Instant Crime Scene Reporting (ICSR)

by

Noor Aisha bt Md Tamsi @ Amir

Final Dissertation submitted in partial fulfillment
of the requirements for the
Bachelor of Technology (Hons)
(Information Technology)

DECEMBER 2004

Universiti Teknologi PETRONAS
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CERTIFICATION OF APPROVAL

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Information Technology Programme
Universiti Teknologi PETRONAS
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BACHELOR OF TECHNOLOGY (Hons)
(INFORMATION TECHNOLOGY)

Approved by,

_____
(Mr. Rozana bt Kasbon)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

December 2004

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

(NOOR AISHA BT MD TAMSI @ AMIR)

ABSTRACT

Almost everyday the newspaper, magazines and televisions bombards us with the heartbreaking news of increasing number of crimes committed all around the nation. Often the police officers have difficulties in enforcing the law due to lack of evidence and poor public cooperation especially in volunteering to be a witness. The aim of the project is to create a MMS application to be used by the general public to allow them to lodge instant report on any crime scene that they have witnessed by providing a rough picture of the scene or potential suspect in assistance towards the investigations. Civilians can use MMS technology to send multimedia messages the police department reporting on various incidents such as traffic violations, robberies, vandalism and so forth. The proposed system is aimed to help the authorities to identify suspects, obtaining reliable evidence which enables them to conduct an effective investigation on the alleged crime. The research to be undertaken will involve delving into the nature of law enforcement in Malaysia as well as the mobile phone technology in general and in depth research on the MMS system and application development. The Rapid Application Development (RAD) has been chosen as methodology to be applied during the development of the system.

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1G	First generation
2G	Second generation
3G	Third generation
API	Application Programming Interface
CCTV	Closed-circuit Television
CDMA	Code Division Multiple Access
EGW	E-mail Gateway
HTTP	Hypertext Transfer Protocol) over
HLR	Home Location Register
ICSR	Instant Crime Scene Reporting
IRC	Internet Relay Chat
JRE	Java Runtime Environment
GPRS	General Packet Radio Service
GSM	Global System for Mobile
MIME	Multipurpose Internet Mail Extension
MM	Multimedia Messages
MMS	Multimedia Messaging Service
MMSE	Multimedia Message Service Environment
RAD	Rapid Application Model
SDK	System Development Kit
SMPP	Short Message Peer to Peer
SMS	Short Messaging Service
SMSC	SMS Center
SMTP	Simple Message Transfer Protocol
TCP/IP	Transmission Control Protocol / Internet Protocol
TDMA	Time Division Multiple Access

TGW   Terminal Gateway

WAP   Wireless Application Protocol

WCDMA   Wideband Code-Division Multiple Access

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

1.1.1 Multimedia Messaging Service (MMS)

The MMS as its name suggests, 'the ability to send and receive rich media messages comprising a combination of text, sounds, images and video to and from MMS cable handsets.' [iBilt]. The MMS confers the ability to send still images such as mobile postcards, mobile pictures, mobile screensavers, mobile greeting cards, mobile maps and business cards. In addition, MMS will also support moving images, cartoon and interactive video.

'The MMS application is a messaging application, not a browsing application. Therefore it requires its own user interface, just as SMS does.' [Toland]. An MMS message is a multimedia presentation in a single entry-it is not a text file with attachments. It can, for example, be a photo or picture postcard annotated with text and/or an audio clip, a synchronized playback of audio, text, photo or in the near future, a video emulating a free-running presentation or a video clip. It can also simply be a drawing combined with text. MMS is bearer independent and is not limited to only GSM or WCDMA networks. MMS does not use the WAP browser in any way.

MMS allows for the messages to be sent to both mobile numbers and e-mail addresses. This addressing feature is beneficial for MMS messaging to users who may not have an MMS capable handset. MMS messages can still be sent to non MMS capable handsets, however, the user will not be able to view the message on their mobile. Instead the user will be sent an SMS pointing to a URL address where they can view the message. 'In addition to the text that can be sent by SMS, MMS

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messages can contain images, voice, audio and later in development, video clips and presentation information.' [Nokia]

MMS is a store-and-forward protocol. Messages are stored on an MMS server, which sends the recipient a notification message using WAP Push (essentially an SMS message). The notification message triggers the receiving terminal to retrieves the message automatically (or depending on filters defined by the user) using the WAP GET command. This allows the receipt of the message to be transparent to the user, as is the case with SMS.

1.2   PROBLEM STATEMENT

1.2.1   Problem Identification

Almost everyday the newspaper, magazines and televisions bombards us with the heartbreaking news of increasing number of crimes committed all around the nation. This has created a situation where civilians no longer feel secure to go on with their daily lives. Often the police officers have difficulties in enforcing the law due to lack of evidence and poor public cooperation especially in volunteering to be a witness.

There should be a mechanism in which civilians may provide accurate evidence of crimes that they had witnessed by capturing images via their phones. Civilians can use MMS technology to send multimedia messages the police department reporting on various incidents such as traffic violations, robberies, vandalism and so forth. The proposed system is aimed to help the authorities to identify suspects, obtaining reliable evidence which enables them to conduct an effective investigation on the alleged crime.

1.2.2   Significant of the Project

The identified problem statements that urged for the development of this application are as follows: -

The Government is considering introducing a law to strengthen the people's rights in helping the police to curb crime including snatch thefts, murders and vandalisms. Prime Minister Datuk Seri Abdullah Ahmad Badawi said for The Star, June 17th this year. "I am looking into how to beef up the legal provisions to authorize citizens to a certain degree to encourage them to extend their assistance to the police to curb crimes" he said in his comments on the reported cases of snatch thefts that are becoming rampant. [The Star]

With the use of MMS technology, local citizens may play bigger part in crime fighting as they usually the witnesses of the crime and sometimes become the victim

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as well. Such provision will enable them to take more drastic as well as effective measure in retaliating towards law breakers and set things to right.

The government is now looking for other technological means in which will help to curb down crime rates within the nation. They are willing to look for alternatives routes such as the usage of CCTV to help law enforcers in catching the law breakers in their act. Housing and Local Government Minister Datuk Seri Ong Ka Ting said for The Star, June 20th "The directive to install closed-circuit television cameras is only one of many steps taken by the Government in a co-ordinate effort to curb snatch thefts.." [The Star]

The statement was made to show that the government is willing to consider other viable and effective way of improving crime-busting actions. In this case we shall not limit ourselves, where we will soon realize that MMS can be an effective tool to be utilized.

While in an ideal world all of us would be very humanitarian and civic-minded and go to the aid of the victim of a crime, recent events have proven that sometimes being a good Samaritan is just not worth it. In the recent case of law student Darren Kang who was brutally killed at Desa Sri Hartamas recently, police had a real go at the public for not being proactive to stop the assault. They include not calling the police or going to the assistance of the victim.

"Sometimes, long after the crime is over, the perpetrator returns to haunt the do-gooder. Everyone's first concern is for their own safety and family." (VRK, Petaling Jaya in this e-mail written to The Star on July 13th). [The Star] The MMS technology will enable witnesses as well as spooked victims to lodge a police report at the same time providing quick and reliable proof in which the police officers are able to use to prosecute the perpetrator.

1.3   OBJECTIVES

- To conduct a research in understanding the underlying concept of MMS and its architecture.

- To develop a prototype application that would be an alternative towards crime reporting using the MMS technology.

1.4   SCOPE OF STUDY

The scope of the project will involve an online interface for local authorities to process MMS messages that have been sent, with backend database connectivity. This database will be built up around crime details, and will be accessed for the purpose of investigation matters.

The research to be undertaken will involve delving into the nature of law enforcement in Malaysia as well as the mobile phone technology in general and in depth research on the MMS system and application development. The related SDK will also be studied in order to develop the interface for the system.

The project focuses on MMS concept and application by studying the MMS architecture and transmission means. There would also be in depth discussion on how to receive MMS and store it in a database. Focus on how to retrieve MMS message and manipulating the message.

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.1   History and Evolutions of MMS

The MMS as its name suggests, 'the ability to send and receive rich media messages comprising a combination of text, sounds, images and video to and from MMS cable handsets.' [iBilt] The MMS confers the ability to send still images such as mobile postcards, mobile pictures, mobile screensavers, mobile greeting cards, mobile maps and business cards. In addition, MMS will also support moving images, cartoon and interactive video.
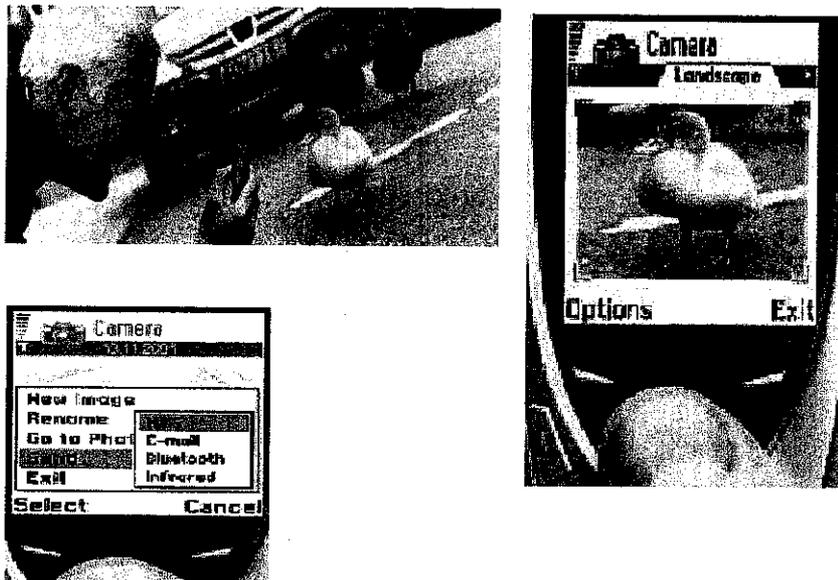

Figure 1: Example of Multimedia Messaging Service (MMS)

Display of Text and Picture
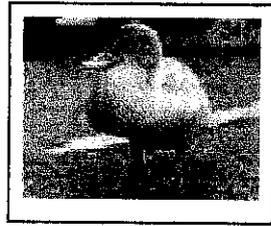
"I found him in the middle of the road, isn't he cute?!"

Played or Spoken

Duckie

Figure 2: Example Message with Multimedia Content

"Mobile phones have become an everyday accessory for hundreds of millions of people and they are also increasingly being used as the one and only means of personal voice telecommunication." [Ericsson] Three generations of mobile phones have emerged so far. Each successive generation has shown to be more flexible and reliable than the previous. This can be seen in the figure below:

- Increased Voice Capacity
- Multi-Media Messaging
- Video streaming
- Location Based Services
- Mobile Commerce
- On-line Gaming

- Increased Voice Capacity
- Text Messaging
- Web Browsing
- Email

- Voice Services

1G Analog   2G Digital   3G Digital

Figure 3: Evolution of mobile devices [Toland]

- **1G**

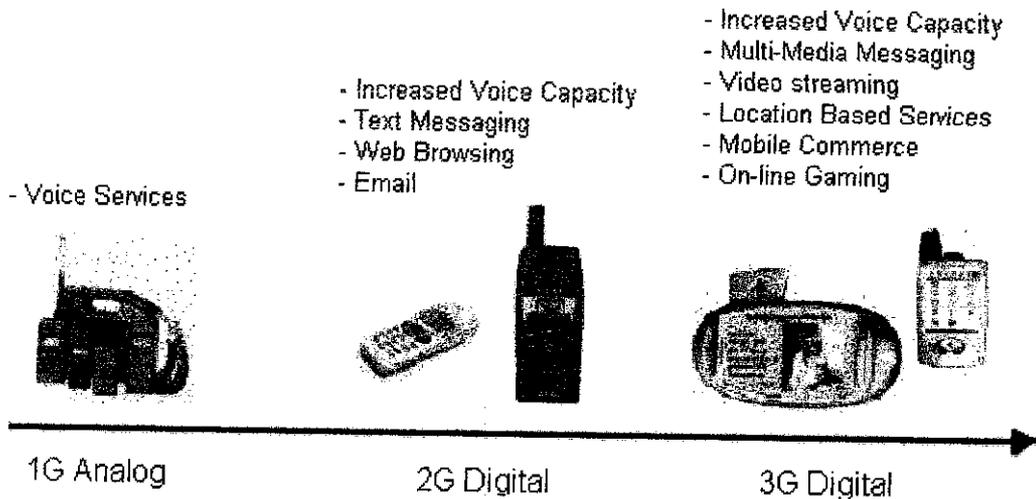1G (mobile phones were introduced in the late 1970s/early 1980s and at the time represented a massive leap in mobile communication. The 1G device only provided analog voice services, however, at the time "markets in the developed economies were not really asking for much more." [NancyGl]

- **2G**

Advances in technology brought digital transmission to mobile communications. 2G mobile technology made use of these advances and was able to improve transmission quality, system capacity and coverage. The technology used circuit-based, digital networks. Since 2G networks are digital, they are capable of carrying data transmissions, with speeds up to 10Kbps. The three standards involved in 2G networks are TDMA, CDMA in America and GSM used in both America and Europe.

- **2.5G**

2.5 is an acronym which represents various technology upgrades to the existing 2G mobile networks. These upgrades include increasing the number of users a network can service, and boosting data transmission speeds. Upgrades are designed to be overlaid on top of 2G networks with minimal additional infrastructure. "GPRS enabled networks offer 'always-on', higher capacity, Internet-based content and packet-based data services. This enables services such as color Internet browsing, e-mail on the move, powerful visual communications, multimedia messages and location-based services" [GSM]. The introduction of 2.5G makes it possible for today's mobile operators to gain vital business and market experience by providing, high speed mobile data services. It also gives users a feel for the possibilities of 3G.

- **3G**

Tomorrow's information society will be characterised by a vastly increased worldwide market for users of mobile communications, providing businesses and consumers with a new world of media-rich information and entertainment services, spanning voice, video and high-speed Internet access, wherever they are in the world.

3G will support far more users than today's networks and will offer data transmission speeds far in excess of today's second-generation systems. In fully mobile environments these speeds will reach up to 384kbits/sec; around forty times that possible today over current second-generation networks like GSM. In low mobility applications -- inside buildings for instance -- the comparisons become more dramatic still. At speeds of up to 2Mbit/sec, 3G will allow users to download complex graphics files, full motion video clips, and more, in seconds rather than minutes or even hours. With these data rates, 3G will have a vital role to play within the office environment. "3G will facilitate high-speed access to corporate networks and intranets for office-bound workers." [3G]

A major strength of 3G is its wireless high-speed access to the Internet, allowing super-fast downloads, providing the ability to play networked games and much more. Unrestricted by a fixed line connection to the Internet, users will be able to do the things they currently do on the Internet, on their mobile. Imagine being able to check train times from your phone when traveling overseas and perhaps even book a ticket from your phone. The boundaries are vast.

Speed aside, 3G will introduce new and better services, with more coverage, for more users. High-quality voice services will become cheaper. "The added appeal of 3G networks is that they will offer a high level of networking with 2G operators to enable new players to meet their coverage obligations, so everybody in the operator community can continue to benefit from the continuing growth of the mobile market over the next several years" [3Gevo]. The potential for 3G is huge. The many services 3G will make available are expected to not only result in a corporate revolution but also a consumer revolution. Mobile users will benefit from more interactive and personalised applications for their phones, which in turn could significantly improve their lifestyles and the way they conduct business.

2.2 MMS Architecture

The MMS architecture has a number of key elements that have been defined and incorporated into a MMSE. The MMS architecture contains several key platforms that interwork with each other to provide the MMS service.

The key elements are:

- MMS Relay
- MMS Server (servers)
- MMS Store (stores)
- MMS User Agent
- MMS User Databases

2.2.1   MMS Relay

MMS Relay is the engine of the MMS and is responsible for the transfer of messages between different messaging systems. It is responsible for transcoding multimedia message format, interacting and interworking with other platforms as well as enabling access to various servers residing in different networks and the like.

2.2.2   MMS Server and MMS Store

The MMS server and store is responsible for storage and handling of incoming and outgoing messages. Several MMS servers can be included within an MMSE, for example MMS server, email server, SMSC and fax servers.

2.2.3   MMS User Database

This may consists of lots of different data including user profile database, subscription database, and HLR information for mobility management.

2.2.4 MMS User Agent

It is an application layer function that provides the users with the ability to view, compose and handle Multimedia Messages.
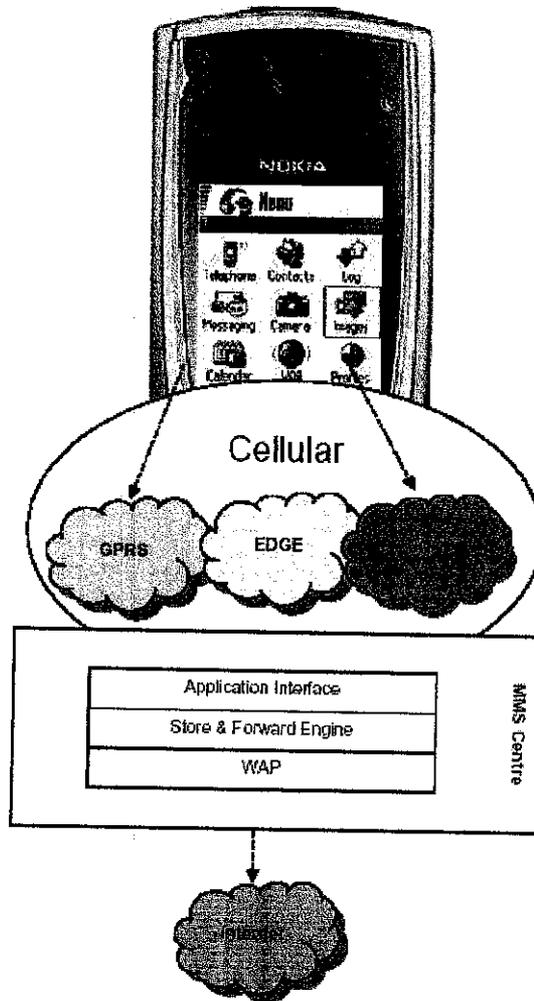

Figure 4: MMS Architecture [iBilt]

This architecture allows multimedia access to all types of different information with a range of servers providing access to new and legacy services. This allows operators to consolidate access to multiple applications from a single architecture.

2.3 Multimedia Messaging Service

The main target area for MMS is mobile-to-mobile traffic. Because there is always the possibility of the receiving mobile not being able to receive a message, due to reasons such as an empty battery or poor network coverage, there is a new network element called the MMSC. The MMSC is needed for storing MMS messages until the receiving phone is reached. It also hosts a number of interfaces to connecting networks and an API to enable delivery of value-added services and network interconnection to e-mail.

MMS standards do not state any specific content format for MMS messages. Instead, MMS messages are encapsulated in a standard way, so that the receiving party can identify content formats it does not support, and deal with them in a controlled manner. The following media types are recommended by the standard: JPEG, GIF, text, AMR voice and some other less-important formats. To achieve interoperability, a minimum set of content types to be supported by a MMS phone has been agreed by Nokia and some other manufacturers. Also due to interoperability reasons, a maximum 'MMS message' size has not been set. This has been done to avoid the SMS dilemma, of putting character limits on the messages. The message size is dependent on implementation and operator preferences. Some operators may want to set a message size limit for billing purposes. Some estimates so far, have been that an initial message size will range between 30kB and 100kB. The mobile network operator controls MMS charging.

2.3.1 MMS Protocol

MMS is a store-and-forward protocol. Messages are stored on the MMSC. Using WAP Push the recipient receives a notification message (basically an SMS message) from the message centre. The notification message triggers the receiving terminal to retrieve the message automatically (or depending on filters defined by the user) using the WAP GET command. This allows the receipt of the message to be transparent to the user, as is the case with SMS. MMS uses Internet protocols like MIME and SMTP for access to the MMSE. Initial MMS implementations will be based on enhanced WAP protocols (WAP MMS encapsulation), however, later

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MMS versions will also support non-WAP, standard internet protocols for communication between terminal and MMS relay, such as HTTP over TCP/IP.

2.3.2   Sending an MMS Message

The 'basic' concept of sending an MMS message is the same as that of sending an SMS message:

- The message sender addresses the multimedia message to the receiver.
- The mobile contains information about the MMSC (MMS Centre), and the message is sent there.
- MMSC attempts to forward the message to the receiver.

If for some reason the receiver is unreachable, the MMSC stores the message for a time, and if possible, delivers the message later. If the message cannot be delivered within a certain time frame, it is eventually discarded.

Sender   MMS Center   Receiver
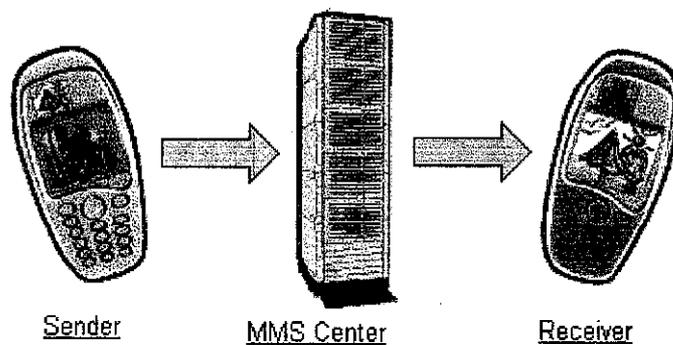
Figure 5: Sending an MMS message

It is important to note that the MMSC does not directly try to send the message to the receiver, what it does is send a notification message telling the receiver that a message is waiting. Depending on the mobile settings, the message may be fetched immediately, held off until the user wants, or discarded completely. If automatic retrieval is set on the mobile, the user is only notified when the entire message has been delivered.

2.3.3   MMS Elements

Below in Figure 6, an attempt is made to show some other elements that may be involved in the MMS.
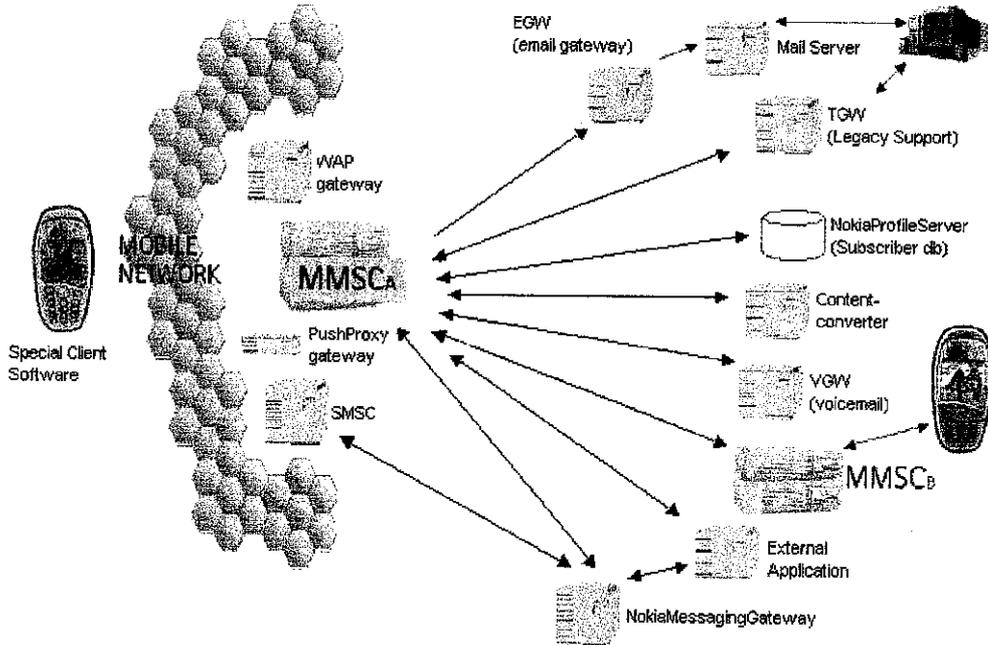
Figure 6: Possible elements in a Multimedia Messaging System

- **E-mail server/gateway**

For MMS-message delivery to e-mail addresses, the MMSC must be able to communicate with existing mail servers, more than likely using SMTP protocol. Nokia's solution has been to create an E-mail Gateway, which lies between the MMSC and the e-mail server.

- **Legacy Support**

In order to support non-MMS capable mobiles, Nokia have created a TGW to work as a legacy-messaging server. It works by storing the MMS message in its own storage, and then it sends an SMS message to the MMS message's intended receiver, with a URL pointing to where the message can be viewed.

- **Subscriber Database**

The principle behind the subscriber database is to have a database of subscriber profiles to help when deciding what type of content to deliver. For example, if A sends B an MMS message, the MMSC can determine via the database, that B does not have an MMS capable mobile, and send the message directly to the TGW, as described above. Nokia have implemented this concept by allowing subscribers to be able to set up message receipt options, e.g. all incoming messages can also be sent to a mailbox.

- **Content Converter**

An example may be that one user may send another user an image in a format that is not supported by their terminal. The MMSC determines this from the subscriber database, and sends the image to a content converting application. This application converts the image to a format that is supported by the user's terminal and sends it forward to them.

- **Voicemail**

Instead of receiving a text message indicating that there is a voice message stored, the voice message is now encapsulated in an MMS message and sent directly to the phone.

2.4 Comparison between SMS and MMS

The SMS is the dominant messaging service in the mobile world at present, with tens of billions of SMS messages sent and received every month globally. As seen in below, MMS is predicted to tap into this market and indeed eclipse it over the coming years. SMS will still remain one of common ways people will communicate; however, MMS's richness of communication is set to become the dominant form of messaging in the near future.

Table 1: Comparison between SMS and MMS

FEATURE	SMS	MMS
Store and Forward (non real time)	Yes	Yes
Confirmation of message delivery	Yes	Yes
Communications Type	Person to person	Application to Person Person to person
Media supported	Text plus binary	Multiple-Text, images, Video
Protocols	SMS specific e.g. SMPP	WAP and general Internet e.g. MIME, HTTP, SMTP
Configuration	Simple telephone number	Diverse Parameters
Platforms	SMS Centre	MMS Relay plus others
Principle Applications	Simple person to person	Still images, person to person, server based MMS services e.g. video news
User behaviour	Discreet	Indiscrete

Both SMS and MMS are non-real time services, meaning that both must pass through an intermediate platform on route to the mobile. They pass through the likes of an SMS centre or an MMS Relay. Both give the sender confirmation of delivery, allowing the sender to know that the message sent was successfully delivered.

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2.4.1 Media Supported

The SMS support text and binary as media compared with MMS supporting media ranging from text to images to sound to video, and also a combination of these media. This clearly shows the power of MMS and the possibilities of communications available to the user.

- **Delivery Mechanism**

The signalling channel over which SMS messages are sent and received is an additional transport mechanism on GSM networks, over and above the radio channels themselves. Similar in principle to the hard shoulder on the motorway, it runs parallel to the traffic lanes themselves. Instead of running parallel to the traffic lanes, multimedia messages will be transmitted over the traffic lanes themselves, alongside the voice data and other data being transported. 3G's high capacity will mean that the different traffic types can share the traffic lanes without the chance of congestion.

- **Protocols**

SMPP has become the standard SMSC interface protocol in recent years. It is also likely to be used for some MMS interfaces. "MMS uses standard internet protocols such as MIME and SMTP for access to the MMSE." [Mmsdata]

- **Configuration**

SMS is very easy to use. There are no special numbers to remember in order to send a message. The sender just enters the recipient's mobile number. MMS message sending is much more complex than SMS message sending. "In the initial implementation of MMS using WAP, WAP Push is used such that concatenated SMS messages are used to transport the notification data (sender, size, retrieval URL, etc.) encapsulated in a WAP Push data unit. The 3GP IP-based implementation proposal for MMS does not include SMS notification – it assumes a pure HTTP payload between the terminal and the relay." [Mmsdata] This will require the user to enter more details about the content of the messages being sent.

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- **Platforms**

The SMS Centre is at the core of the SMS service, with all short messages of any type passing through one, on route to and from mobile phones. This being so means that there is only one platform type dominating SMS. MMS on the other hand has many key platforms within its environment, MMSE – including the MMS Centre (combination of MMS Relay and the MMS message store), the MMS User Database and other platforms including existing platforms such as the SMSC, voice mail platforms and the like.

- **Applications**

The vast majority of SMS traffic accounted for is simple person to person messaging in which people send messages such as "How's it going?." MMS allows for more advanced applications. Screen savers, photos, etc., can to be sent from Internet sites.

- **User Behaviour**

The sending of SMS can be a very discreet operation that can take place virtually anywhere, for example, in an office meeting without disturbing anyone. MMS is completely different, in that, sending MMS messages will draw attention to the sender, for example, if the user is taking a picture using a built in camera in the phone.

2.5   Predicted Growth for MMS

The evolution of SMS to MMS on mobile handsets will have a huge impact on the way mobile users communicate in the near future. Moving from sending simple text messages through a monochrome mobile handset to being able to send images, video, audio and data to MMS-enabled mobile phones will enrich the user's experience and enjoyment. "Unlike SMS, MMS provides an excellent platform for customers, with a colourful, user-friendly application interface." [Sharp] It is no surprise, then, that the telecommunications industry seeks to revolutionise messaging by enhancing its robustness and delivering on a promise to bring the next generation of communications to mobile consumers.

"Today, analysts estimate that more than 62 billion SMS messages will be sent worldwide on a monthly basis in 2002. That translates into a little more than 5.7 billion euros in transaction revenue per month." [Sharp] One research organisation, Mobile Streams, recently published forecasts for the number of monthly messages and revenue for SMS and MMS see Figure 7 below:

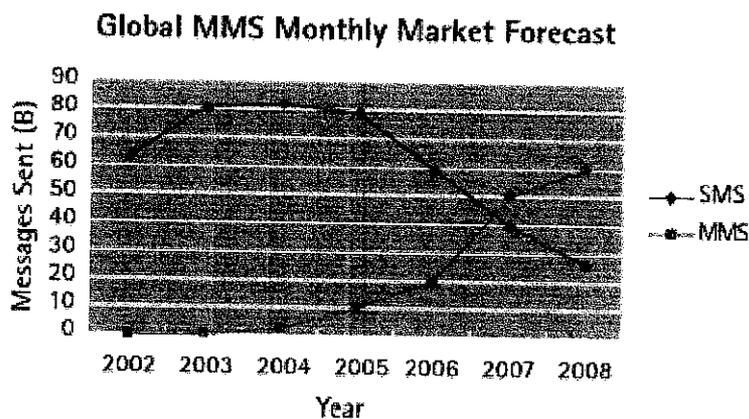**Global MMS Monthly Market Forecast**

Figure 7: Global MMS Monthly Market forecast

From this graph above, it is clear to see that MMS traffic is expected to exceed SMS sometime in 2007. "Data excludes Japan. (Source: Mobile Streams, 2001)" [Sharp]

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2.6 Benefits of MMS

- **For Mobile Users**

  Messaging is the modern way to communicate. It's instant, location independent, and personal. MMS allows users to enrich the messages they send with images and sound, thus satisfying user's desires for rich personal communication. MMS is very flexible, in that it can be used for all types of mobile phones and can be sent to e-mail addresses.

- **For Operators**

  MMS provides a natural path to continual growth. This new service beyond voice communication allows operators to increase free airtimes, service differentiation and customer loyalty. "As MMS is bearer independent, it leverages GPRS and WCDMA investments by providing a mass-market application for them and adding value to the utilisation of infrastructure. Early adaptors can secure a strong position and accumulate the required competencies to be leaders in the era of personal multimedia." [Sharp]

- **For Content Providers**

  MMS facilitates three factors that boost information value for phone users: personalisation, time-sensitivity and mobility. Applying these three factors to their products and services will enable content providers to maximise their attractiveness to mobile users. MMS is fast, personal, audio and visual, so providing content for such a service is a big opportunity as its popularity is set to grow enormously over the next decade.

- **Developers**

  MMS will generate a need for developers across a broad range of areas, from creating interesting content to storage services for downloading to aggregation software.

CHAPTER 3

METHODOLOGY AND PROJECT WORK

Rapid Application Development (RAD)

Throughout the development of the application, RAD will be the framework for describing the phases involved in developing and maintaining this system. The RAD model will be used to decrease time needed to design and implement information system radically which incorporates a very short life cycle without sacrificing its quality. For this project, there are pressing reasons for speeding up the portion (accuracy consideration) of the existing application. Rapid development is achieved by using component-based construction. Equipped with requirements well understood and project scope constrained, a fully functional system can be created within very-short time periods. This model is an object-oriented approach to systems development that includes a method of development as well as software tools. There are four broad phases to RAD as shown in Figure 8:
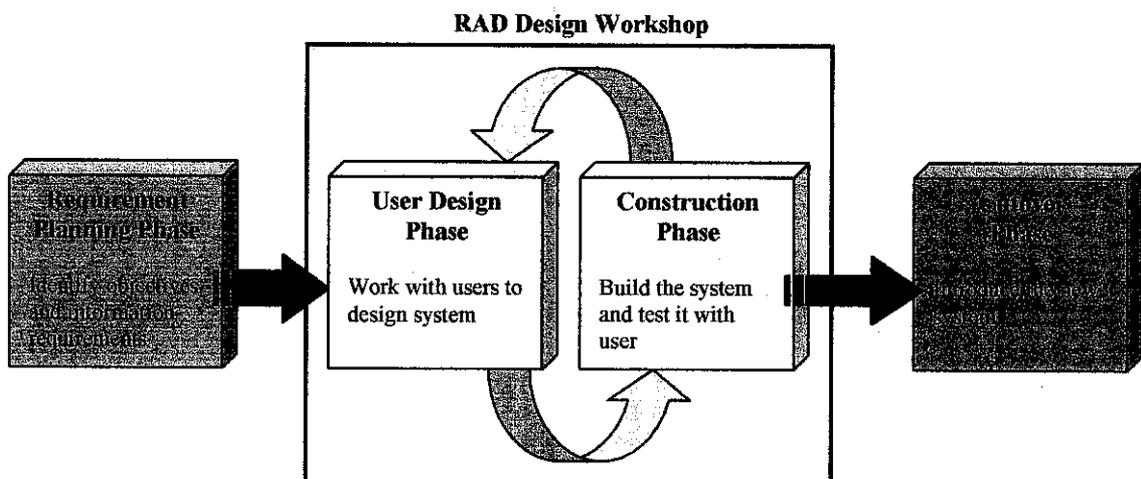

Figure 8: Phases in Rapid Application Development (RAD) Model

3.1 RAD Model Phases

3.1.1 Requirements Planning Phase

The first activity in the requirements planning phase is to identify objectives of the application or system and to identify information requirements arising from those objectives. This stage involves the understanding of the content and nature of the requirements of the MMS technology as well as in depth research on law enforcement in Malaysia. Within this phase, the relevant information to be gathered was identified. Formulate a method in which to collect those information and to whom those information to be retrieved.

3.1.2 Data Collection Method

For gathering the data in for the research area, methodology as listed below is being practiced:

- **Observational survey**

  The current trends of hand phone usage among mobile users are observed. The current issues and scenarios of crime reporting as crime rate increases are also being observed.

- **Fact Finding**

  Gather data regarding the MMS technology from in depth research on various journals and web pages. References are made from textbooks and printed materials as reference.

- **Interviews**

  Interviews conducted either face-to-face or via the phone with the people listed below:
  - Randomly selected students of UTP concerning their views of the ICSR and MMS technology.
  - Professionals within the MMS fields:

Rostam Abd Hashim (Head-Maxis Developer Programme)

Lester Neil Francis (General Manager - AKN Messaging Technologies Bhd)

- **Questionnaires**

    Questionnaires (Set 1) have been distributed for randomly selected students who possesses hand phone. The questionnaires had been distributed online through the local IRC as well as personally administered. As a total, the research obtained 35 numbers of respondents.

- **Internet**

    Fully utilize the Internet to find literature reviews to support the results regarding the research area.

3.1.3 Data Analysis

The data that had been obtained during the data collection had been analyzed to see the relationship between the student's reactions to the current crime reporting procedure. Analyze the all the data by:

- Count on the frequency of occurrences for each question being asked. For example, how many people agree on the statement, how many people do not agree on the statement and etc. Note: This method is applied in analyzing the questionnaires.

- Measuring the level of understanding of current mobile users to the usage and functions of MMS technology.

- Take into considerations the feedback from the lecturers, students, the police department as well as the general public.

3.1.4 Design Phase

This phase is a design and refine phase that can be characterized as RAD Design Workshop. During this phase, the outcomes from the requirements planning phase; scope, objectives, data models and reports will be reviewed. During this analysis, the functionality should be defined and determined to be represented and added in the existing prototype. This functionality should focus upon the requirements that are unclear or fuzzy. It is undesirable and costly to prototype requirements that are fully understood. This approach must offer features, which satisfy the general requirements of prototyping, such as rapidity and ease of modification. Obviously, an approach, which relies upon a complex and lengthy development cycle, is unsuitable.

3.1.5 Construction / Testing Phase

During this phase, detailed design is done using a design tool, and the design is 'translated' into code via a code generator. Adjustments and enhancements of the system will be designed and tested during construction. It is desirable that any prototype construction activities be performed as quickly as possible. During the RAD Design Workshop, users respond to actual working prototypes and analysts refine designed modules based on user's responses. In this phase, conversion data and system will be developed. Besides that, testing of the system will be conducted in terms of functionalities, interface, and general perception.

- **Questionnaires**

  Questionnaires (Set 2) have been given to selected person to test the ICSR system. There are two (2) within the questionnaire where the first part needed to be completed before the testing commenced and another after the completion of system testing.

24

3.1.6 Cutover

Final documentation needs to be prepared during this phase. Technical people may be required for installation and acceptance testing.

3.2 TOOLS REQUIRED

3.2.1 Hardware

- A workstation / computer
- 600 MHz or faster processor
- 96 MB RAM (minimum), 256 MB RAM recommended
- 110 MB disk space
- 64 K colors or more

3.2.1 Software

- Microsoft Windows XP
- JRE1.4.1. Java Runtime Environment (Java Platform Standard Edition, Version 1.4.1 or higher)
- Nokia 7210 Content Authoring SDK 1.0 (Nokia 7210 Terminal Emulator)
- Nokia Connectivity Framework (Connectivity Environment)

CHAPTER 4

RESULTS AND DISCUSSION

4.1 RESULTS

4.1.1 Requirements Planning Phase

A Gantt chart has been drawn up in order to systematically plan the project according to allocated time and cost. Please refer to Appendix C to view the chart.

4.1.2 Data Collection Phase

Set 1 questionnaire to 35 random respondents is distributed via the UTP's IRC network. Please refer to Appendix B to view the Set 1 questionnaire. The results from the questionnaires are further discussed in following phase's results.

4.1.3 Data Analysis Phase

Results from Questionnaires (Set 1) - Research on the Relevancy of ICSR

The findings and discussion below are reflected from the interviews, fact findings and the questionnaires feedback.
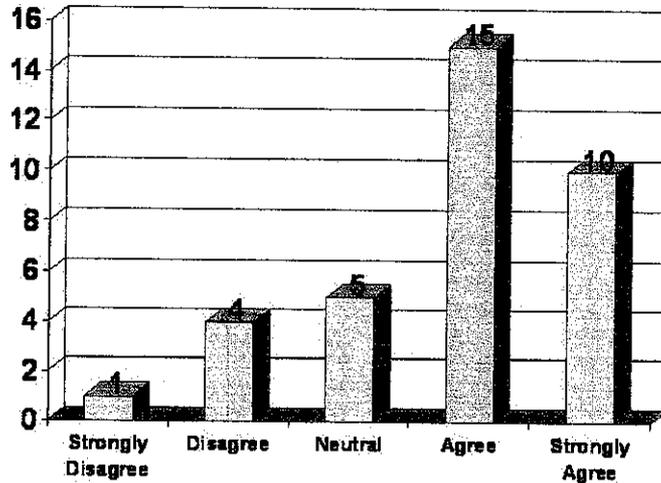
Figure 9: User Response on Traditional Crime Reporting System's Validity

Based on Figure 9, out of 35 respondents, it is deducted that 15 persons (42.86%) agree and 10 persons (28.57%) strongly agree that the current crime reporting is rather out dated and something fresh need to be injected into the system as it no longer cater to the current scenario.

The questionnaire also made to depict the overall awareness of the public on MMS technology. It is rated that 1) Expert as having the same level as a developer of the technology, 2) Knowledgeable as having in depth understanding of the subject matter, 3) Fair as understanding its usage and function, 4) Lacking as little knowledge on the subject; whereas 5) Never heard as no knowledge on MMS.
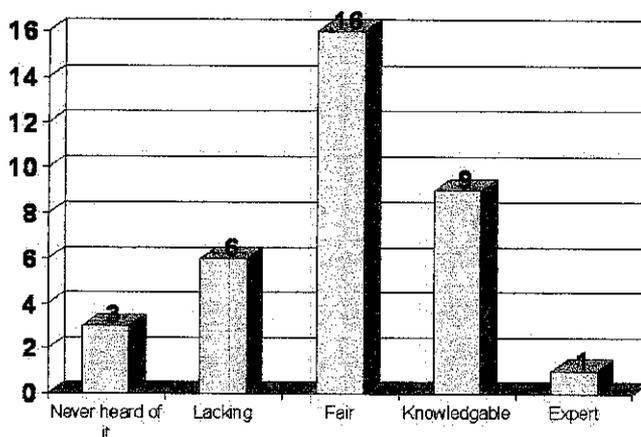

Figure 10: User Response on Level of Awareness on MMS Technology

Looking at the responds in Figure 10, the level of knowledge on MMS is considered average. 16 persons who represented 45.71% of overall respondents feel that they have fair level of understanding, in sense that they understand the usage as well as the functions of MMS even though they have not fully exposed to the idea.
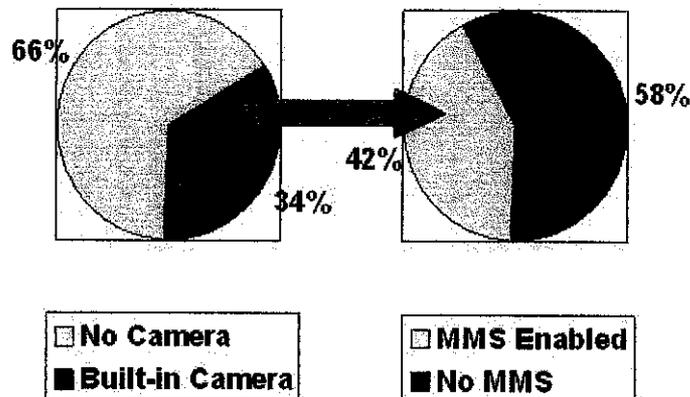

Figure 11: User Response on the Number of People has Built-in Camera and Subscribe to MMS

Based on Figure 11, 35 respondents that have been selected randomly all throughout UTP campus; it is found that 100% of the respondents possess a hand phone. The research has found that 12 persons (34.28%) of the respondents have a built-in camera on their hand phone. However, only handfuls who have subscribe to MMS services. The study indicates that the markets for MMS are growing and mobile users are slowly moving into the technology

4.1.4 Design Phase

Based on the data gathered during the previous phases, a sketch of the ICSR system architecture had been drawn up (Figure 12). The overall idea of ICSR is that, it will act as a centre of information where mobile users may send crime report via MMS and the ICSR will act upon the message by storing it systematically into the database. The system will then notify the appropriate personnel for further action and reply back to the originator of MMS, thanking them for their cooperation.
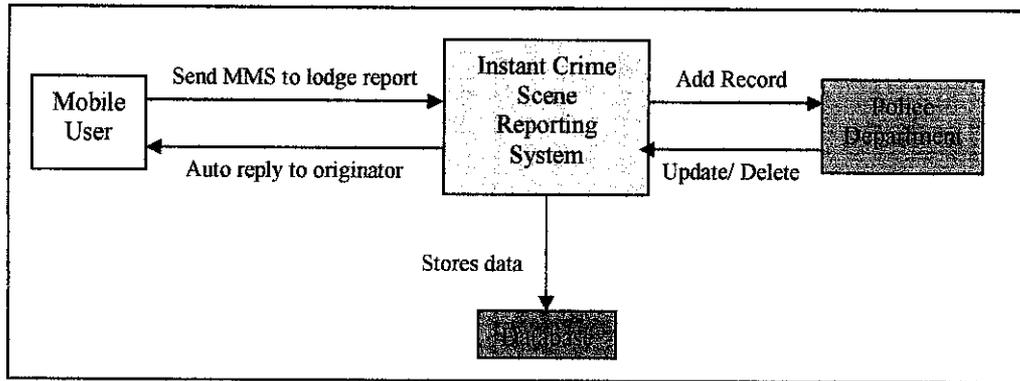
28

Overview of the Actual System Architecture

Figure 12: Actual System Architecture

4.1.5 Construction / Testing Phase

Results from Questionnaires (Set 2) - Research on User Response to ICSR

For this particular set, the questionnaire is being done face-to-face as the user had to single-handedly use the ICSR system. Only five (5) respondents have managed to test the system due to time constraint.

Section 1 –User Level

According to feedback that has been given, the overall users can effectively use a computer. They are capable of entering data via input devices and able to understand data that is represented by the output devices. They have an average level in computer literacy, and most of them had already utilizes computers in their daily lives.

Section 2 – Functionalities

In general the respondents have no difficulty in maneuvering themselves into the ICSR system. However, they have identified certain areas in which they feel that needs more improvements.

- Viewing Graphs

  Rather confusing at first as they do not understand the purpose of the button that linked to the graph.

- Receiving MMS

  They have difficulty in understanding how to view the MMS.

- Sending MMS

  The concept is already good, but need to be highlighted to capture user's attention.
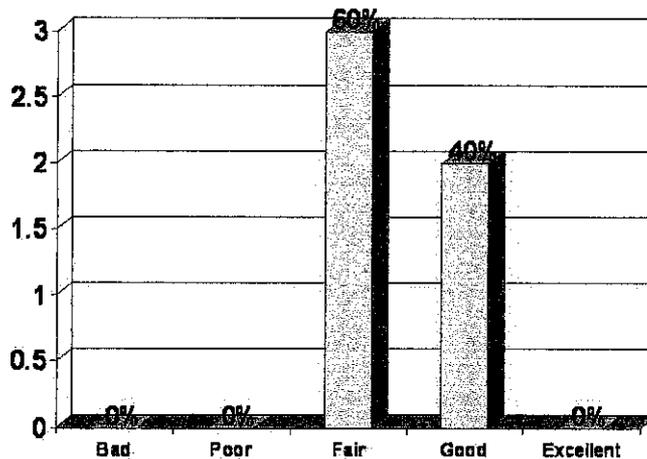

Figure 13: User Rating on Functionalities Incorporated within the ICSR

Based on Figure 13, it is clearly stated that 40% of the respondent rate the functionalities within the ICSR as good. Where as the remaining rate those functionalities as fair.

At the time being no user proposed on adding additional functions. However they do propose that the existing functions needed to be enhance, to provide greater flexibility.

Section 3 – User Interface

Among of the respondent's suggestion for user interface enhancements, consists of making interface more interesting by adding animations etc. Suggestions also include creating larger button and clear indication of each button's functions with larger display for ease of navigation. Another brilliant idea is to provide help button where users can click and view the user manuals to greater improve usability of the ICSR.
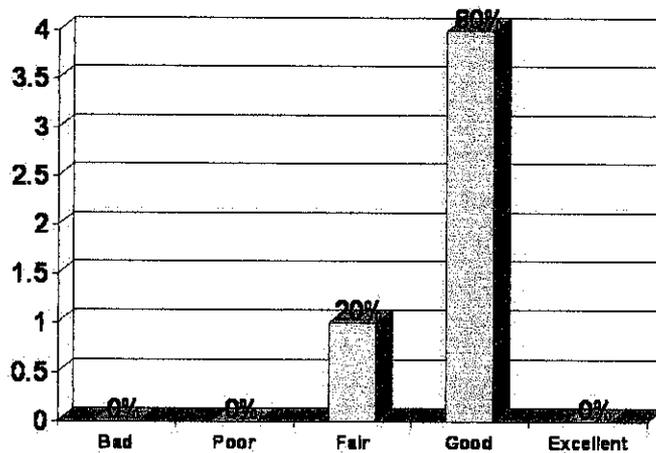
Figure 14: User rating on the System's Overall Interface

Based on Figure 14, it is clearly stated that 80% of the respondent rate the user interface of the ICSR as good. Where as the remaining respondents rate those as fair.

The following shows the user feedback on user interface as depicted in **Table 2**:-

Table 2: User Response on the ICSR User Interface

	Pleasing to the eye	Moderate	Inappropriate
Design & Arrangement	4	1	

	Pleasing to the eye	Moderate	Inappropriate
Display (Size & Color)	2	3	

	Very clear	Moderate	Unclear
Text (Font & Size)	3	2	

	Clear	Moderate	Inappropriate
Buttons, Tabs & Links	2	2	1

	With ease	Moderate	Difficult
Navigations	1	4	

	Understandable	Moderate	Inappropriate
Use of Language	5		

4.2.6 Cutover Phase

The prototype of the ICSR system is produced. For further explanation, please refer to point 4.3 which explains the implementation of ICSR.

4.2 FINDINGS AND DISCUSSION

In order to develop the Instant Crime Scene system, it requires a computer equipped with Nokia 7210 Content Authoring SDK (7210 Terminal Emulator) and Nokia Connectivity Framework installed. The system is running on a computer server with a connection to the Instant Crime Scene Reporting database. The hardware and software for database administration has yet to be determined.

For the developed prototype, the system will be integrated with a suitable database. Using Microsoft Access with Visual Basic, the Instant Crime Scene Reporting system should be able to record all MMS sent to the system. The prototype would not focus on how the message is being managed by the database.

The initial plan is that the system should be able to comply with both SMS and MMS messages. Due to lack of functions of the Nokia 7210 Terminal emulator, the prototype system could not receive SMS messages but only focuses on MMS. The general idea of the Instant Crime Scene Reporting is to receive SMS, EMS as well as MMS sent to the system.

The Nokia Connectivity Framework enables application developers to test the basic functionality of their applications without a live connection to the MMSC. The connectivity framework will act as an MMSC which enables external application to communicate with the MMSC to send multimedia messages. MMSC also enables applications developers to verify the message format and content as well as to test the sending or receiving capability of their developed applications before connecting the applications to a live MMSC.

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4.3 IMPLEMENTATION OF MMS IN INSTANT CRIME SCENE REPORTING

After an extensive research, adequate understanding on the MMS functionalities has been gained such as; hardware and software requirements of MMS application development. The prototype application of Instant Crime Scene Reporting need a server to run its applications, 'Nokia MMS Terminal Emulator Support for Nokia Mobile Server Services SDK' needed to be installed in the computer server which contain the Nokia 7210 Terminal Emulator. Kindly refer Figure 16 to view the output of the emulator.

The Nokia 7210 Terminal Emulator would emulate Nokia 7210 mobile handset. While the Nokia EAIF Connectivity (refer to Figure 15) allows for connectivity of the mobile handset to the EAIF Service, for example the Nokia Mobile Server Services SDK's Interface Emulator for MMSC. The Nokia Connectivity Framework provides the messaging environment between Terminal Emulators and the system. In order to ensure that all are to function properly, the J2RE1.4.1 Java Runtime Environment (Java Platform Standard Edition) is installed for stable platform.
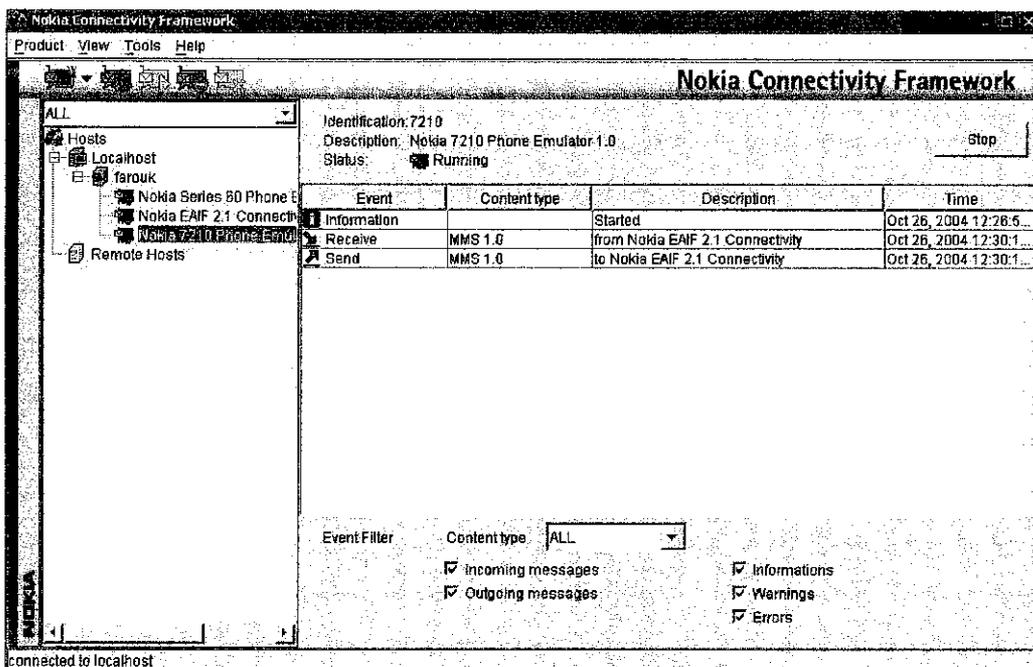

Figure 15: Nokia Connectivity Framework

4.3.1 System Functionalities

- **Log in into the system**

  View the screen shot of the log in page in Appendix A – Figure A-2.

- **View / Update / Delete record**

  View the screen shot on how existing records are listed in Appendix A – Figure A-3. User can also update the record by changing the necessary information and then click on Update button. A record can be deleted from the database by selecting the record and then click on Delete button.

- **Error trap**

  View the screen shot of sample of prompt message box informing that an error have been made as depicted in Appendix A – Figure A-5.

- **Adding new record**

  User can easily add new record by selecting Add tab and will be able to view the Add record page as shown in Appendix A - Figure A-4.

- **View graphs**

  Additional function is that user may view a graph depicting the crime rate in particular area of the police department. Users are able to change the format of the graph according to their preferences. Please refer to Appendix A – Figure A-7 and Figure A-8.

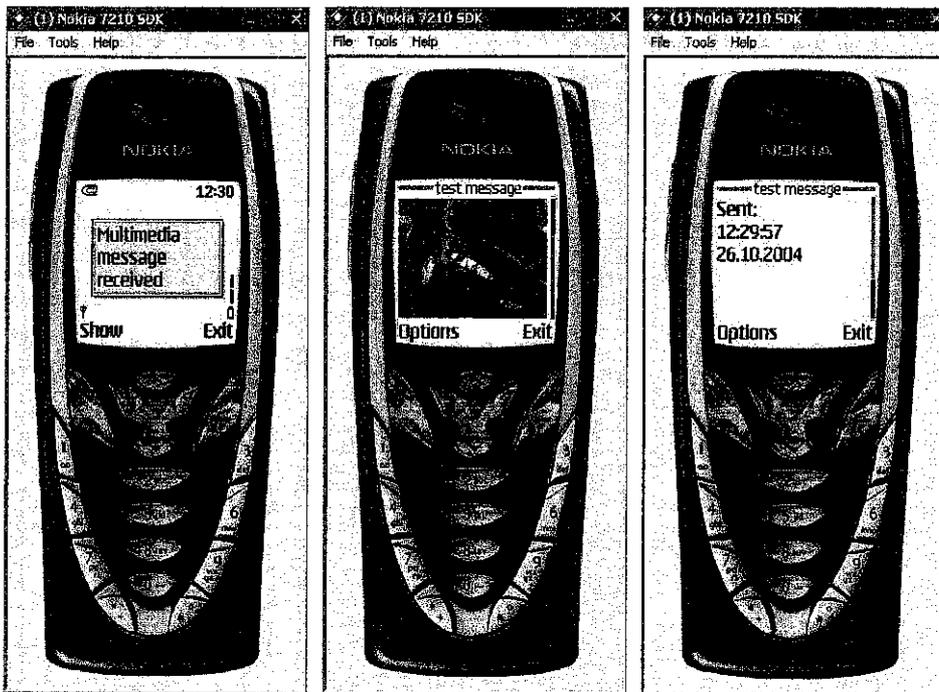## 4.3.2 Output from Instant Crime Scene Reporting (ICSR) System

Figure 16: Viewing MMS using Nokia 7210 Terminal Emulator

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 DISCUSSION

Great deal of satisfaction had been gained as the project is completed within the time frame. Vast knowledge and experience has been gained on mobile technology during the research and the development of this project using programming tools and language. In the course of this project, a working prototype has been created. The ICSR is showing the way of delivering message from user to the system as well as from the system to the intended recipients.

The ICSR is aimed to break the conventional way on how crime reporting is being implemented. The prototype should be able to pave the way to further enhancement and improvements that would benefit all. Hopefully that ICSR could be the answer for the entire problem that we are currently experience in order to improve the crime reporting in general.

I had the opportunity to follow a few seminars, talks as well as exhibitions that are related to MMS field and discover that; MMS applications are greatly in demand. The timing never had been more perfect, as more and demand for such application is in demand. Content providers are looking for fresh ideas as well as new programmers who are knowledgeable about the technology. It has been encouraging that the ICSR to be submitted to major content provider as such Maxis to be further reviewed, and if possible to be implement.

5.2   RECOMMENDATION

MMS is a natural step towards major technology changes that are transforming the way people live and work. By bringing together wireless devices, corporate data systems, and the Internet, MMS allows you to deliver secure information to any user at any location.

Instant Crime Scene Reporting project would be among of the pioneer in incorporating MMS in crime fighting. It is hoped that the project could be enhanced in the future to improve the system to be more effective. Other functions that are relevant can also be fabricated into the system such as; archiving, graphing etc.

It is also recommended that the usage of MMS should be widespread, by promoting other services to incorporate into the technology.

5.3   CONCLUSION

The objectives of the project are very much relevant to the current scenario. Lodging police report via MMS could be viewed as an alternative to the existing means that is being applied right now. Implementing the Instant Crime Scene Reporting may solve certain issues such as timeliness and accuracy of report.

It is clear from the literature studied that MMS remains a technology very much in the middle of immense growth and development. The applications that MMS is applied to also continue to diversify rapidly. The market and innovation show no sign of halting, but rather intensifying. Therefore construction of an online messaging system could be in no way seen as something that will become redundant in the near future. Instead it seems that such an application may well be a familiar sight in years to come.

The benefits of MMS in such an environment are excellent in comparison with traditional methods of communication such as the telephone or e-mail. MMS is

much more cost effective than phone calls. Also individual means of contact are time consuming and laborious, most witnesses are reluctant to talk one on one to the authorities. MMS as a new mean in coaxing people to be more open. MMS also guarantees delivery of a message. Therefore any urgent messaging, such as pictures of crime scene or faces of suspected criminals will be relayed via this interface.

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            MMS - Multimedia Messaging Service. GSM World - the world wide web site
            of the GSM Association.© GSM Association 2004. GSM and the GSM Logo
            are registered and owned by the GSM Association.

[3G]   http://www.tdap.co.uk/uk/archive/mobile/mob(umts_9909).html

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[Mmsdata]http://www.mobilemms.com/sample_dataonmms.asp

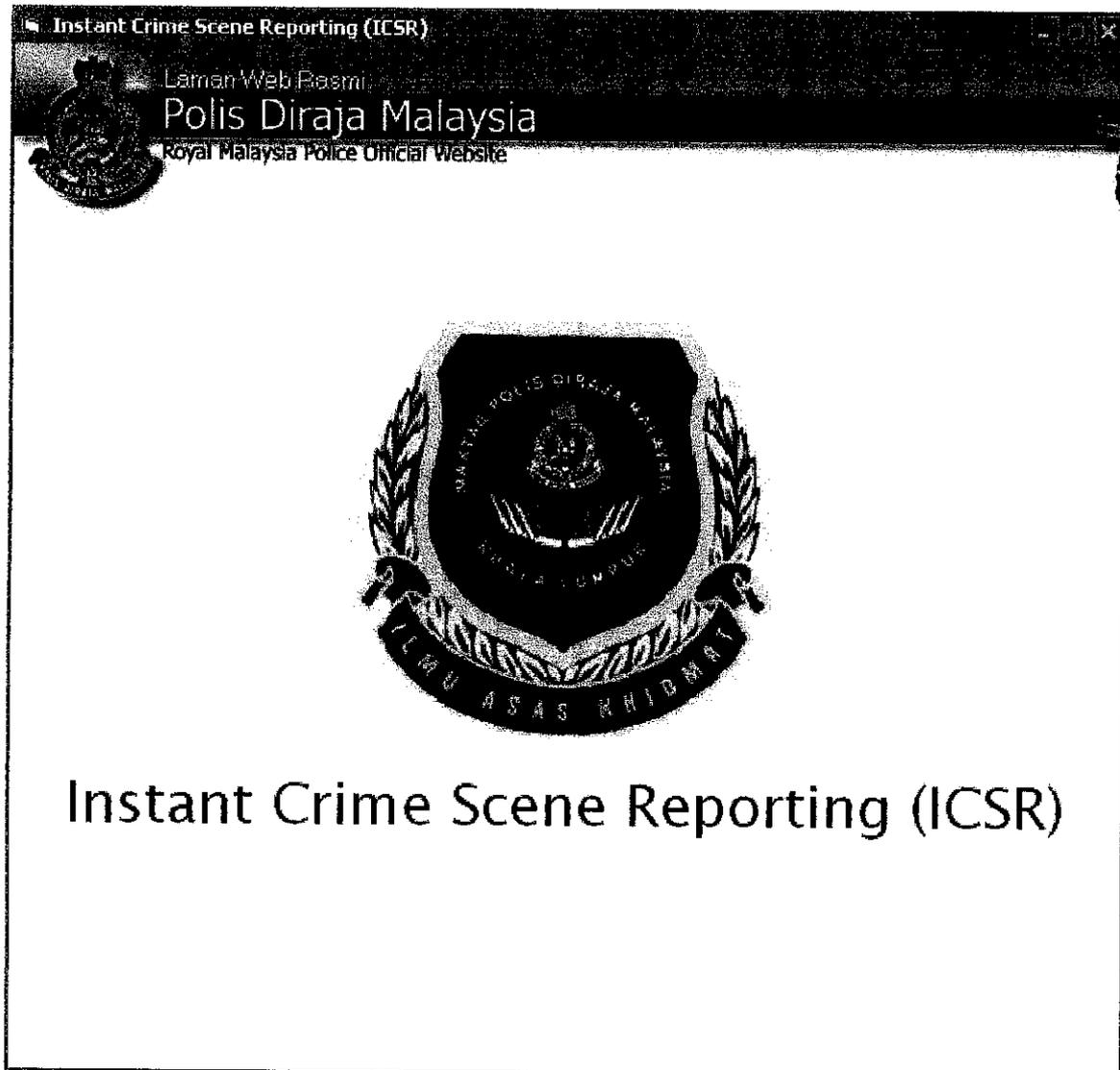Comparisons between SMS and MMS © Copyright Mobile Streams Ltd 1999 - 2002

[Sharp] http://www.dhtml-zone.com/Nokia/Article/6969

APPENDIX A

Figure A-1: Opening page for ICSR
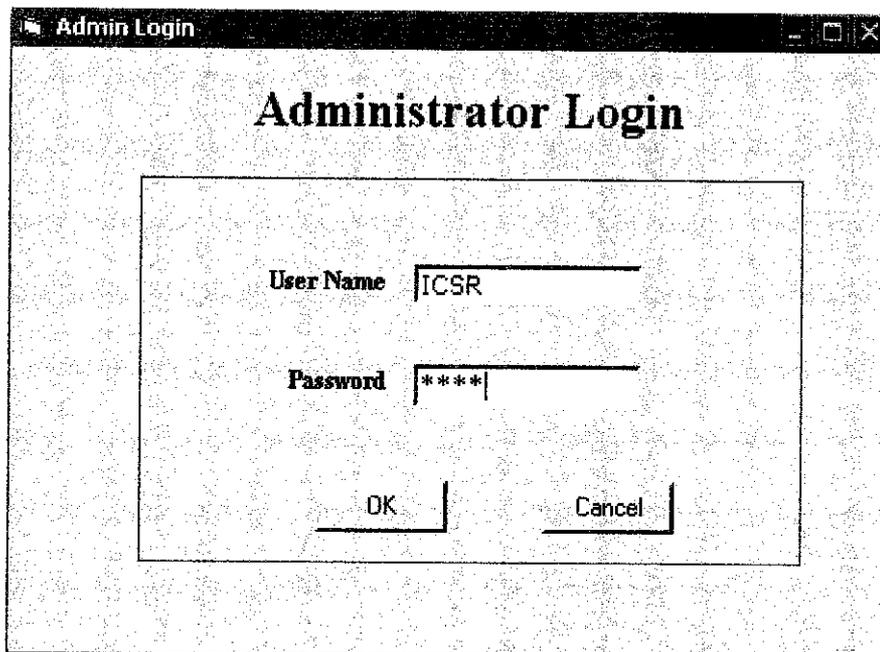
Figure A-2: Login page for ICSR
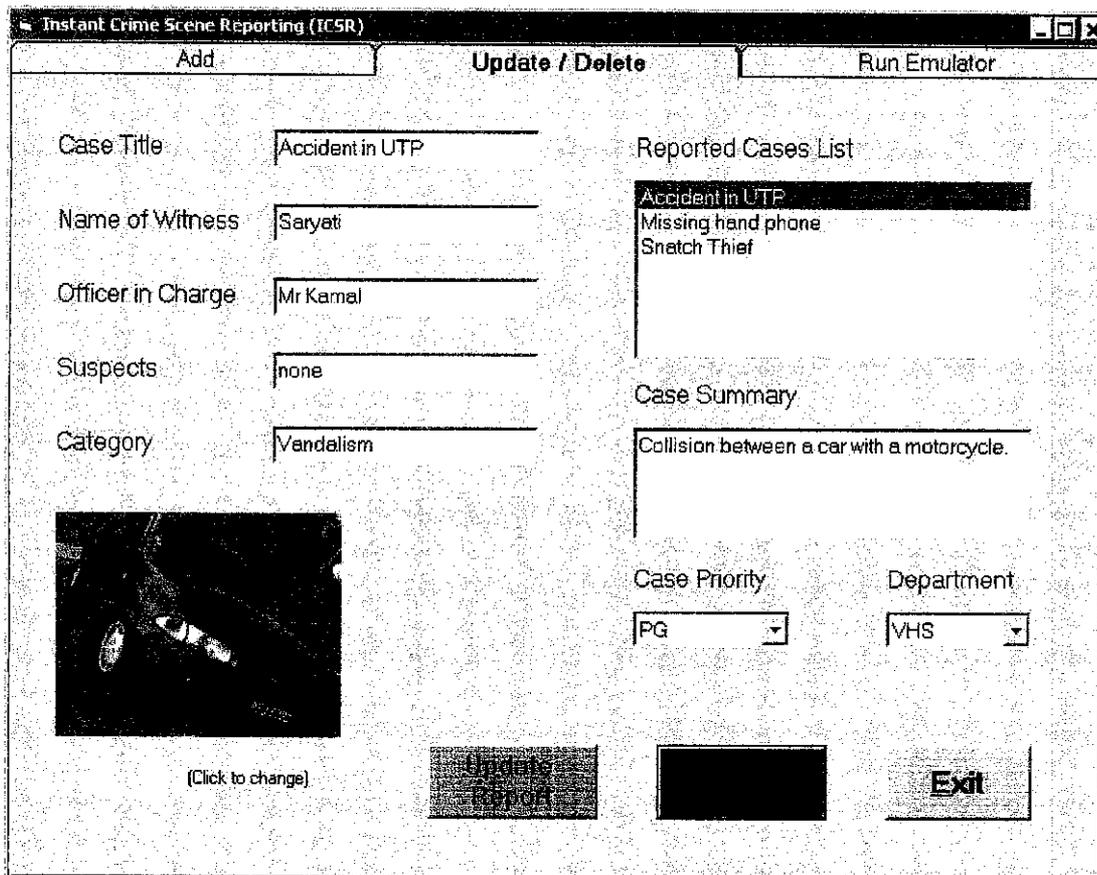
Figure A-3: View / Update / Delete page for ICSR

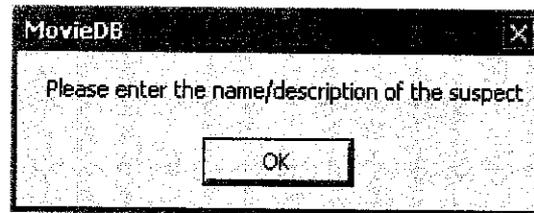Figure A-4: Add new record page for ICSR

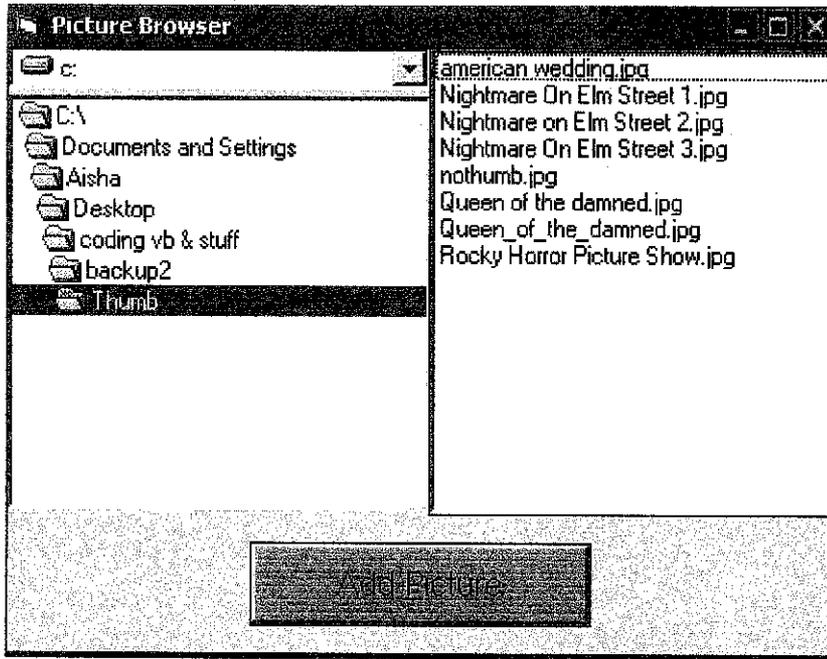Figure A-5: Sample of error trap in ICSR

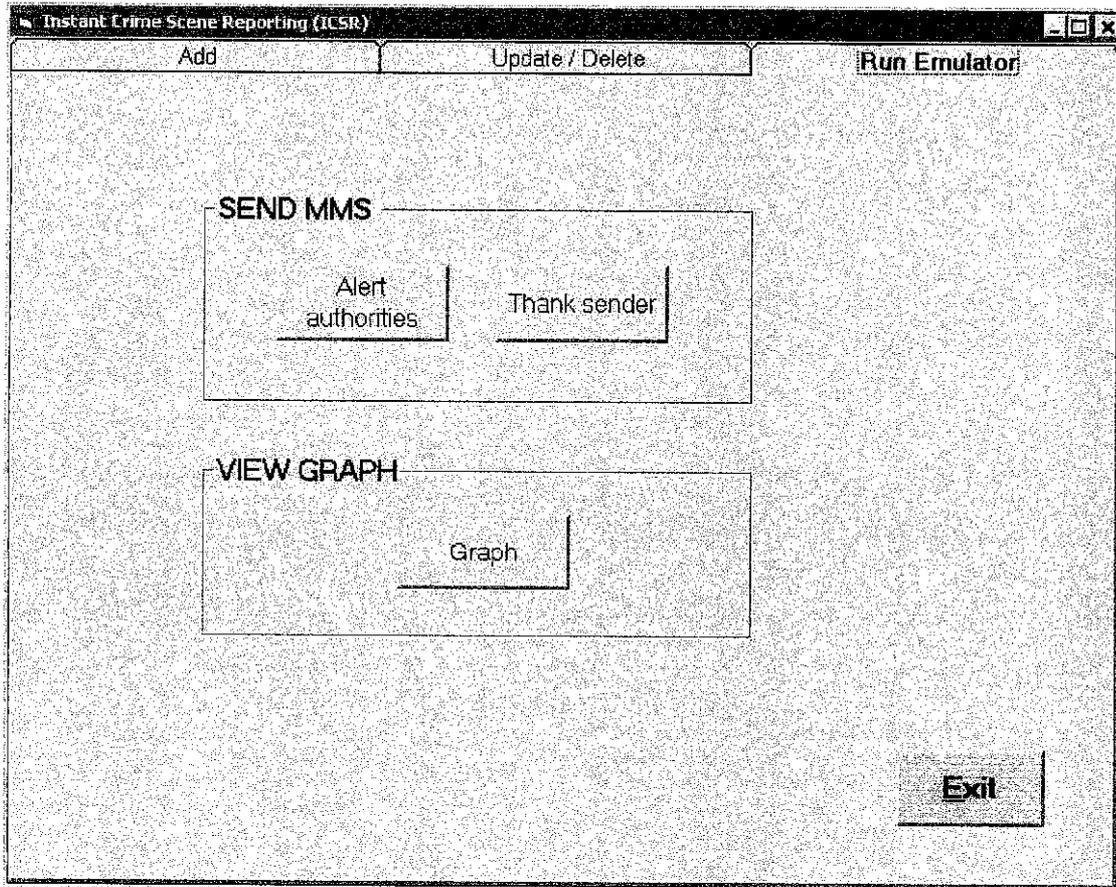Figure A-6: Adding picture into ICSR database

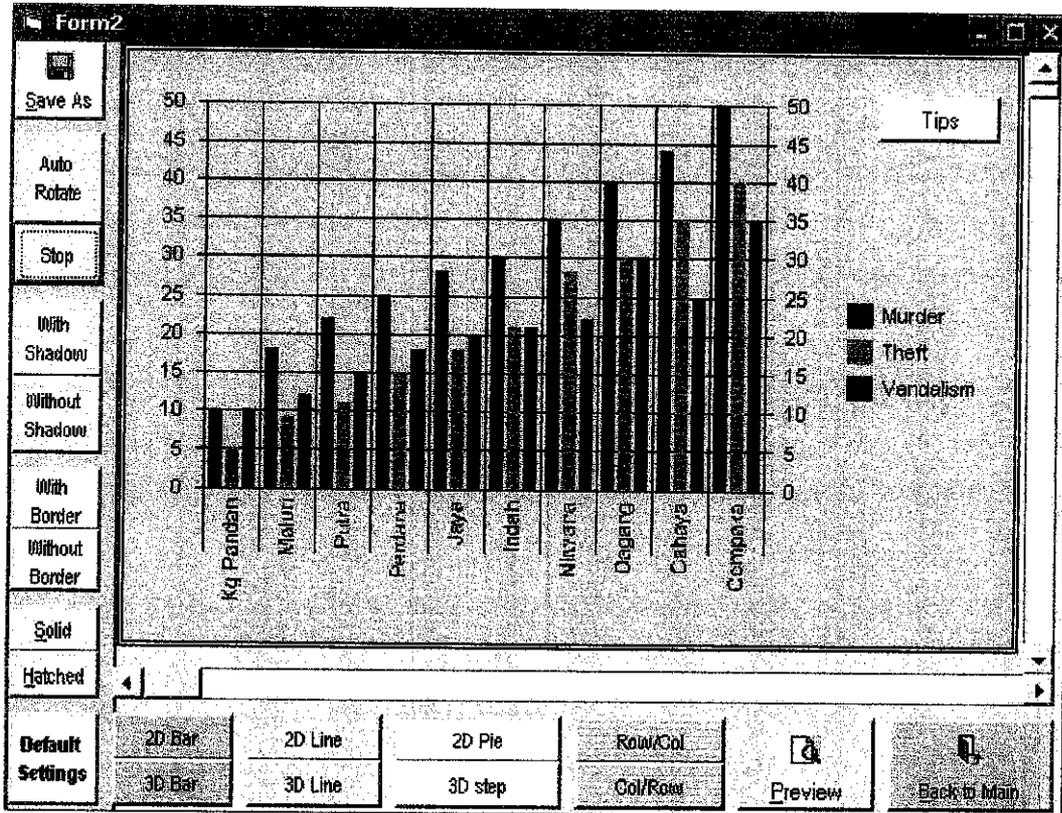Figure A-7: MMS Sending page

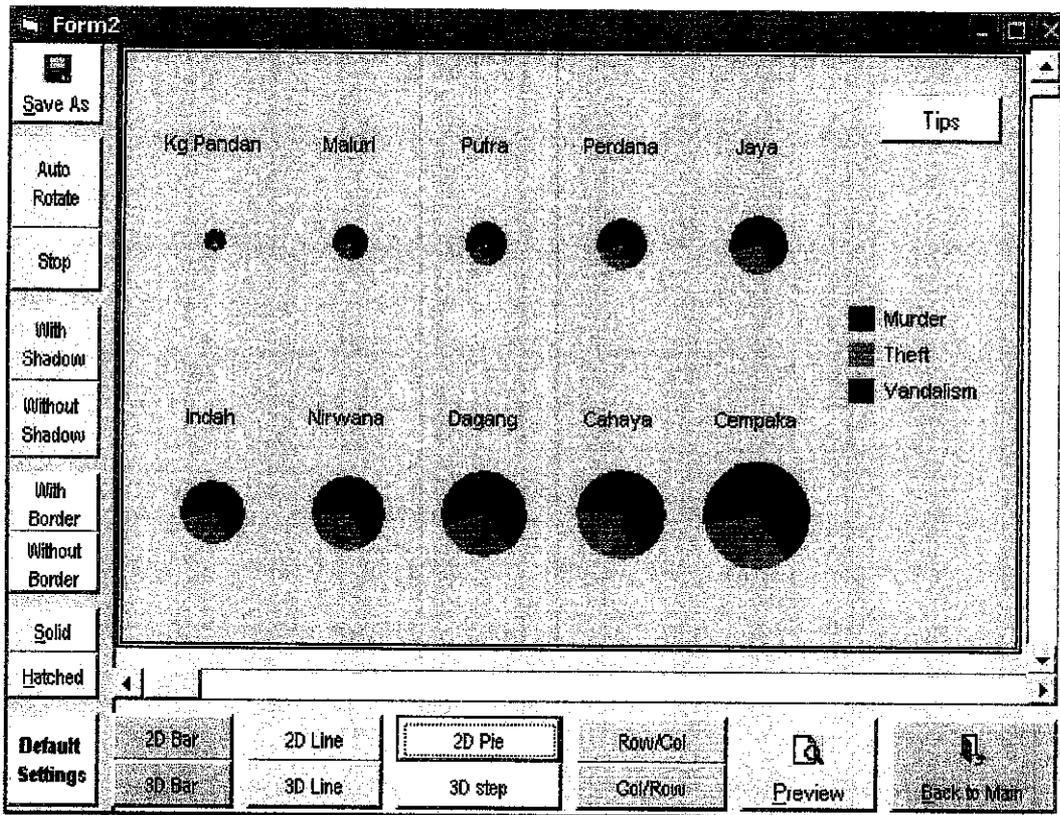Figure A-8: View crime graph (bar chart)

Figure A-9: View crime graph (pie chart)

APPENDIX B

The questions below ask about your knowledge on the MMS technology. In terms of your everyday experiences and personal perception, put the most appropriate response number for you on the side of each term, using the scale below.

Year / Semester :

Program :

SECTION 1 General view on current police reporting system

Please rate your answer between the given ranges:

1. Do you agree that the current procedure of crime reporting is outdated?

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

2. How do you rate the current service provided by the Police Department?

1	2	3	4	5
Excellent	Best	Good	Poor	Worst

3. What are the difficulties in the current way of lodging police report?
   - ☐ Have to personally go to Police Department to lodge report
   - ☐ Not effective / slow action taken on report
   - ☐ Insecure / lack of privacy
   - ☐ Problem in recalling back the incident
   - ☐ Too much procedure and bureaucracy

   Reason(s) / Other(s):

   _____

   _____

SECTION 2 Knowledge on MMS

Please rate your answer between the given ranges:

4. Do you own a hand phone?
   - ☐ Yes, I do
   - ☐ No, I do not (proceed to question 5)

5. If you do, does your hand phone have a built-in camera?

☐ Yes, I do

☐ No, I do not

6. If you do, do you subscribe to MMS services?

☐ Yes, I do

☐ No, I do not

7. Are you aware of MMS technology?

1	2	3	4	5
Expert	Knowledgeable	Fair	Lacking	Never heard of it

The questions below ask about your perception on the ICSR system in terms of functionalities and usage. Based on your personal perception, put the most appropriate response number for you on the side of each term, using the scale below.

Year / Semester :
Program :

SECTION 1 User Level (To be completed **before** ICSR user testing)

Please rate your answer between the given ranges:

1. Understanding user computer literacy level (please tick on appropriate boxes):

   ☐ I have very limited knowledge on computers, yet I am willing to learn
   ☐ I can effectively use the user inputs (keyboard, mouse, joystick etc)
   ☐ I can understand the output of the computer (display monitor, printer etc)
   ☐ I know how to correctly plug-in my computer
   ☐ I can efficiently work using a computer
   ☐ I have used the computer extensively for many purposes

   Please state other software (if any):

   _____

   _____

2. Are you experienced in using any particular software?

   ☐ Yes, I do
   ☐ No, I do not (proceed to Section 2)

3. Kindly state those applications:

   ☐ Visual Basic
   ☐ PHP / HTML / any web based applications
   ☐ Lotus Domino
   ☐ Microsoft packages
   ☐ Cannot recall

   Please state other software (if any):

   _____

   _____

SECTION 2   Functionalities (To be completed **after** ICSR user testing)

Please rate your answer between the given ranges:

4. Which part of the functionalities that you have problem with?

- ☐ Adding a new record
- ☐ Deleting an existing record
- ☐ Updating / changing information within a record
- ☐ Viewing graphs
- ☐ Receiving MMS
- ☐ Sending MMS

Please state other problem (if any):

_____

_____

5. Is there any other functionality that you see fit to be added into the ICSR system?

Please state (if any):

_____

_____

6. How do you rate the functionalities incorporated within the ICSR?

1	2	3	4	5
Excellent	Good	Fair	Poor	Bad

7. With the functionalities, do you agree that the ICSR would improve how crime reporting being managed?

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

SECTION 3   User Interface (To be completed **after** ICSR user testing)

Please rate your answer between the given ranges:

8. Please indicate your selection by an X in the relevant section

	Pleasing to the eye	Moderate	Inappropriate
Design & Arrangement			

	Pleasing to the eye	Moderate	Inappropriate
Display (Size & Color)			

	Very clear	Moderate	Unclear
Text (Font & Size)			

	Clear	Moderate	Inappropriate
Buttons, Tabs & Links			

	With ease	Moderate	Difficult
Navigations			

	Understandable	Moderate	Inappropriate
Use of Language			

9. How would you rate the system's overall interface?

| 1	2	3	4	5
Excellent	Good	Fair	Poor	Bad

10. Can you suggest any improvement that can be made on the user interface of the ICSR?

Please state (if any):

_____

_____

APPENDIX C

#		Task Name	Start	Finish
3		1.2 Topic approval	Wed 5/26/04	Wed 5/26/04
4		2 Planning Phase	Thu 5/27/04	Sun 7/25/04
5		2.1 Preliminary research	Thu 5/27/04	Sun 7/25/04
6		2.2 Identify title's problem, scope and cons	Mon 7/19/04	Sun 7/25/04
7		2.3 Requirement gathering	Mon 7/19/04	Sun 7/25/04
8		2.4 Submission of Preliminary Report	Mon 7/26/04	Mon 7/26/04
9		3 Analysis Phase	Mon 7/26/04	Sun 8/1/04
10		3.1 Feasibility study	Mon 7/26/04	Tue 7/27/04
11		3.2 Requirement Specification	Wed 7/28/04	Thu 7/29/04
12		3.3 Resource allocation	Fri 7/30/04	Sun 8/1/04
13		4 Design Phases	Mon 7/26/04	Sun 8/15/04
14		4.1 Design system architecture	Mon 7/26/04	Mon 8/9/04
15		4.2 Design system database	Mon 7/26/04	Mon 8/9/04
16		4.3 Design system interface	Mon 7/26/04	Mon 8/9/04
17		4.4 Design review and feedback	Tue 8/10/04	Fri 8/13/04
18		4.5 Changes in design (if any)	Sat 8/14/04	Sun 8/15/04
19		4.6 Submission of Progress Report	Mon 8/16/04	Mon 8/16/04
20		5 Development Phase	Tue 8/10/04	Sun 9/12/04
21		5.1 Setting up local server	Tue 8/10/04	Sun 9/5/04
22		5.2 Implement MMS emulator	Tue 8/10/04	Sun 9/5/04
23		5.3 Interface programming	Tue 8/10/04	Sun 9/5/04
24		5.4 Integrate all modules	Mon 9/6/04	Sun 9/12/04
25		6 Testing Phase	Mon 9/6/04	Sun 9/26/04
26		6.1 Unit Testing	Mon 9/6/04	Fri 9/17/04
27		6.2 Integration Testing	Sat 9/18/04	Fri 9/24/04
28		6.3 User feedback and approval	Mon 9/13/04	Fri 9/24/04
29		6.4 System modification and error debuggi	Sat 9/25/04	Sun 9/26/04
30		7 Evaluation Phase	Sun 9/26/04	Tue 11/2/04
31		7.1 IT/IS and EDX Exhibition	Tue 10/19/04	Tue 10/19/04
32		7.2 Submission of Supervisor's Final Draft	Mon 10/25/04	Mon 10/25/04

Legend:
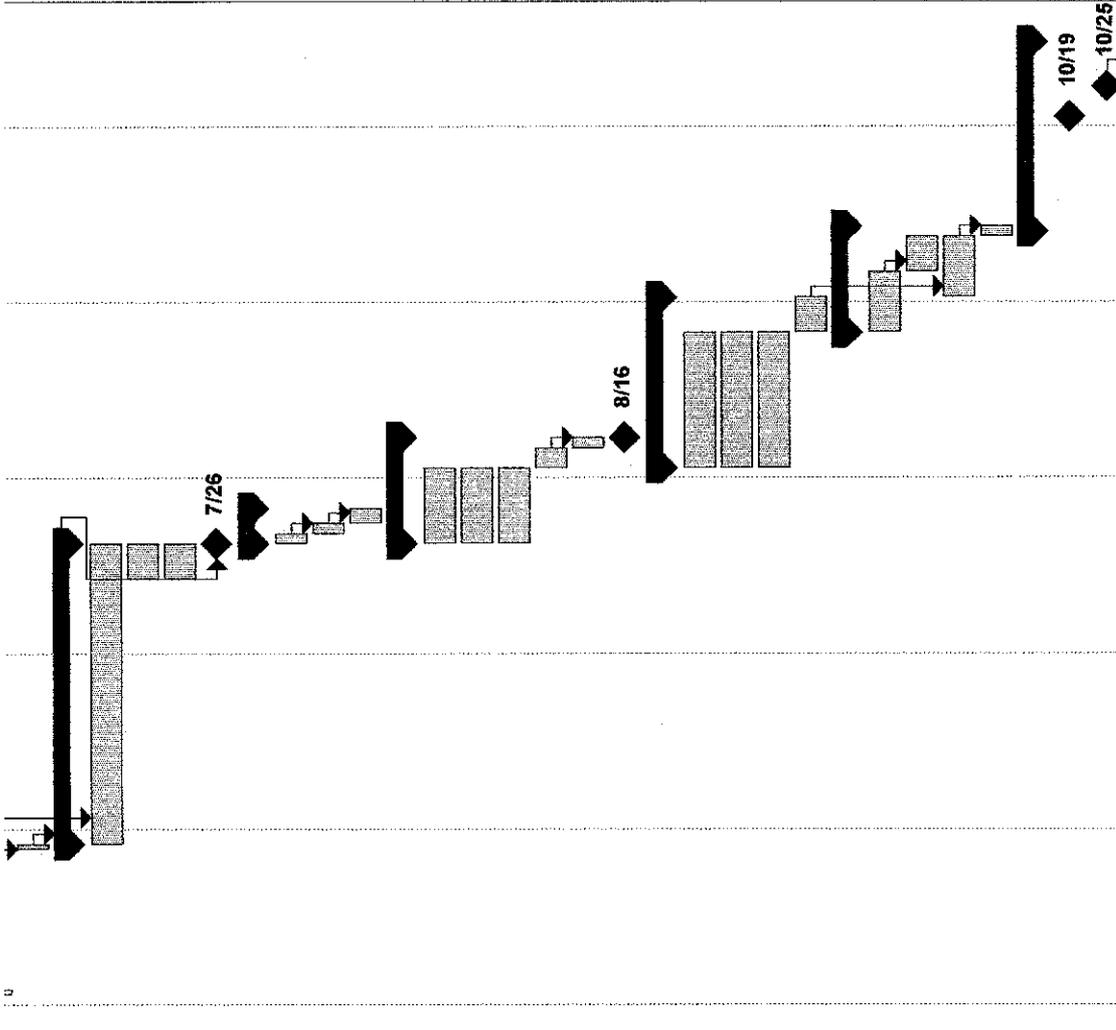
Task	Milestone	External Tasks
Split	Summary	External Milestone
Progress	Project Summary	Deadline

Project: FYP - Instant Crime Scene Re
Date: Tue 12/14/04

#	Task		
35	8.1 Oral Presentation	Mon 12/6/04	Mon 12/6/04
36	8.2 Submission of Project Dissertation	Mon 12/20/04	Mon 12/20/04
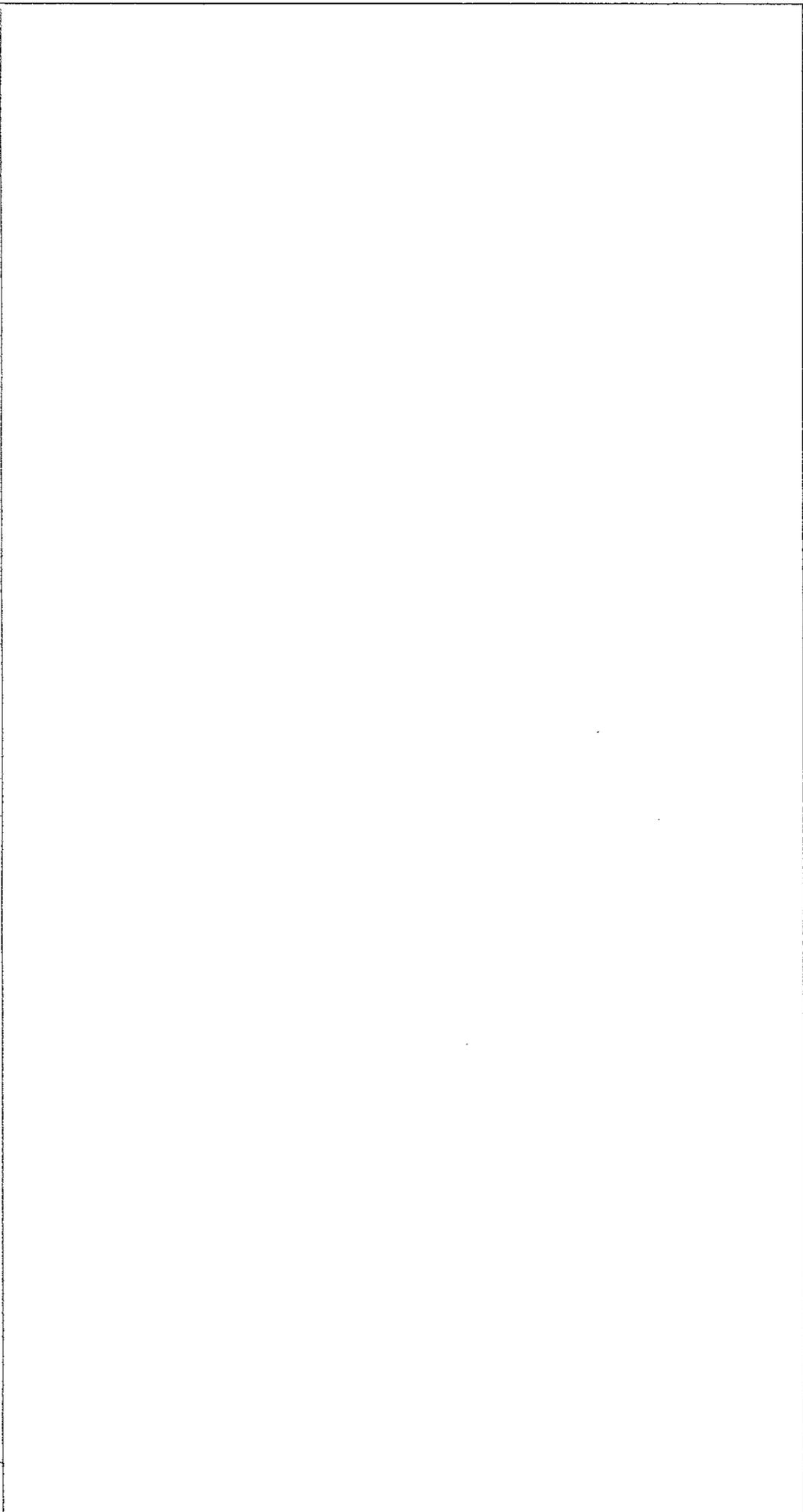
Project: FYP - Instant Crime Scene Re
Date: Tue 12/14/04

Task		Milestone	◆
Split		Summary	
Progress		Project Summary	
		External Tasks	
		External Milestone	◆
		Deadline	⇨