaborate to achieve the application's goals. A sequence diagram focuses on time sequencing and the order of the messages which are sent. Booch, G. et al., (1999) indicates that the sequence diagrams are a means to model some aspect of the dynamic behavior of the system and can be used in the context of whole system, a sub system or they can be referred to a particular use case.

The author prefers this technique as it depicts the sequence of actions that occur in the system and it is a very useful tool to easily represent the dynamic behavior of the system. (Refer Appendix A 1.1 for the sequence diagram of proposed system.)

**Class Diagram**

Class diagrams are widely used to describe the types of objects in a system and their relationships. Class diagrams model class structure and contents using design elements such as classes, packages and objects. This diagram used to describe the classes of the system and the relationships between each other.

**High Level Diagram**

The high level diagram of the system is used to identify the basic functions of the system. By viewing the high level diagram the reader or stakeholder can be understand the full system in a view. Each and every function of the system is clearly defined in the high level diagram in order to demonstrate the system to the reader.

#### 2.2.5.2 Information Gathering Methods

Information gathering was carried out through two major sources; primary data and secondary data, which involves many methods of data gathering, where some of these methods were applied in data collection process. These methods include; experiment, survey, case study, grounded theory, ethnography, and action research, where survey method was selected as the most appropriate strategy in carrying out the research, taking in to consideration all the above methods.

This allows collection of a large amount of data in a highly economical way and this would also give more control over the research process (Saunders et al., 2003). Data collection methods that belong to the survey strategy include interviews, questionnaires and observation according to Saunders et al. (2003).

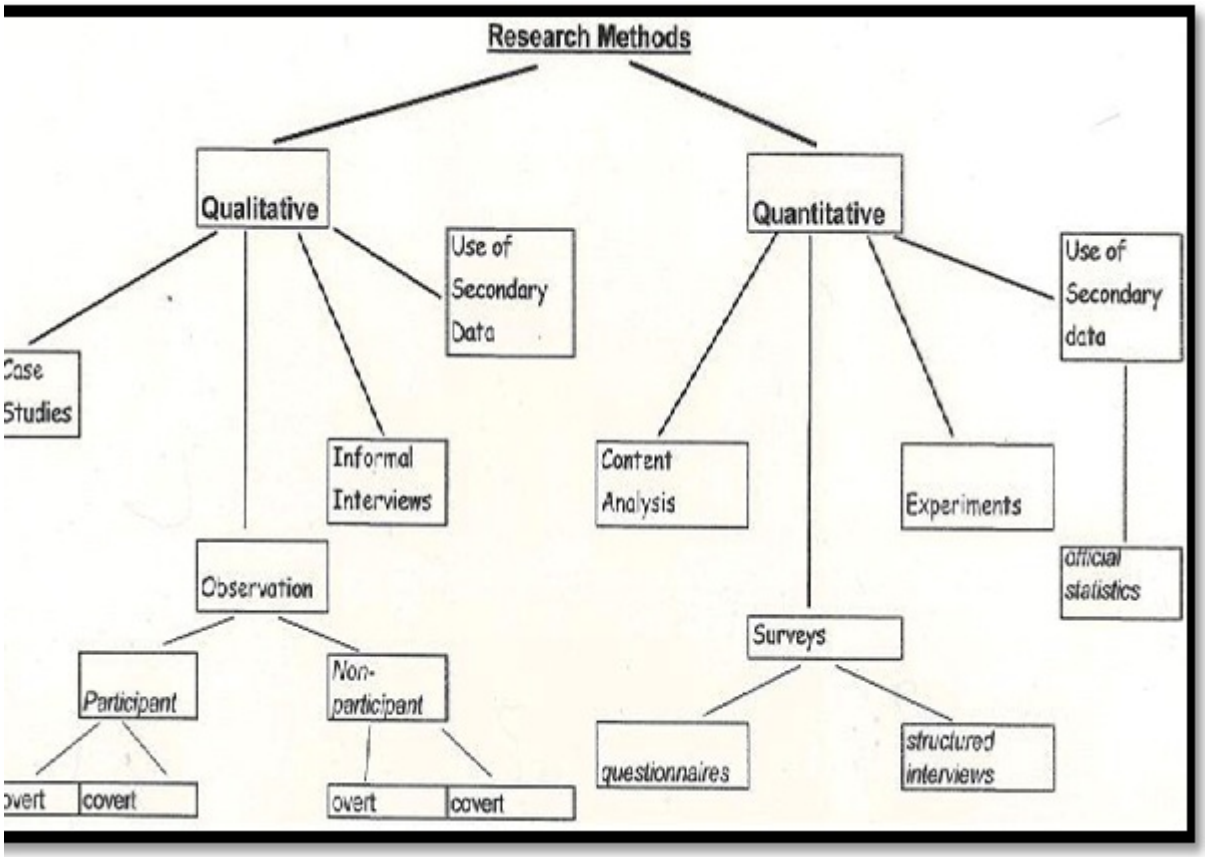



Figure 2.5: Research methods

**Interviewing**

Interviews are one of the primary techniques for information gathering during the requirement gathering phase of a project. Interviews are useful for gather details like the participant's point of view, opinions and the background information on the research area, although interviews are time consuming.

Interviews are also useful to obtain additional in-depth information and clarification from some of the questionnaire respondents.

**Questionnaires**

Questionnaires used to gather data from large number of people and saves researcher time and money. Considerably questionnaire results are more truthful because people are more straightforward while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous. Questionnaires can be quickly done and data analysis can be carried out in a timely manner. It can be expressed statistically as the same question asked from large amount of people.

**Observation**

Direct observation of work performance is an excellent means of gathering data. Observations are usually done in conjunction with another data gathering method that is used to fill in the gaps and answer questions.

**Focus Groups**

Focus groups are used to gather data relating to the feelings and opinions of a group of people who are involved in a common situation. This is a valid method to gather realistic information from the employees.

**Survey**

A survey is a data collection tool allows the researcher to gather large amount of data in short period of time. Surveys produce quantitative data, which has reliability and validity.

#### 2.2.5.3 Justification of Information Gathering Methods

Given below is the summary of chosen information gathering methods that will be applied for this project.

Interviews - Interviews are planned in order to gather data on current work life polices in the organization from the management. The author prefers interviews as it is useful for gather details like the participant's point of view, opinions and the background information on the research area, such as barriers in implementing work life policies in an organization and problems raised by having particular policies.

Questionnaires - Questionnaires are used in this project, as this is a more convenient way to reach more people at some distance. It is also an appropriate method of gathering qualitative and quantitative data. Since the author had planned to send the questionnaires via mail, the author expects to get more accurate and honest answers from the respondents because they are not intimated by the presence of the researcher. The general population for this study is composed of apparel industry staff. These respondents will be asked questions regarding their current status of work life balance, their expectations and their personal views on the impact of maintaining work life balance.

Survey - The author will be conducting the survey through sending questionnaires via e-mail. This information is collected through use of standardise procedures, every participant will be asked the same questions. As this is a structured format of gathering valid data, the author will be using it to gather reliable data from apparel industry staff.

Observation - As the author completed her placement year in one of the larger apparel organization in Sri Lanka. Facts gathered during the placement period also will be used for this project.

#### 2.2.5.4 Software Tools

Software tools were critically analyzed in order to determine the ideal software to exploit in developing ERMS.

**System Development Application**

Visual studio 2010 is used to create the user interfaces. The author decided to use ASP.Net to develop the system, as the author is familiar and finds easy to use this particular programming for system development. Visual Studio 2010 software will interact with a relational database- MSSQL 2008 as the proposed system will require a back end database

**Diagrammatic Tools Development**

StarUML is an open source project to develop fast, flexible, extensible, and freely available UML platform. The goal of the StarUML project is to build software modeling tool and also platform that is a compelling replacement of commercial UML tools such as Rational Rose. Author used StarUML for use case diagram, class diagram and sequence diagram as she familiar with using StarUML. Pencil 1.1 is used to draw the sample interfaces of the system.

**Diagrammatic Tools Development**

As the ERMS need a back end database, SQL 2008 was used to create a back end database in order to store the relevant details. All the relevant data such as user name, pass word, ERMS measure, Accident Rates, Past Populations data's, Birth data's, new vehicles registrations, traffic data's, road busy time all will be stored in this database.

#### 2.2.5.5 Summary

In here discussed the tools and techniques available for the project and the selection of tools for this particular project. The diagram given below clearly shows the author's selection of tools and techniques needed for this project. These tools and techniques are selected according to the author's familiarity on the particular tools and supportiveness of the tools and techniques to the ERM system. Data gathering methods are selected in order to cover large number of people within a

short period. Due to time and resource constraints author selected online questionnaires as the best solution.

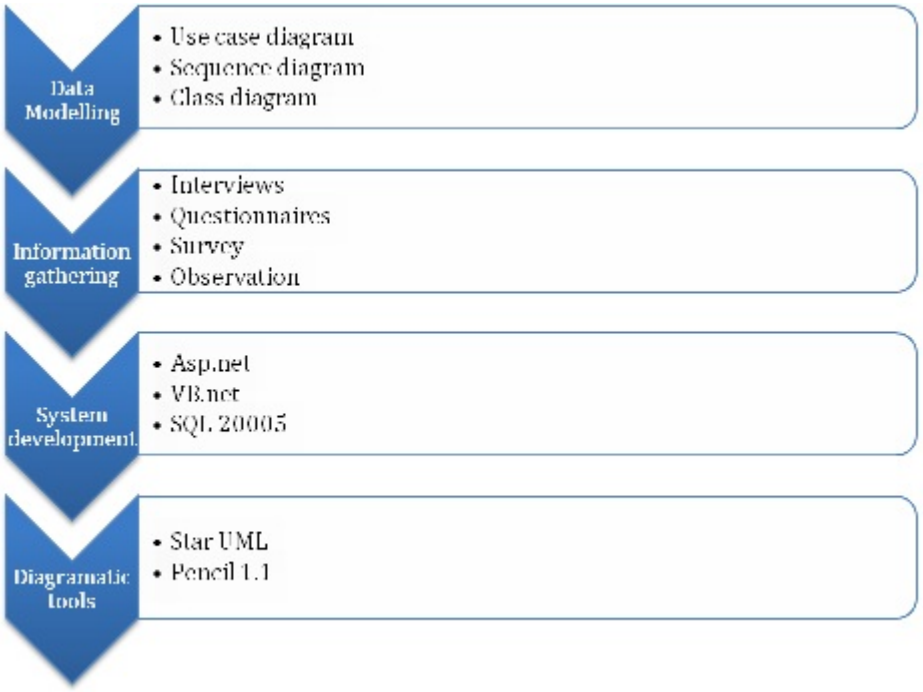



Figure 2.6: Development Process

### 2.2.6 Project Management

A success of a project is not solely dependent on the use of an effective research methodology and selection of tools and techniques. Effective project management also directs a project to its success. The author chose techniques taken from the PRINCE2 methodology to manage this particular project. This chapter outlines initial project plan, revised plan, and project management methods that are used to ensure the timely delivery of the project deliverables.

#### 2.2.6.1 Project planning, management, and techniques

Project planning is a critical factor for project success. Project planning includes selecting the appropriate tools and techniques that will be needed for the successful completion of the project. Activities and the deliverables must be defined using techniques such as work break down structure. Time and the effort required for each activity, dependencies between activities must be estimated in order to develop a realistic project schedule to complete the tasks.

Milestones can be set, which will indicate the critical dates during the project. PRINCE2 project management methodology that is used in this project is a process based method for effective project management. The author uses this methodology as it gives skills to feel confident in managing a project successfully within the available resources. Also PRINCE 2 is recognized as a world class standard method for project management. Using PRINCE2 enables managing the risks more effectively. Following diagram shows process of PRINCE2.

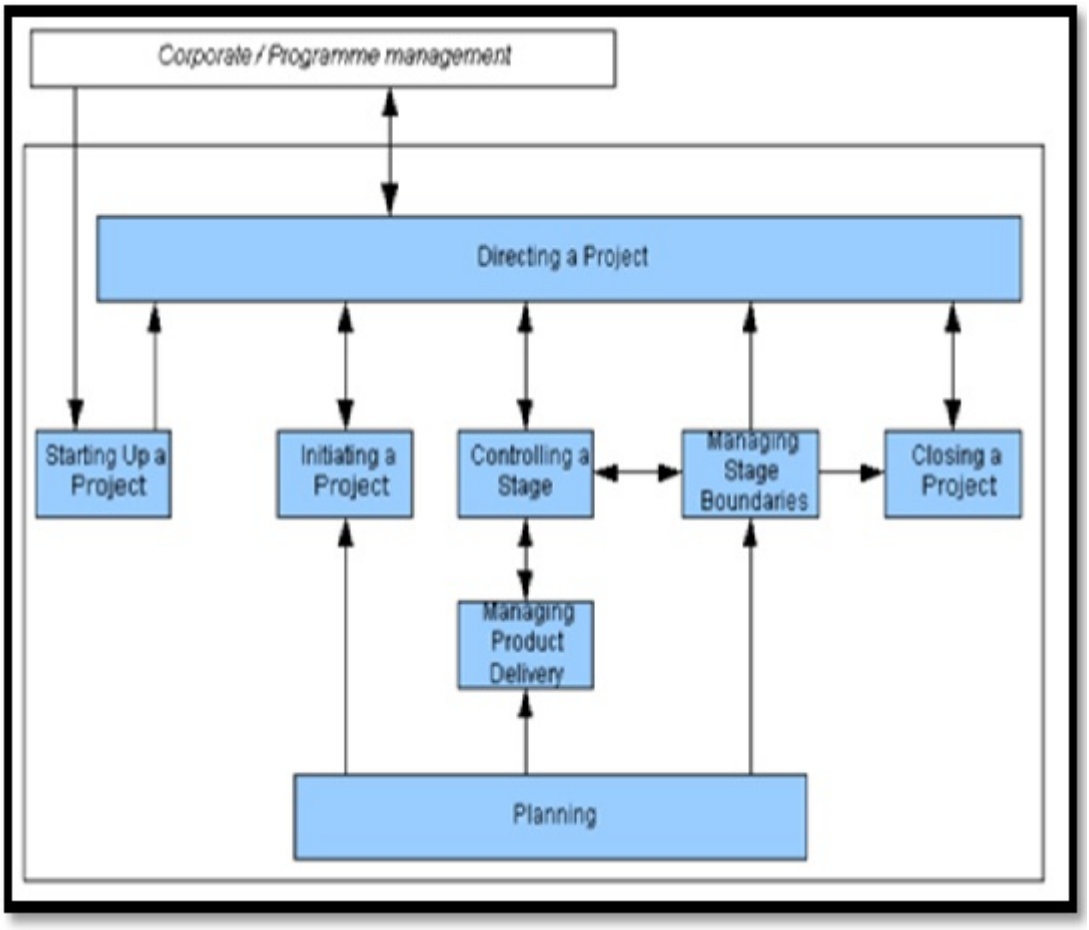



Figure 2.7: PRINCE2 Process

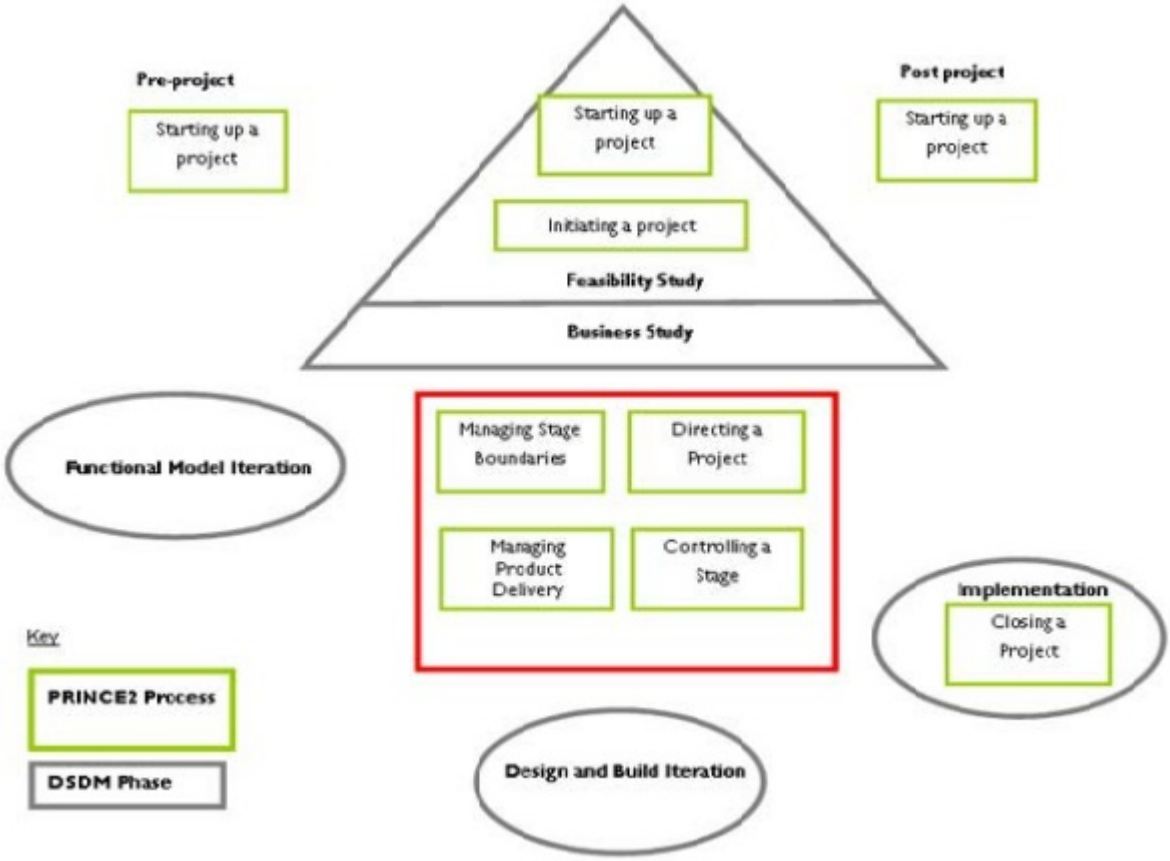



Figure 2.8: PRINCE2 processes fit into DSDM lifecycle

Above figure shows the combined method of PRINCE2 and DSDM. The chosen methodology DSDM, combined with PRINCE2 will improve the project management. Therefore DSDM methodology which are managed and controlled within PRINCE2 standards can easily achieve the objectives and targets of a project.

### Risk Management

Managing risk is a key element within PRINCE2 for the successful project management. A risk register is a tool commonly used in the project planning within the context of PRINCE 2. The author has been maintaining a risk log according to overcome some unexpected risks. It is helpful for identifying, analysing and managing the risks. It contains the information on the identified project risks, impact of the risks and the contingency plan for the risks. A complete risk log has been attached in the Appendix.

### Project Deliverables and Support Project Plan Chart

The following are the deliverables identified within the project.

- Proposal Document
- SRS
- Prototype
- Mid review Document
- Final project report
- Research papers

#### 2.2.6.2 Original Project Plan

Microsoft Project was used to draw the Gantt chart and plan the activities. This Gantt chart illustrates a project schedule, start finish dates of the terminal elements and summary elements of a project. It also shows the dependencies between activities. Mile stones focus mainly on the end dates which reminds the particular task need to be complete or certain objective need to be achieved. Given below is the actual project plan from the outset. For detailed plan refer appendix.

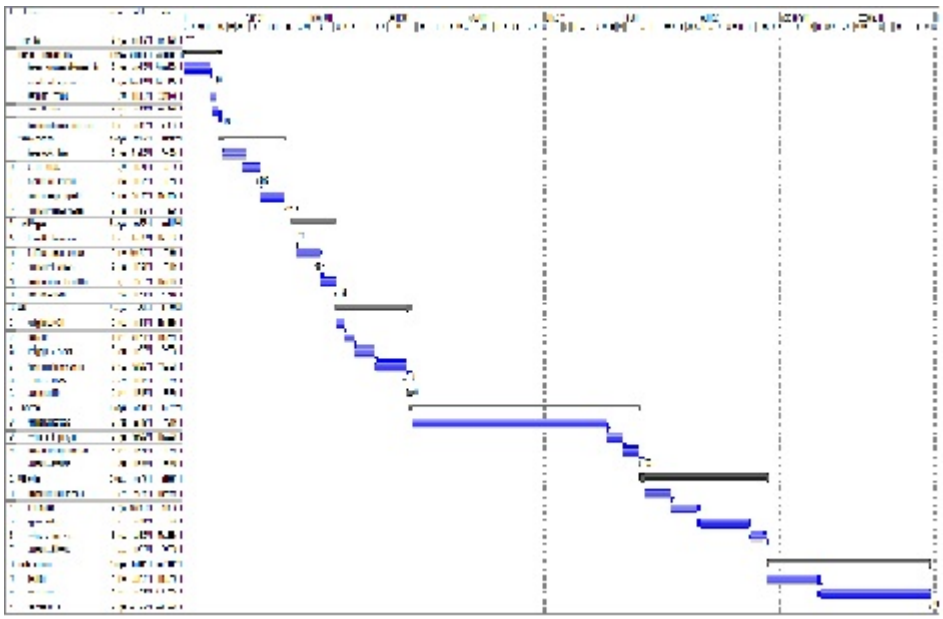


Figure 2.9: Gantt Chart

#### 2.2.6.3 Project Supervision

Regular meetings were conducted with the supervisor in order to evaluate the components and deliverables. Given below is a sample of project supervision log. Project Log book is attached in the appendix which provides details of each meetings.

#### 2.2.6.4 Requirements Specification

Requirements Specification presents the detailed description of the ERMS. It explains the purpose and the features of the system, the interaction between the users, what the system will do, and how it will work. This chapter includes functional requirements, non functional requirements, and the use case diagrams and descriptions. This section gives an overview of functionality of the proposed software product.

| Test Case 1 | Indicate the Accident Point to the System using the Mobile phone | |
|---|---|---|
| Pre conditions | System is in working order. | |
| Actors | Internal User | |
| Description | 1. | User is asked to fill the accident type |
| | 2. | User gives the command to next page. |
| | 3. | User will add a description about the accident or block. |
| | 4. | System shows the current location where the user is in. User press the message send button. |
| | 5. | The use case ends. |
| Exception | 3.a | System will generate an error message. |

Table 2.1: Test Case-1

IF an authorized Person indicate an accident point to the System EPI. The alert of the accident will be send as a sms from the authorized person mobile which is capable of running EPI mobile application. Allowing with sms the Person send latitude, text (volume of the accident; no of person injured. . . etc)

| Test Case 2 | If accident point found system looks for nearest emergency time helpers | |
|---|---|---|
| Pre conditions | System is in working order. | |
| Actors | Client | |
| Description | 1. | User gets a SMS and a mail. |
| | 2. | The mail contains the accident point with indicating in the Google Map. |
| | 3. | The use case ends. |

Table 2.2: Test Case-2

Using the received longitude and latitude from the sms system starts searching on emergency service providers. And send them auto generates alerts. Before automated functions start working system admin according to the description of the accident o road blocks the relevant person have to accept the automated function to start.

| Test case 3 | Select the nearest helpers | |
|---|---|---|
| Pre conditions | System is in working order. | |
| Actors | Client | |
| Description | 1. | System checks the nearest coordinate matching with the accident point. The ERMS database contains the emergency time helper's coordinates. |
| | 2. | System picks the nearest coordinate. |
| | 3. | System send sms alerts. |
| | 4. | The use case ends. |
| Exception | 2.a | System will generate an error message when User indicate a wrong coordinate. |

Table 2.3: Test Case-3

EPI database having the all emergency service provider's details. Including their longitude and latitude of the location. Using that longitude and latitude and system starts searching the nearest service providerh.

| Test case 4 | Administrator | |
|---|---|---|
| Pre conditions | user logged in | |
| Actors | Administrator | |
| Description | 1. | Administrator conforms the accident or block. |
| | 2. | System does authentication |
| | 3. | Point will indicated in the Google Map |
| | 4. | The use case ends. |
| Exception | 4.a | Authentication Fails |
| | 4.a.1 | Start to reconfirms the point. |

Table 2.4: Test Case-4

## 2.3 *Research Findings*

Currently there are so many traffic controlling systems are existing all over the World. But still in Sri Lanka we I the earlier stage's so this kind of cost effective systems are helpful to control the traffic in the country.

"How to traffic arrives?" This question lead us to the solve this problem or this question gave the idea to came up with this solution. The main reason to the traffic in the developing Countries like us is... lack of highway roads and the non-efficient road management.

And next problem is traffic or accident happens in a short time how to get rid off that. The communication is the problem in the real time or in other word how to indicate the exact location. And this function should be automated.

EPI came up with the solutions to these problems. If a road block happens the authorize persons have the full permission to access to the system and indicate the type of the system. Later if a motorist wants best path by accessing to our system they can get an idea about how to reach their destination point.

**System Overview**

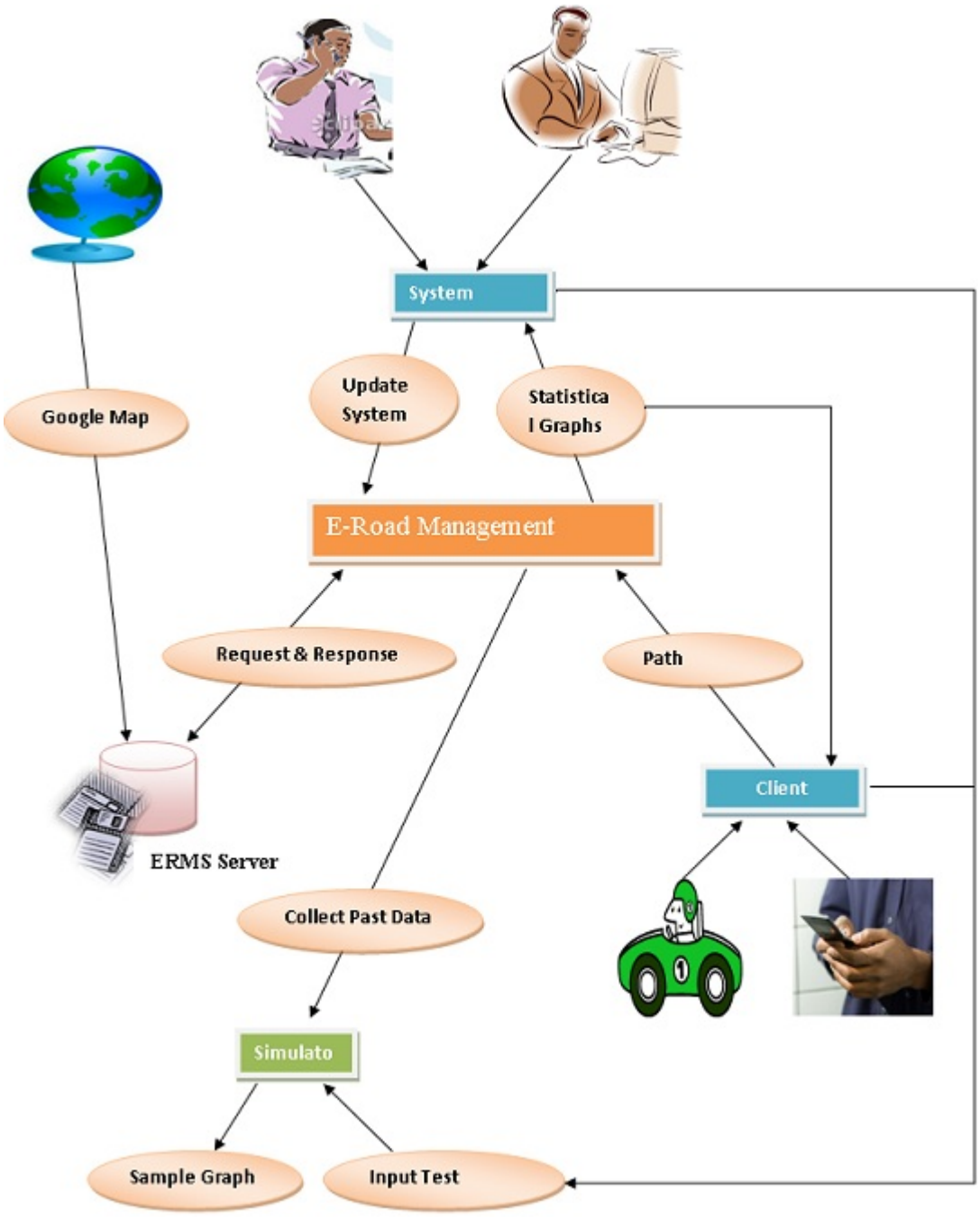



Figure 2.10: High level diagram of the system

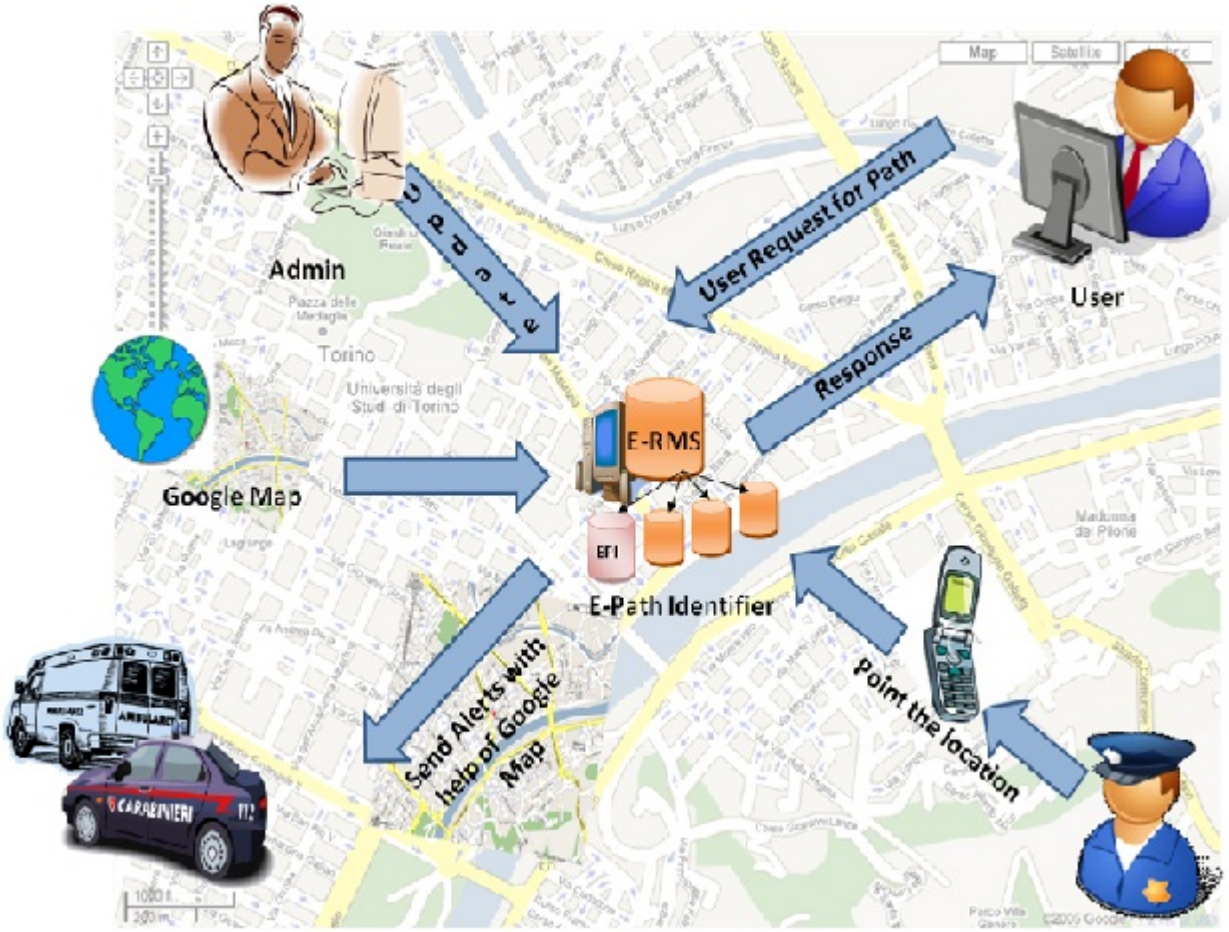



Figure 2.11: E-Statistical Analyzer Diagram

# Chapter 3

# Results & Discussion

## 3.1 *Evidence*

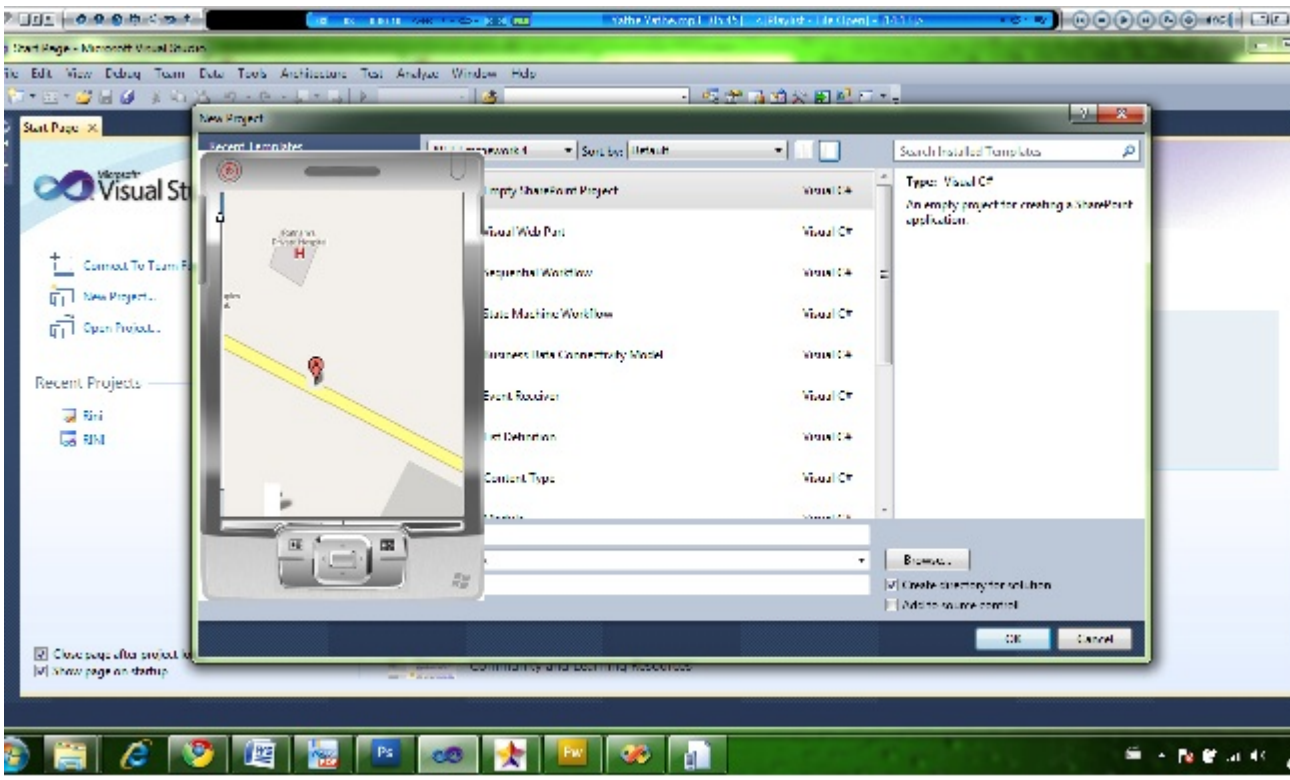


Figure 3.1: Interface to User access


Figure 3.2: Mobile Interface

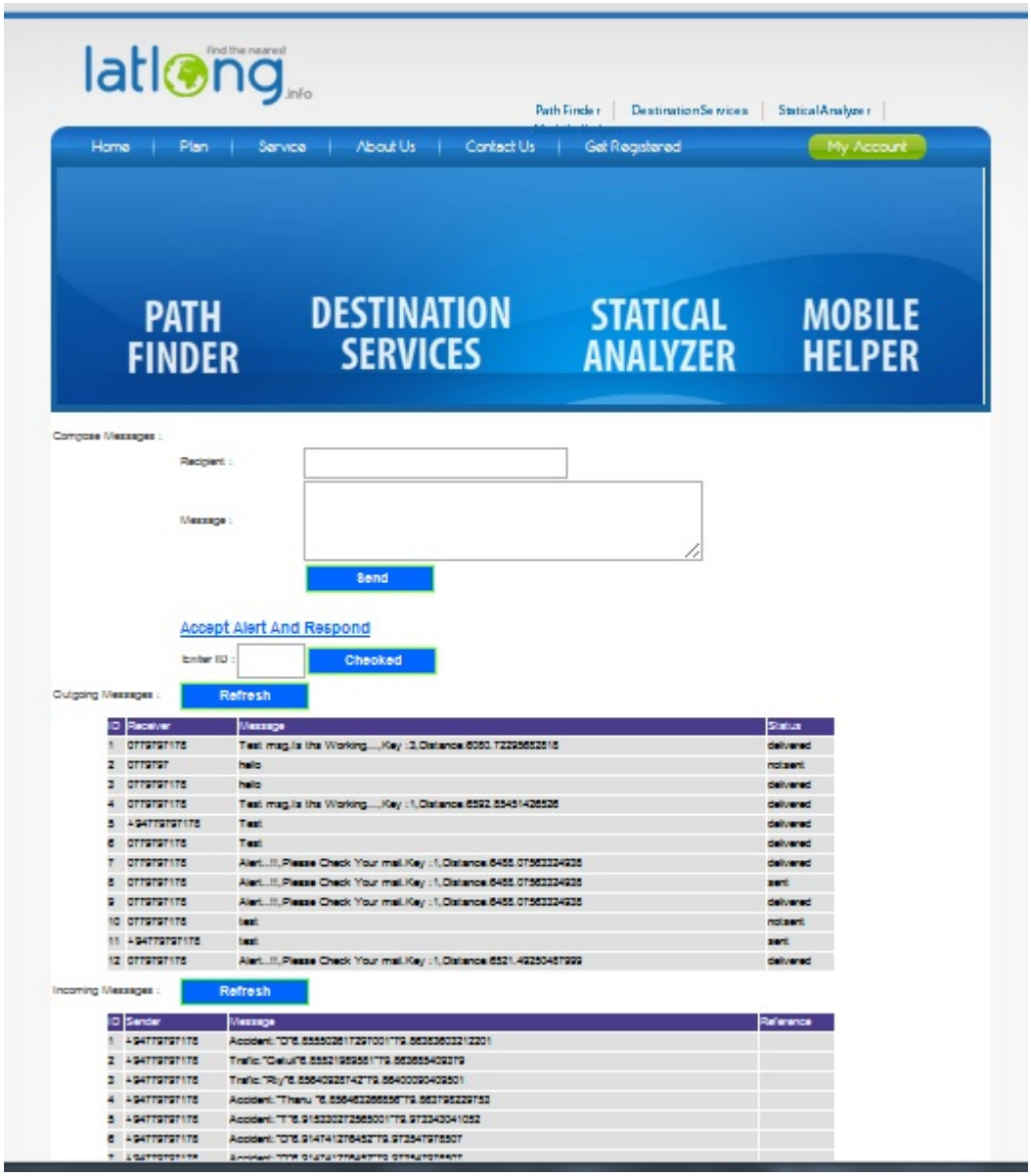



Figure 3.3: Admin access Interface

This is EPI Administrator home page. Using this page only system admin enable or disable automated functions(auto send emergency allerts) according to the accident or traffic volume .

## 3.2 *Discussion*

This document covers the user expectation and helps to get a better understanding about the proposed project and the research criteria, and this document expresses all the requirements, overview, main goals and tasks of the proposed

E-Road Management System for the Motorist.

Further it defines the product perspectives which compare the system with other related competing products. It also provides product perspectives and details of the design process. Requirements are categorized in to functional requirements and non-functional requirements.

Functional requirements are associated with specific functions, task or behaves the system must support. Non functional requirements are the constraints, on various attributes of these functions or task which have to pay more attention.

# Chapter 4

# CONCLUSION

In module EPI (E-Path Identifier), under ERMS number of functions proposed. Some of them are indicate accidents, road blocks, traffic in Google map and a calendar it carries the pre-planned road blocks by the Government in addition to this the system will provide an alternative path to the Client by using the Google map by graphically.

The main function in this module is when an accident is indicated to the system so after the system look for the nearby Hospitals and Police stations send them emergency alerts (SMS and mails). All this are done in a short time period. So this will make huge impact in the future motorway. And by just login to the system user can get to know about the pre-planned road blocks.

This is done with the help of Google map and it carries alternative path as well. Ultimately the client can get the precise location and easiest way for his destination in an effective manner within a short time and more accurate way. Thus it should need a global system by getting the information of all locations in a defined area for the client and conveyed via GSM providers at the same time for the user. Thus the revelation of the project is to provide the client with an accurate and efficient way to solve the existing problem domain.

Automate their day-to-day functions by a web based system, and a mobile based web with more features such as each and every day relevant person can update the system by just login to their account through the website, and they can easily keep track of the details of roads through the proposed system. To make their existing website more user friendly, we decided to use Google map,

send sms to update the system.

The other introducing feature is auto generate graphs, this will help to get a brief idea about the past in road vs. traffics time, road vs. no of vehicles uses a particular road, accidents per year and population vs. vehicles. This is more helpful to the government to take the decisions and other to get some idea. Also we are going to introduce a simulator.

By using this simulator we can get what will happened in the future when no of vehicles increase, when population increase and when road conditions change what will happen. We think this is little challenge for us. Hence satisfying all the requirements specified the project is going towards the goal of developing a reliable and easy to use tool for the ERMS.

The new system is going to radically change the way the Traffic control, transport services, as the will be input directly into the computer in this function.

- This solution will also provide the following non quantifiable benefits.
- Better relation with Clients.
- More accurate motorway history and information.
- Improved management information.
- Faster processing of staffs and services details.
- This solution will provide e-mail and internet facilities to all staffs of the ERMS

For our web based mobile access system initially the place and area of our research will be defined in terms of precise location using longitude and latitude. We are selecting an area that can be easily accessible in various ways with the optimal transportation to the destination points with ticket reserving facilities.

After the definite of the area the information entry points, exit ways and roads will be collected manually and web access basis from the governance, police department and road development authority with the proper direction, accurate length, grading of the road, important landmarks, such as historical points, government institutions, private firms and various important places in

view of the client.

As doing this, the most effective care on clients and travelers kept in mind for their easily accessible paths in a quick web access basis via the GSM providers while they travelling.

For that the collection of data regarding the roads and the land marks will be done in an effective manner with their distance between each landmark, distance from every road, distance between the roads and distance of the roads.

This will enable the client in an accurate way to guide the destination point from the start point or from the point on the way. After collecting all the data, the data will entered to database in terms of longitude, latitude, location, distance of the roads and landmarks. Then entering data will be synthesized in a clear manner for an easy detection purpose to save the time in a quick access way.

It should be kept in mind the easiest landmarks not be missed and the names of the roads will be in their ancient name with their grading. After processing all these data the map will be constructed with the geographical distribution by using the proper indemnification system as in the same way which has mentioned inversely at present. The identification marks will be put on clearly first then they will be noticed with their own names. Then only the client can easily palatable for EPI system in various occasions i.e. the user friendly accessibility.

# Chapter 5

# References

[1] Ministry of Finance and Planning, Sri Lanka new development strategy, Edition(if not the first), Vol.(if a multivolume work). Colombo: Central Bank, 2005 . < http://www.recoverlanka.net/data/SLDF05/SLNDS.pdf >

[2]zOOml rapid Object Oriented modeling.[online].

Available at http://www.zooml.com/.

[3]Websequence diagram. [online].

Available at http://www.websequencediagrams.com/examples.html

[4]School of Engineering and Design[online].

Available at http://www.brunel.ac.uk/about/acad/sed/sedteach/umltool

[5]Visio [online].

Available at http://www.microsoft.com/office/visio/default.asp.

[6]ArgoUML [online].

Available at http://www.microsoft.com/office/ArgoUML/default.asp.

[7]BoUML [online].

Available at http://www.microsoft.com/office/BoUml/default.asp.

[8]Booch, G., Rumbaugh, J., Jacobson, I., The Unified Modeling Language User Guide, Addison-Wesley,1999

[9]webopedia[online].

Available at http://www.webopedia.com/TERM/X/XMI.html.

[10] WPF Technology [online]

at http://www.infoq.com/articles/wpf-rich-client-java

[11]W3C, Extensible Markup Language (XML), [online].

Available at http://www.w3.org

# Chapter 6

# APPENDIX

**Appendix A:Diagrams**

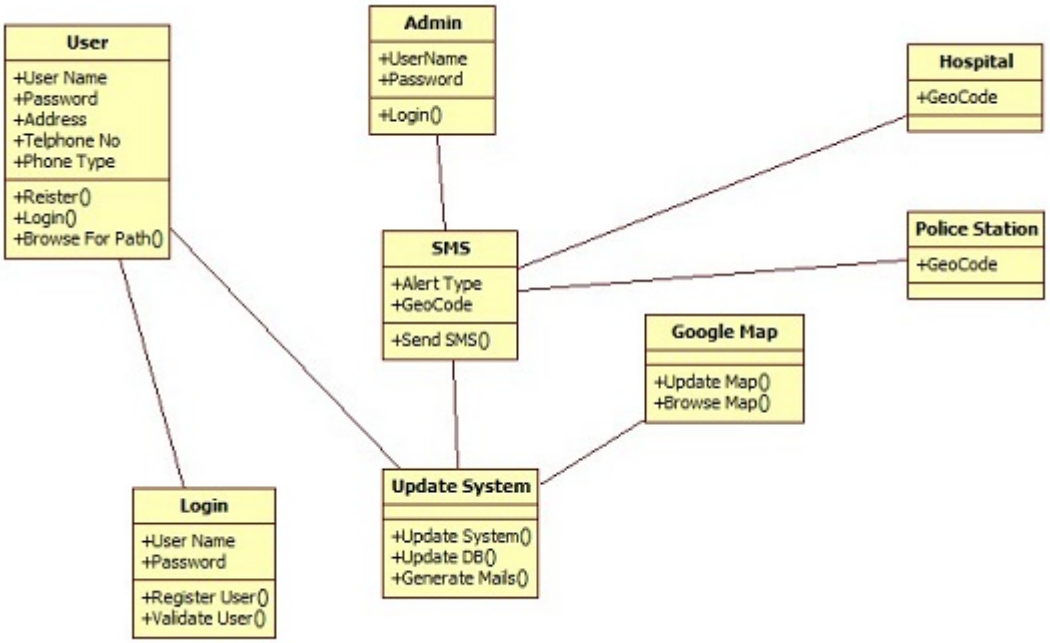
| Risk Id | Risk Category | Risk Description | Risk Impact | Probability of occurrence | Risk response category | Contingency plan | Risk Status | Risk Actionee |
|---|---|---|---|---|---|---|---|---|
| R1 | Commercial risk | Poor identification of problem domain about work life balance | High | Low | Avoid risk | To use proper technique to identify the problem & get supervisor's feedback on problem domain | Close | Project owner (Author) |
| R2 | Commercial risk | Poor identification of scope in the project of work life balance in the Apparel industry of Sri Lanka | High | Low | Avoid risk | To define the scope according to the time limit and according to the contacts in the industry. (Double check with the supervisor) | Close | Project owner (Author) |
| R3 | Relationship risk | Poor contacts with stakeholders of the project | High | High | Mitigate the risk | To check availabilities of contacts in various companies (Small companies such as Tri star) | Open | Project owner (Author) |
| R4 | Relationship risk | Users not committed to system or unwilling | High | Low | Mitigate the risk | Negotiations and training of users | Open | Project owner (Author) |

Figure 6.1: Risk Management-1

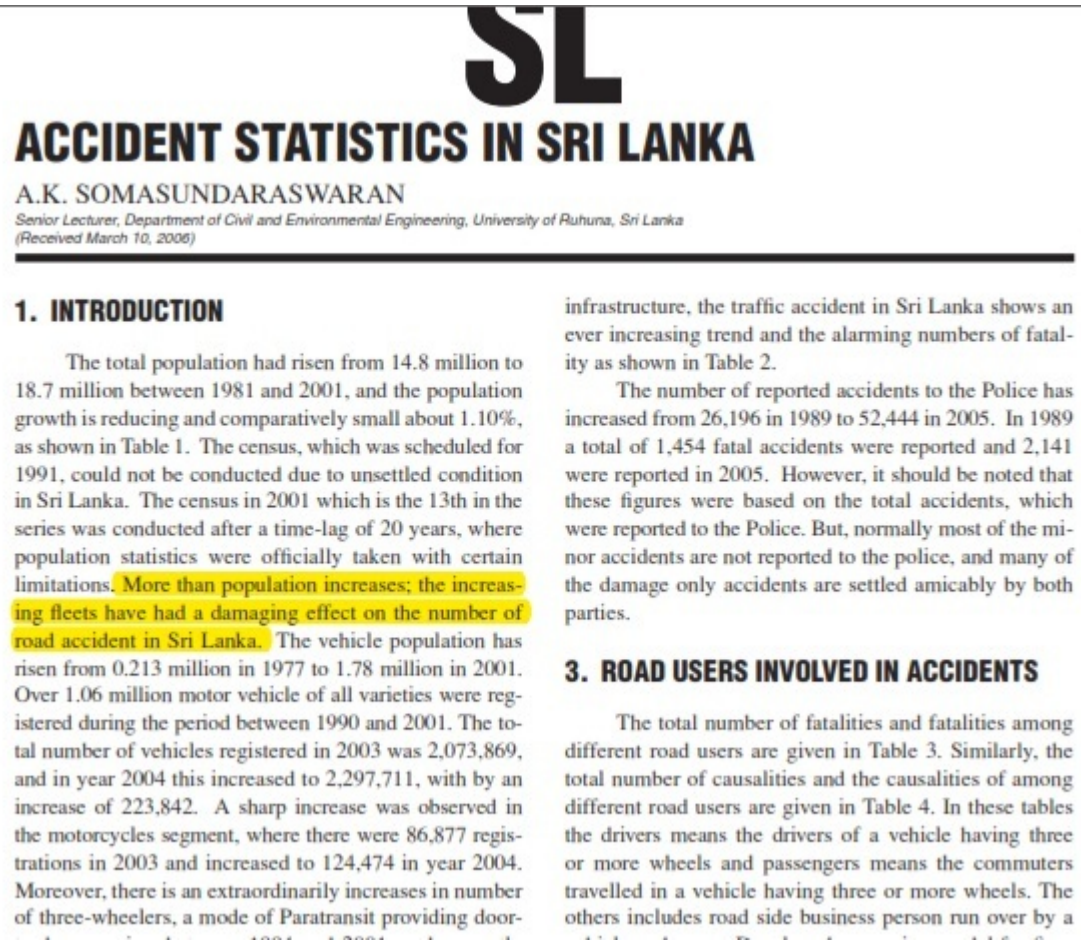

Figure 6.2: Usecase Diagram

### Classes / Objects

Class diagrams are widely used to describe the types of objects in a system and their relationships. Class diagrams model class structure and contents using design elements such as classes, packages and objects. This diagram used to describe the classes of the system and the relationships between each other.




## Appendix B: Findings



SL

# ACCIDENT STATISTICS IN SRI LANKA

A.K. SOMASUNDARASWARAN

*Senior Lecturer, Department of Civil and Environmental Engineering, University of Ruhuna, Sri Lanka*

*(Received March 10, 2006)*

## 1. INTRODUCTION

The total population had risen from 14.8 million to 18.7 million between 1981 and 2001, and the population growth is reducing and comparatively small about 1.10%, as shown in Table 1. The census, which was scheduled for 1991, could not be conducted due to unsettled condition in Sri Lanka. The census in 2001 which is the 13th in the series was conducted after a time-lag of 20 years, where population statistics were officially taken with certain limitations. More than population increases; the increasing fleets have had a damaging effect on the number of road accident in Sri Lanka. The vehicle population has risen from 0.213 million in 1977 to 1.78 million in 2001. Over 1.06 million motor vehicle of all varieties were registered during the period between 1990 and 2001. The total number of vehicles registered in 2003 was 2,073,869, and in year 2004 this increased to 2,297,711, with by an increase of 223,842. A sharp increase was observed in the motorcycles segment, where there were 86,877 registrations in 2003 and increased to 124,474 in year 2004. Moreover, there is an extraordinarily increases in number of three-wheelers, a mode of Paratransit providing door-

infrastructure, the traffic accident in Sri Lanka shows an ever increasing trend and the alarming numbers of fatality as shown in Table 2.

The number of reported accidents to the Police has increased from 26,196 in 1989 to 52,444 in 2005. In 1989 a total of 1,454 fatal accidents were reported and 2,141 were reported in 2005. However, it should be noted that these figures were based on the total accidents, which were reported to the Police. But, normally most of the minor accidents are not reported to the police, and many of the damage only accidents are settled amicably by both parties.

## 3. ROAD USERS INVOLVED IN ACCIDENTS

The total number of fatalities and fatalities among different road users are given in Table 3. Similarly, the total number of causalities and the causalities of among different road users are given in Table 4. In these tables the drivers means the drivers of a vehicle having three or more wheels and passengers means the commuters travelled in a vehicle having three or more wheels. The others includes road side business person run over by a

Figure 6.3: Research Finding-1

**Population, Intercensal growth 1981-2001 and population density by district**

| District | Population | | Intercensal growth | | Average Annual Growth rate (per cent) | Populati densit (person per sq.k |
|---|---|---|---|---|---|---|
| | Census 1981 | Census 2001 | Number | Per cent | | |
| Sri Lanka[a] | 14,846,750 | 18,797,257 | 3,950,507 | 26.6 | 1.2 | |
| Colombo | 1,699,241 | 2,251,274 | 552,033 | 32.5 | 1.4 | 3, |
| Gampaha | 1,390,862 | 2,063,684 | 672,822 | 48.4 | 1.9 | 1, |
| Kalutara | 829,704 | 1,066,239 | 236,535 | 28.5 | 1.2 | |
| Kandy | 1,048,317 | 1,279,028 | 230,711 | 22.0 | 1.0 | |
| Matale | 357,354 | 441,328 | 83,974 | 23.5 | 1.0 | |
| Nuwara Eliya | 603,577 | 703,610 | 100,033 | 16.6 | 0.8 | |
| Galle | 814,531 | 990,487 | 175,956 | 21.6 | 1.0 | |
| Matara | 643,786 | 761,370 | 117,584 | 18.3 | 0.8 | |
| Hambantota | 424,344 | 526,414 | 102,070 | 24.1 | 1.1 | |
| Jaffna[a] | 738,788 | 490,621 | -248,167 | -33.6 | -2.0 | |
| Mannar[a] | 106,235 | 151,577 | 45,342 | 42.7 | 1.7 | |
| Vavuniya[a] | 95,428 | 149,835 | 54,407 | 57.0 | 2.2 | |
| Mullaitivu[a] | 77,189 | 121,667 | 44,478 | 57.6 | 2.2 | |
| Kilinochchi[a] | 91,764 | 127,263 | 35,499 | 38.7 | 1.6 | |
| Batticaloa[a] | 330,333 | 486,447 | 156,114 | 47.3 | 1.9 | |
| Ampara | 388,970 | 592,997 | 204,027 | 52.5 | 2.1 | |
| Trincomalee[a] | 255,948 | 340,158 | 84,210 | 32.9 | 1.4 | |
| Kurunegala | 1,211,801 | 1,460,215 | 248,414 | 20.5 | 0.9 | |
| Puttalam | 492,533 | 709,677 | 217,144 | 44.1 | 1.8 | |
| Anuradhapura | 587,929 | 745,693 | 157,764 | 26.8 | 1.2 | |
| Polonnaruwa | 261,563 | 358,984 | 97,421 | 37.2 | 1.6 | |

Figure 6.4: Research Finding-2

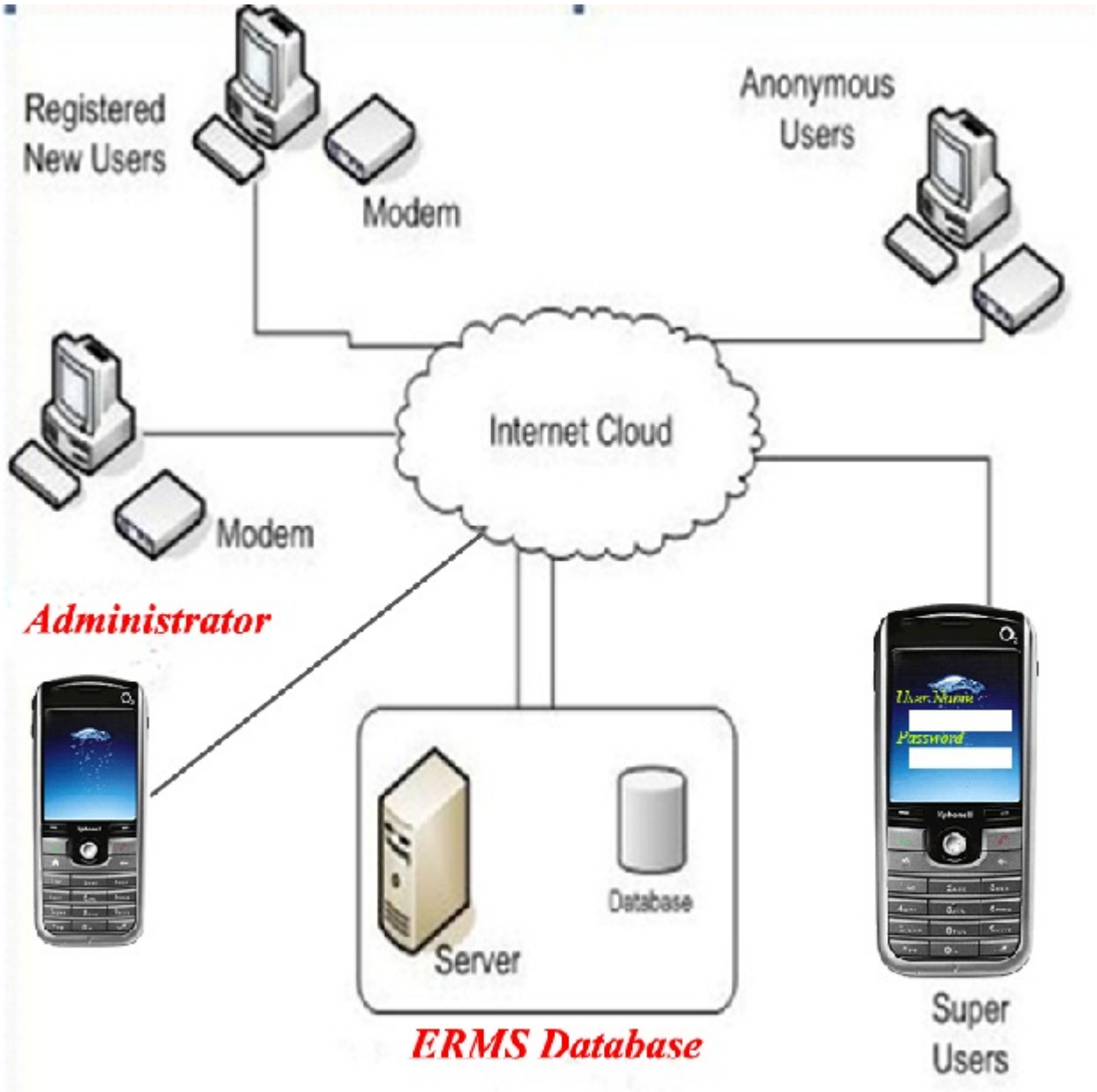



Figure 6.5: ERMS Operations