Messaging Information System

Submitted By

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Abstract

Nowadays, sending message has become a routine task in a corporate world. This message can be in a form of exchanging information or communication purposes. Previously, these tasks is completed or done by using pen and papers.

Messaging Information System (MIS) is a software system developed using Microsoft Visual Basic 6.0 in Windows environment to make the task of sending message easier and paperless. It is especially designed to assist staffs in an organization to manage their daily affair particularly those where information is involved intensively. It also aims to serve as an alternative means of communication among staffs.

Furthermore, it also provides facilities for staffs to know the whereabouts of another colleague. The contact details of the staff are included in the system to enable them to be easily search.

Another feature of the system is the ability to store meeting records. This is to provide a reference for staffs in the future and also important to management level for decision-making.

A search function will also be included in the system to assist the staff to get the information that they desired. This system also has an on-line help features to guide the user if they are unfamiliar with the systems.

In developing the MIS system, the System Development Life Cycle approach had been choose. This approach had been choose because it is an organized process for established a system project plan besides developing and maintaining the system.

Besides using Microsoft Visual Basic 6.0 as the developing tool, Microsoft SQL Server 7.0 was chosen to store all the input from the MIS system. This database had been choose because of it capability of handling large amounts of data and many concurrent users while preserving data integrity and providing many advanced administration and data distribution capabilities.

In implementing the MIS system, suitable controls and components had been choose to assist the functions of the system. Besides system implementation, the MIS system had also been through a set of system testing. This includes unit testing, integration testing and system testing. Finally, the MIS had been evaluated. The system evaluation includes the process of defining the system strengths and limitations. Besides, it also evaluate the system problem and it future enhancements.

Although the concept of the MIS system is rather new, it is believed that this system will gradually become an essential tool in an organization in future, especially with the present rapid advancement in information technology.

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Chapter 1: Introduction

1.1   Project Introduction

Today, sending messages has become a part of our daily lives. Almost every hour we are sending message either by using email or pen and paper. Even staff in an organization are sending message for communication and sharing information purpose. It can be said that sending information between staff is becoming a daily chores. Besides sending messages, important information such as meeting records is kept by filling. This takes up a lot of space and paper work.

To solve the problems face by the organization, this system, which is Messaging Information System (MIS), offers the advantage of eliminating large number or paper work, time wasting and provide faster and more accurate way of sending and storing information. This MIS system will be most useful in an organization that does not provide Internet access or email for their staff. By using this MIS system, the staff will be able to send and receive messages from each other.

Besides sending and receiving messages, this MIS system also is able to search for staff whereabouts. This is because when a person needs to attend to an event or function outside the organization, he just needs to enter some particular details about the event or function and the purpose into the systems. Besides that he can also leave down messages stating that he is currently away from his workstation. This way, the staff at the organization is able to know his whereabouts. By doing this, if someone in the organizations needs to contact him, they will just have to use the MIS system to do a search and see is he is available in the company. The results provided included contact number, the destination, the reason and the date and time.

The additional feature of the MIS system also includes storing meeting records. Detail information on meetings will be provided for those who wish to view the content of certain meeting. The reason for this is for future reference.

Using this MIS system can solve most of the problems face within an organization, which provide a better tool for communication and information sharing.

1.2   Project Aims

In developing the MIS system, there are a few aims or purposes to be achieved. These aims had provides a better guidance towards the developing of the MIS system. Below are the project aims:

- **Provide better communication among staffs**

  In developing the MIS system, one of the aims is to provide better communication among staffs. This is achieved with the help of the MIS system by enable the user to send and received messages among staffs. This is because by sending messages, they are indirectly communicates with each other.

- **Eliminate paper wastage**

  The MIS system is a computerized system, which allows the user to store information. By storing the information into the MIS system, paper usage is reduced to a minimum level. Therefore, it can help to eliminate paper wastage.

- **Information sharing among staffs**

  In an organization, information is a vital tool in determining organization flow. By using the MIS system, information can be shared among the staffs. Besides, information can be retrieved easily without any time wasting.

- **Storing data electronically**

  The MIS system provides a data storage to store data electronically. All the information can be store into the MIS system. By doing this, most manual filing can be eliminated.

- **Easier and faster to search for staffs**

  The MIS system is developed mainly for a small to a medium size organization. One of the features in the MIS system is to easily search for staff whereabouts. Although this system mainly concentrated on a small to a medium size organization, however the benefit of the feature mention above is still very useful because it provides a faster and easier way to search for a staff without leaving the workstation.

1.3 Project Objectives

Development of this MIS system is based on a few objectives. Basically these objectives provide a better understanding as why this system is needed. These objectives are as below:

- **Easier to search for a person within an organization**

  This is to provide a faster and easier way to search for another staff instead of doing it manually. They can use the MIS system to locate the user whereabouts and contact information.

- **Faster way to send and received information among staffs**

  Sending and receiving information will be faster with this MIS system as it provide instant messaging feature. An alert will be prompt out to inform the receiving user that he has a new message.

- **Provide information on staff meetings**

  Staff meeting can be kept in this system for future reference. Previous meeting held can be view over and over again in the future. However, only certain user can view the meeting records.

1.4   Project Scopes

The project basically consists of six main modules namely the login module, the leave message module, instant messaging module, the meeting record module, the search function module and the help information module.
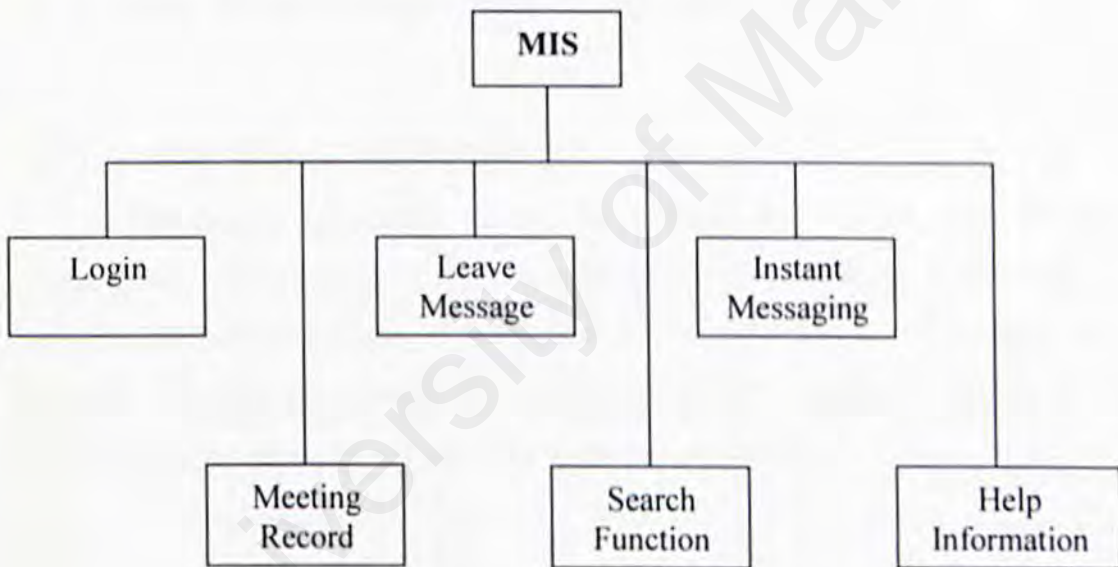
Figure 1: Main Features of MIS System

1.4.1 Login Module

The Login module will be the main interface to the MIS system. In order to use the system, user need to enter their username and password for verification by the system. In this module, the user is also allowed to change or maintain their password. The user needs to enter their old password first and then enter their new password. Verification of the old and new user password will be done before the

new password can be updated and use. The Login module also acts as a medium to connect to other modules.

1.4.2 Leave Message Module

The main function of this module is to allow the user to leave their message down whenever they leave their workstation or the organization. This is for other staffs to know the whereabouts of the user. Contact details do not have to be entered. However, the contact details of that user will be provided during searching for the user whereabouts. This is to provide easy access to get the contact detail from the system, rather than to search for it manually from the filling cabinet. The message will be store into the relevant database.

1.4.3 Instant Messaging Module

This Instant Messaging module is to allow the user to send instant messages to another person. This module allows user to write down their message and send it to their colleague. Besides, user can also check if they have receives any new messages. The special feature that appears in this module is that an alert icon will pop up to inform the user that he had a new message.

1.4.4 Meeting Record Module

The main function of this module is to allow the user to keep the minutes of meeting into the system. However, this module can only be access by certain user. Besides, verification of control will be done to check the user status. This is to provide additional security as only the invitees of the meeting can view the meeting record. This meeting record will be kept as future reference.

1.4.5 Search Function Module

The Search Function module allows the user to search for other user's whereabouts information if he is not available in his workstation or in the organization and also searching for meeting records in a faster and easier way. To search for the user's whereabouts, there are three kinds of choices. The user can search by selecting the username, selecting the relevant date or selecting the username and date. The message that was left by the user will provide information on his whereabouts and his contact number.

However, searching for meeting records will need the user to select the relevant date that the meeting was held or entered the meeting ID. The meeting information will be display out for the user as a result from the search.

1.4.6 Help Information Module

The Help Information module provides a guide for the user on how to use the MIS system. The user will just have to select the topic or module that he is not clear and the system will provide information regarding the topic to the user.

1.5 Project Limitations

For the MIS systems, there are some limitations, which is not included in this system. The limitations are:

- **This MIS System is not Web based**

The proposed system will sit on each computer within an organization, as it is not run through a web browser. The user will just have to execute the program from his computer to use the system. However, this system will use a centralize database.

- **Creating user will have to be done manually**

  This means that when a new staff joins the organizations, system administrator will have to take ownership of the systems and add the user name to the systems in order for him to use the systems and for others too see him in the systems.

- **Database size will increase**

  As more and more data is being entered into the systems, the database will increase dramatically and in the future more database space will have to be added. Old data will not be deleted for future reference purpose.

- **This MIS system only store information about meeting record**

  The user can only keep the minutes of meeting. However for future enhancement, storing information about seminar, appointment and conference can be added into the system.

1.6   Importance Of Project

In developing the MIS system, there are a few important that should be considered. There are:

- **Provide communication tools for staffs**

  The importance of the MIS system is to provide a communication tool for the staffs to exchange information. This is because not every staff in an organization has e-mail. With this MIS system, the staffs can still communicate with each other easily.

- **Paperless environment**

  Nowadays, developing a computerized system help to reduce the use of papers. These go the same with the MIS system. This step is important because it help to create a paperless environment where the usage of paper is reduced.

- **Save time**

  The MIS system is important because it help to save a lot of time. This can be achieved because the staffs do not have to leave their workstation to search for a staff, which is a time consuming process if it is done manually.

- **Provide faster and accurate staffs information**

  The MIS system allows the user to get staffs information in a faster and accurate way. This is because all the staff information is store inside the MIS system. And the user just has to search for it by using the search function.

- **A system to store organization information**

  The MIS system enables organization to store information in it such as minutes of meeting. Organization information is important especially for higher management level for decision-making. Besides that, organization information that contain in the MIS system can be view in the future for reference.

1.7   Project Target Users

This project is targeted at the middle level and higher-level users in organizations. The middle level users consist of Executives, Assistant and Secretary. This is because most middle level and higher-level users tend to attend more meeting then the rest of the staffs in the organizations.

But, the lower level users are also allowed to use the systems for searching purposes. This is to get the contact information of certain staff. Besides that, they can also

use the feature for sending messages, which is open to all users of the systems. However, the targeted users for these systems are mainly the middle and higher-level users.

1.8   Project Planning

In planning for the MIS system, a project schedule was design for the development of the system. This is important so that the system can be implemented according to the time given. The project schedule is the operating timetable of the project. It serves as the fundamental basis for monitoring and controlling project activity. In a project environment, proper scheduling function is of paramount importance because projects lack the continuity of day-to-day operations and often present much more complex problems of coordination [MER95].

The proposed project will be carried out in two stages, which each stage has to be completed within the period of one semester respectively. The work involve in the first stage will be project planning, research, analysis and design. The next stage involves the actual development of the system, testing and implementation.

The project schedule for developing the MIS system is shown in *Figure 2*. The project was schedule using Gantt chart. Gantt chart is choosing because it can be prepared to help schedule tasks. They show when tasks should begin and end, what tasks can be undertaken concurrently, and what tasks must proceed serially. They also help identify the consequences of early or late completion of a task [RON99].

	Task Name	Duration	Start	Finish	Jun '01	Jul '01	Aug '01	Sep '01	Oct '01	Nov '01	Dec '01	Jan '02	Feb '0
1	**Semester 1**	70 days	Mon 11/06/01	Fri 14/09/01									
2	Requirement Analysis	30 days	Mon 11/06/01	Fri 20/07/01		20/07/01							
3	Initial Design	28 days	Mon 23/07/01	Wed 29/08/01				29/08/01					
4	Requirements Documentation	58 days	Mon 11/06/01	Wed 29/08/01				29/08/01					
5													
6	**Semester 2**	90 days	Mon 8/10/01	Fri 8/02/02									
7	Comprehensive Design	15 days	Mon 8/10/01	Sun 28/10/01						28/10/01			
8	Development	43 days	Wed 31/10/01	Fri 28/12/01								28/12/01	
9	Testing	45 days	Mon 5/11/01	Fri 4/01/02								04/01/02	
10	Implementation	10 days	Mon 24/12/01	Fri 4/01/02								04/01/02	
11	Documentation	65 days	Mon 8/10/01	Sun 6/01/02								06/01/02	

Figure 2: MIS Project Schedule Timeline

1.9   Expected Project Outcome

As suggested, the main results of the project will be a stand-alone MIS system for the use of an organization in which the most important feature is to enable staffs sending and receiving messages within organization. Other supplementary features will also be included to enhance the sense of completeness of the MIS system. The main features or functions expected from this project are listed below.

- Searching purpose
- Reminder purpose
- Provide information on meetings
- A help purpose

As mention earlier, this systems is not a web-based system, therefore it is focus in a Local Area Network (LAN) environment where there are network connectivity between each PC in an organization to the database in the server.

1.9.1   Searching Purpose

User will be able to search for a particular person in an organization to see if he is available. Additional information such as the contact details will also be provided.

1.9.2   Reminder Purpose

Users of the systems will also be able to send instant messages or reminder to another user via text. The systems will alert the users if he receives a message.

1.9.3   Provide Information on Meetings

User will be provided with detail of meetings information when they need to view the content of certain meeting.

1.9.4 Help Purpose

These systems also will be able to provide a help guide for the users regarding the use of the MIS system.

1.10 Chapter Conclusion

In this chapter, the proposed project is introduced. This is follow by the proposed project aims and objectives. Besides, the scope and the limitation by the system are also defined that will act as the guidelines and borders for the development of the MIS system. Furthermore, the project planning schedule is also shown in this chapter using Gantt Chart. This schedule will guide me throughout the development of the MIS system.

Chapter 2: Literature Review

In this chapter, I will discuss the research done from the literature review conducted during this phase. This chapter is divided into five parts. The first part will be the research about the messaging system, the process of sending messages, the history and the future of the messaging system. Second part, is the brief information about meeting systems and also additional information about improving meeting management skills. Third part will be the review on a few of existing system that is similar to the development of the MIS system. Fourth part will be the technology review part where a few software will be introduced. Final part will be the comparison between the current systems and the MIS system.

2.1   Messaging System

2.1.1 The Evolution of Messaging

Message is a piece of news or a request sent to a person [CHR88]. The process of sending messages nowadays varies. There includes phone, e-mail, fax and many more. From the perspective of the callee, the term messaging associates the usage of asynchronous communication services. This mean that the involved users do not communicate directly to each other. The calling party sends information as a message, which will be stored that the addressed party can access this information at any time.

In the 1st generation of messaging, all messaging services are processes by special facilities (*Figure 3*). Users had to use different particular types of equipment to check for incoming messages, e.g. an automatic answering machine for voice messages, a fax machine for fax messages, and a workstation for reading e-mails. While this is appropriate for customers with a well-defined communication environment, e.g. inside of an enterprise, mobile users have the

disadvantage of carrying all the equipment or to find appropriate equipment to access their messages [VAN99].
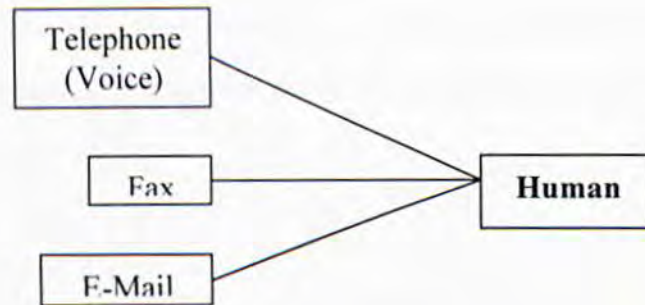
Figure 3: 1ˢᵗ Generation Messaging

The 2ⁿᵈ generation of messaging system, which is also called integrated messaging, provides access to all messages via a universal inbox. The basic technology for these systems is e-mail, which is able to integrate all kinds of multimedia objects (*Figure 4*).
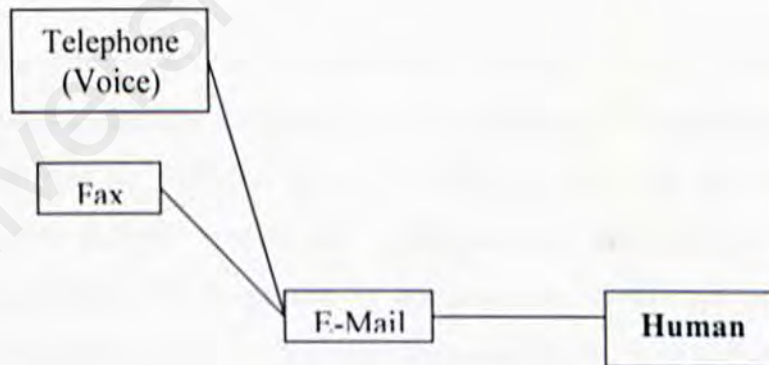
Figure 4: 2ⁿᵈ Generation Messaging

The 3ʳᵈ generation of messaging systems assists the user in his message handling by providing Unified Messaging. They use open architectures to incorporate e-mail, fax and voice mail from most sources, systems, and platforms. Access to the centralized stored and managed information resources are provided

for all major communication services, e.g. touch-tone phone, fax polling, or e-mail retrieval (*Figure 5*). In this context, the first solutions for the conversion of messages appeared. E.g. a text to speech conversion is used to read a fax or an e-mail to users who gain access to their messages by phone. Products of this generation of messaging systems are available on the market today [VAN99].
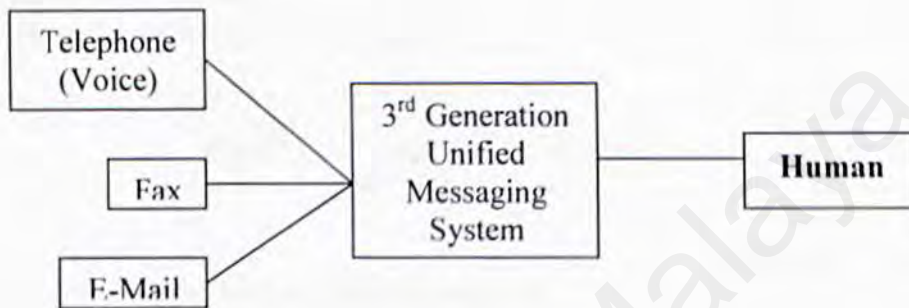
Figure 5: 3rd Generation Messaging

2.1.2 The Future of Messaging

The demands of the customers increase rapidly with new technologies and systems in the area of message processing. The upcoming 4th generation of messaging systems has to concern new technologies such as distributed processing, intelligent mobile agents, and location-aware applications. This means, that the user has to be supported by the seamless integration of new network access technologies (e.g. UMTS), new terminal equipment (e.g. Personal Digital Assistants and enhanced mobile phones), and new multimedia application [VAN99].

The more such technologies are in common use, the more the user's communication behavior will change. The main interest of the users is no longer to access their messages but the control of their reach ability. Messaging systems have to support the user to define exactly when, where, and for whom he is

reachable (*Figure 6*). This means that people will define their own individual communication and services environment, specifying the services they want to use and the manner of the usage of the serve.
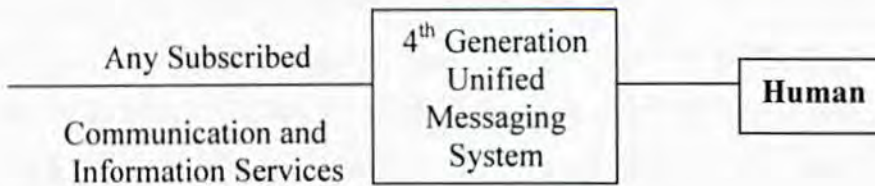
Figure 6: 4th Generation Messaging

2.1.3   The Process of Sending Messages

In discussing the process of sending messages, I will take an example of a messaging system that work in a fast speed environment that is the global address space mechanisms that can be realized efficiently in software. I will describe a high performance one-sided communication model that is implemented as a software layer on top of the *Illinois Fast Messages (FM)* system.

2.1.3.1   Introduction

Global address space programming models, also known as put/get model, offer a fundamentally different method of communication from that of message passing protocols. Under message passing models, the receiver must specify the final destination of the data being transferred, and therefore, the transfer cannot be completed until the receiving process executes a receive operation. Using put/get interfaces, the sender specified both the source and destination location of data, thereby decoupling the receiver from the transfer of data.

For certain applications, especially those with dynamic and irregular communication, put/get models can greatly increase performance and decrease programming effort.

At the same time the emergence of SMP based PCs provides the potential for implementing a put/get system efficiently as a software layer on top of a message-passing interface. One of the additional processors in the SMP can be used to run the *remote agent*. The remote agent is the active entity, which is required by the put/get systems. It handles the remote actions required by put/get call. The remote agent can take many forms. It can be hardware on the network card, an interrupt handler, or a host thread. By using a thread based remote agent we were able to design a high performance put/get system that is able to run efficiently on top of a message-passing layer [GIA98].

2.1.3.2 Background

Illinois Fast Messages is the centerpiece of the High Performance Virtual Machines (HPVM) project. FM is one of several new highly efficient cluster based messaging systems. It uses an active message style interface and is designed to provide high-performance for all message sizes using a single, simple interface. FM provides direct user-level access to the network and supports multiple processes per node.

2.1.3.3 Implementation

All one-sided communication systems require a *remote agent* to perform actions on behalf of other nodes in the system. This agent is the crucial distinction between one-sided and two-sided (messaging) systems. Because the application on the remote node is not explicitly involved in the data transfer (one-sides), the remote-agent handles the data transfer on the remote node. Ideally, the remote agent should handle transfers efficiently, delivering high bandwidth and low latency. The choice of remote a gent implementation is the key choice for a one-sides communication system [GIA98].

While many implementations of a remote agent are possible, every design must deal with the following performance criteria.

- *Low Overhead* - The remote agent should service requests efficiently, delivering high bandwidth and request throughput. It must not interfere with the execution of the application. It must also not consume excessive CPU, memory, or I/O resources.

- *Responsiveness* - The remote agent should respond to requests shortly after they arrive, minimizing the latency of round-trip operations such as get.

2.1.3.4 Design Alternatives

There are a variety of implementation approaches for remote agents, involving a range of hardware and software support. As illustrated in *Figure 7*, the remote agent can consist of hardware on the network interface, an interrupt handler, or a host thread. In particular, the actions on the remote node needed to fulfill a get request.

Figure 7.1 pictures the actions of a hardware-supported get implementation. As can be seen, the NIC directly accesses the physical memory to service the request, bypassing the host CPU. In *Figure 7.2*, the actions required by the interrupt-driven get implementation are illustrated. After the request message arrives at the NIC, it interrupts the processor. An interrupt handler is then invoked on one of the host processors, which then builds a response message by copying the data. Finally the response message with the data is sent. *Figure 7.3* shows the handling of a get request using a host processor thread. After the message arrives at the network interface, the thread, which is polling, extracts the message and builds a response message, which contains the data.
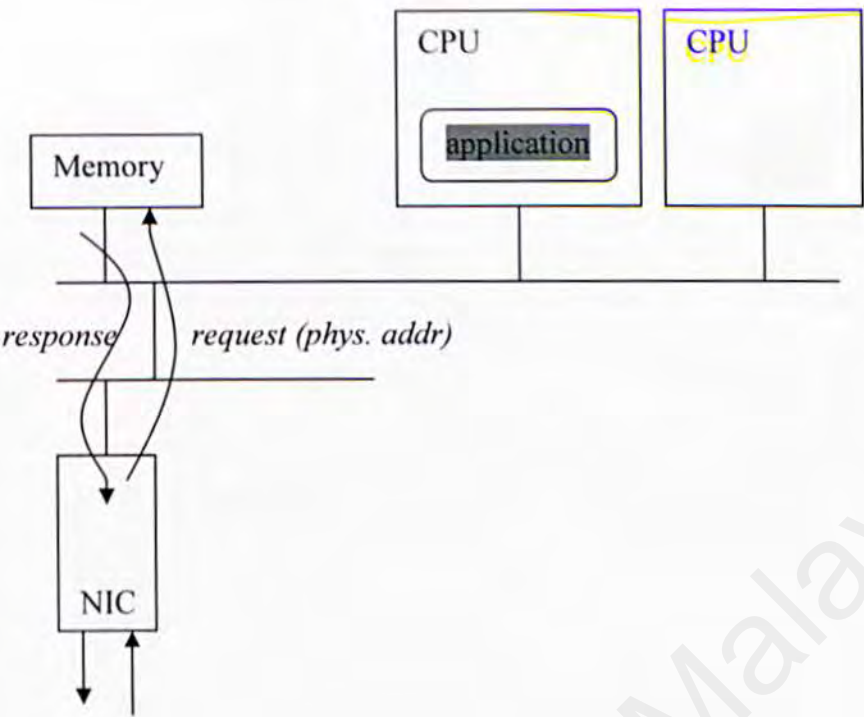
Figure 7.1: Hardware Support
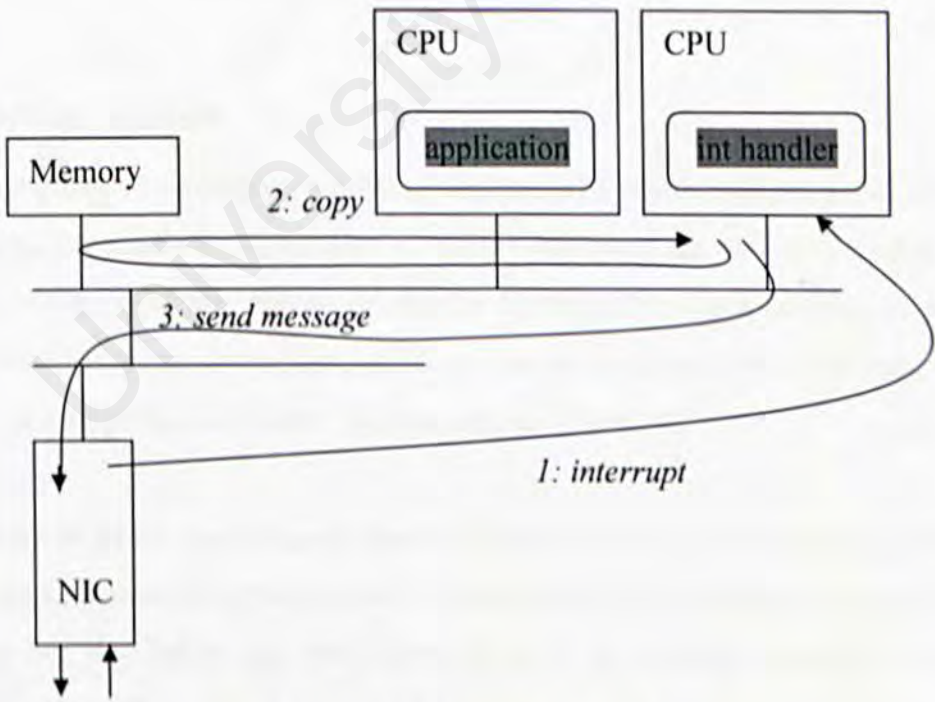
Figure 7.2: Interrupt Driven
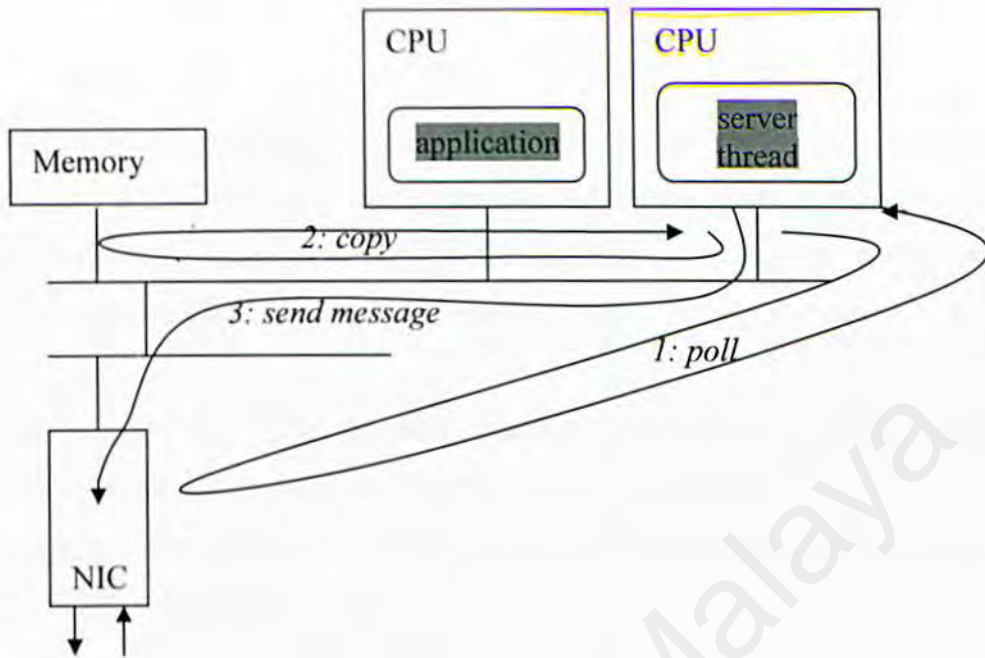
Figure 7.3: Server Thread

Figure 7: Implementation Alternatives

2.2   Meeting System

Meeting can be defined as a coming together of a number of people at a certain time and place, especially for discussion [CHR88]. Meetings are crucial elements in the functioning of organizations. Actors commonly noted as causing a meeting to lose its effectiveness (achieve the desired outcomes) are too many or too few individuals, wrong individuals, lack of goals, and hidden agenda/motives [MAR99].

In order to avoid unsystematic meeting from happening, it is advisable to record all the meetings information systematically. Participants in the meeting works not only in the meetings but also before and after the meetings to accomplish meetings effectively [KAI95]. Therefore, there should be a tool that should not only support the activities in the meetings but also those before and after the meetings, where participants would summarized the minutes of the previous meeting, and where that would describe the

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agenda for the next meeting. The content of the meeting therefore it is important to be recorded.

Participants in the meetings want to refer the records of the meetings both correctly and quickly, for pursuing the arguments efficiently in a meeting, and for constructing minutes and agenda correctly before/after the meeting. To satisfy such requirements, the data structure of the record should includes:

- *Raw Recorded Data* - The recorded data has the hierarchical and temporal structure. This structure helps participants access the meeting record quickly.
- *The Artifacts* - The artifacts, such as textual form of the minutes, the agenda and or the final specification, are represented.

From the observation of the ordinary meetings, there are systems that are designed for structuring the minutes and agenda from the plain record and also the multi-modal graphical user interfaces for referring the minutes and agenda.

2.2.1 *Improving Meeting Management Skill*

Meetings can be very productive. They can also be a waste of time. From the research that I had done, I find out some additional information that provides some useful tips on how to conduct a productive meeting. Here are some ways to improve meeting management skill.

- *Purpose*

    The purpose of the meeting should be defined in 1 or 2 sentences at most. For examples, "This meeting is to plan the new marketing campaign" or "This meeting is to review shipping's new policy for handling returns" That way everyone knows why they are there, what needs to be done, and how to know if they are successful.

- *Agenda*

  Set an agenda. List the items that are going to review or discuss or inspect. And also identify the person responsible to speak or moderate the discussion.

- *Timeframe*

  Set a timeframe. At the very least set a start and end time. It is also recommend setting durations for each item in the agenda. These should total to the overall meeting timeframe.

- *Keep and Send Minutes*

  Someone, other than the meeting organizer, should keep minutes of the meeting. The minutes should record who attended, what was discussed, any agreements that were reached, and any action items that were assigned. Soon after the meeting, usually within 24 hours, the minutes of the meeting should be distributed to all who attended, any invitees who did not attend, and anyone else effected by the discussion. Distributing the minutes informs those not at the meeting of the progress that was made and reminds everyone of their action items.

- *Stay Focused*

  Every meeting should have a "topic keeper". The topic keeper's job is to interrupt whenever the discussion strays from the topic under discussion. These new topics can either be tabled until later or scheduled for their own meeting. There is a fine line between what are amplifying remarks about the topic under discussion and what is a tangential topic.

2.3   Review Existing Systems

2.3.1   *Flash Messaging System*

2.3.1.1 *Introduction*

The Flash Messaging System is an easy to use Network Based Communication Program that runs on all kinds of Windows computers. All PCs on the network are able to send "Popup" messages to each other with the click of the mouse. It is very simple, efficient, and has many advanced features.

This system is designed for small companies who have the need for a very fast internal messaging system. This system is not meant to replace email systems, but rather run as a real-time supplement.

The system comes in two flavors: Version for Netware Networks and Version for NT Networks. It is first designed specifically for a Money Management firm. It is ideal for trader or portfolio manager communications, phone messages, or other fast communication needs within the company.

2.3.1.2 *Flash Messaging Features*

There are a few features that have in this system. They are:

- *Quick*

Average time to send a message is less than 1 second.

- *Reliable*

Multiple levels of verification will let user know the exact status of the message they have sent.

- *Logging*

  A Log is kept for each user in database format. User can sort the log by date, message text, data, or person. User can also search and print the log.

- *Admin Tool*

  An administrative tool will let a network administrator view who is logged into the messaging system, and what their connection status is. Or additionally, shut a user down remotely.

- *Quick Reply Button*

  Upon receiving an incoming message, user can program "Instant Reply Buttons" and respond to a message with just one click.

- *Windows Burn-Thru*

  User incoming messages will have the option of burning through other Windows on user desktop, so other applications won't be able to cover up their important messages.

- *Auto Response*

  If user steps away, they can put in an automated response that will go to anyone who sends them a message.

- *Auto Forwarding*

  Automatically have incoming messages forwarded to another person on the messaging system.

- *Sound Notification*

  Have Sound files play upon reception of an incoming message or just use the default PC beep.

2.3.1.3 System Requirements

The Flash Messaging System runs in a lot of OS. Below are some of the system requirements that need to be fulfilled.

i) Novell Version (3.6)

- Netware 3.x or 4.x Server on Network.

- Windows 3.1, 95, 98, NT 3.51, NT 4.0. Win 3.1 uses 16-bit client, others use 32-bit client.

- Netware Client 32 required; however, 16-bit version can be used with Microsoft Client Service for Netware.

- User Read/Write access to a shared network drive.

- Admin Utility Add-On Works with Win 3.1, Win 95, Win98, or WinNT

ii) TCP/IP Version (4.0)

- TCP/IP Stack on Windows Machine.

- Windows 95, 98, NT 3.51, NT 4.0. (Win 3.1 not available).

- User Read/Write access to a shared drive on an NT (or Netware) server.

2.3.1.4 Screen Samples

Here are a few screen samples for the Flash Messaging System.

25
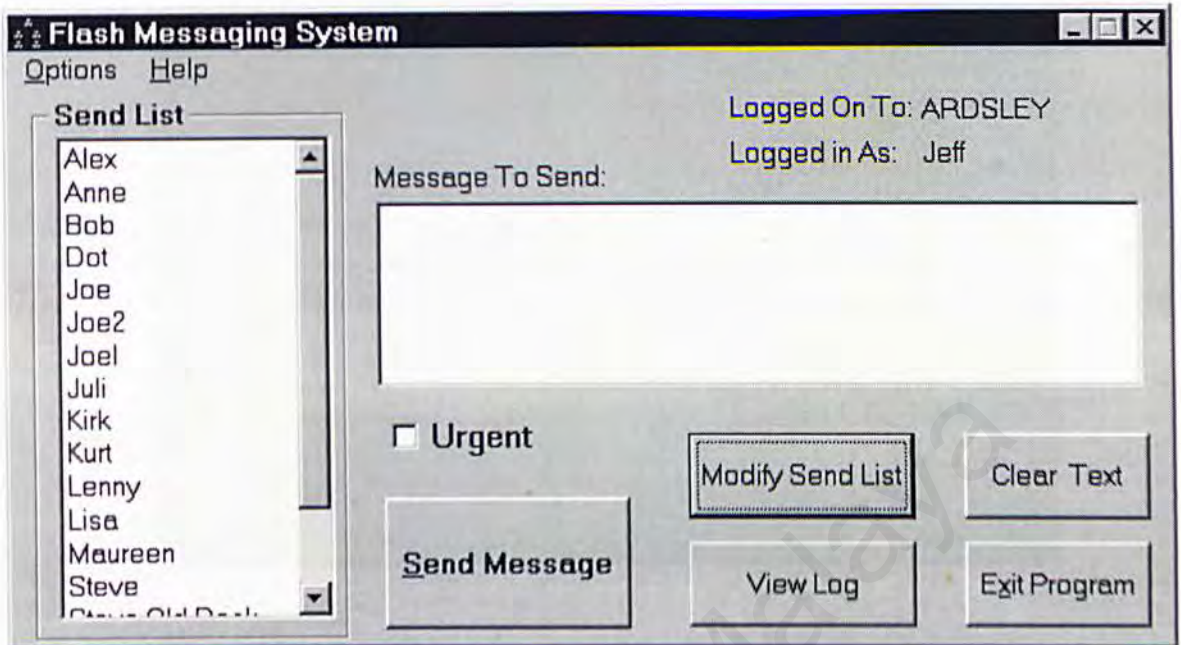
Figure 8: Flash Messaging System Main Program Screen
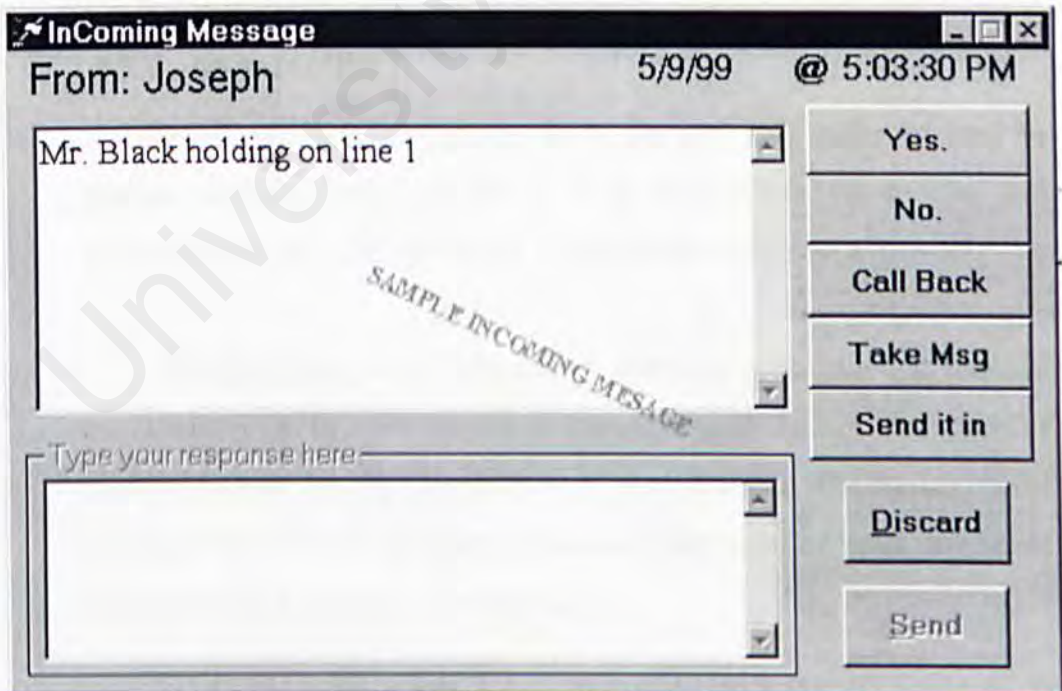
Figure 9: Flash Messaging System Incoming Message Screen
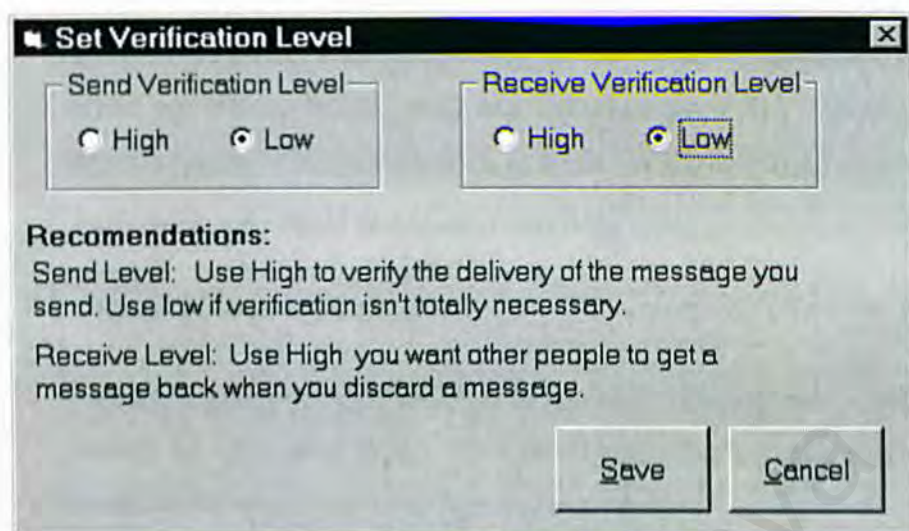
Figure 10: Flash Messaging System Verification Option Screen

2.3.2 Meetingmaker System

2.3.2.1 Introduction

Meetingmaker is a group-scheduling tool that makes it easy to schedule meetings, plan activities, keep a prioritized to-do list, and coordinate user calendar with other meetingmaker users on a network.

Meetingmaker is a client-server software application. It requires one workstation to function as a meetingmaker Server that handles communications among Clients (users' workstations). The Server stores meetingmaker data for all users, processes meetingmaker tasks, and sends notifications and messages among users.

Meetingmaker provides a convenient way to coordinate the schedules of people who work together. Meetingmaker can be used to do the following tasks:

- ***Plan and Schedule Meetings***

  Send invitations, reserve meeting rooms and equipment (like slide projectors, VCRs, etc.) and schedule recurring meetings. Meetingmaker's Auto-Pick feature finds the earliest time that all required guests could attend user meeting.

- ***Organize Personal Calendar***

  Organize personal calendar and keep other meetingmaker users aware of the availability for meetings. Meetingmaker also reminds the upcoming meetings and activities.

- ***Maintain a List of Tasks***

  Use the To-Do List to organize and prioritize important tasks. User can also assign to-do tasks to other people who are part of the meetingmaker environment.

- ***Print Schedule***

  Print schedule in sizes to fit user choice of popular personal organizers, including Day-Timer, Day Runner, Franklin Day Planner, and Dynodex.

- ***Synchronize user Calendar with a Handheld Device***

  User can synchronize their meetingmaker calendar with Palm OS platform handheld devices, such as those made by Palm and Handspring.

2.3.2.2 Windows Hardware and Software Requirements

Meetingmaker requires the following hardware and software:

Hardware/Software	Requirements
CPU	486 or better
OS	Windows 95, 98, Me, NT, (3.51 or 4), or 2000
RAM	8 MB of free RAM
Disk	5 MB of free disk space
Network	10/100 megabit Network Interface Card, TCP/IP

Table 1: Meetingmaker System Requirements

2.3.2.3 Exiting and Signing Out of meetingmaker

User that want to exit the meetingmaker can use the **Sign Out** command to close the connection between their Client account and the rest of the meetingmaker environment without closing the meetingmaker Client. Signing out prevents notifications or reminders from appearing until user next sign-in. Signing out prevents other people from viewing user calendar if user are away from their computer and makes it possible for another user to sign in.

2.3.2.4 Screen Samples

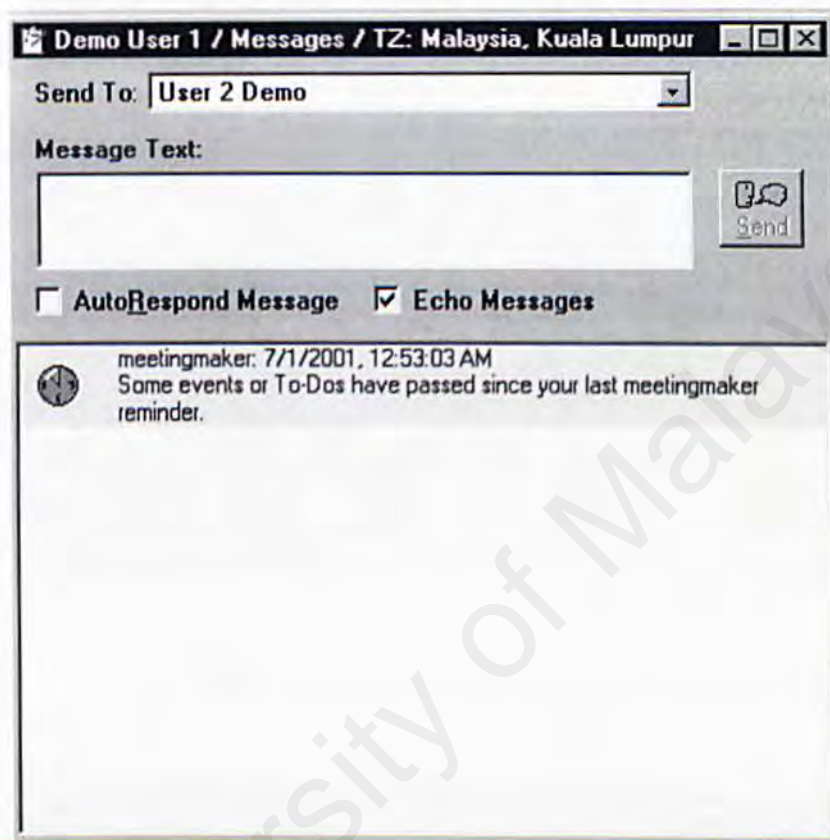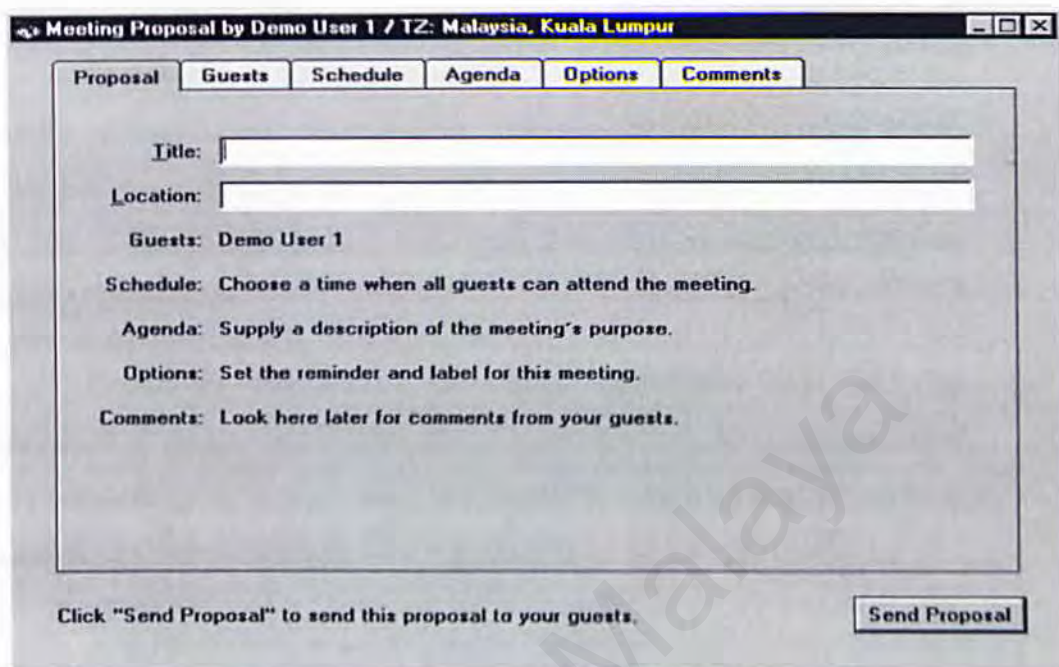Here are a few screen samples for the Meetingmaker System.

Figure 11: Meetingmaker Message Box Screen
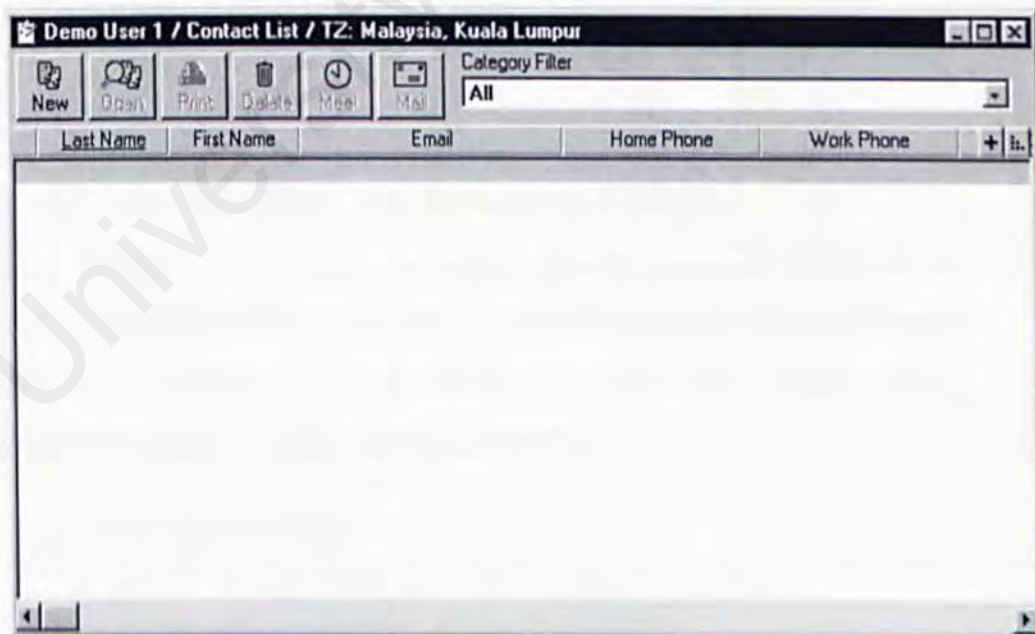
Figure 12: Meetingmaker Meeting Proposal Screen

Figure 13: Meetingmaker Contact List Screen

2.3.3 noteNow Real Time Messaging

2.3.3.1 Introduction

The noteNow desktop is a simple application use to send notes, instant messages, and determine the presence of other noteNow users. User can also configure noteNow to popup only if a note is directed to him or one of his groups. Instant messaging is integrated into the noteNow desktop application.

Unlike the free instant messaging applications from AOL or Microsoft, noteNow instant messaging is restricted to other noteNow users and everything is logged. Also, the noteNow administrator can restrict who has access to noteNow instant messaging.

The in/out box displays users' "Where Abouts". User can enter their "Where Abouts", whether they are in, out, at a meeting, vacation, or other. User can also tell noteNow to notify them when a particular user logs in or out of noteNow. Workgroup supervisors can easily determine how many people are available, on break, or gone for the day.

2.3.3.2 noteNow Real Time Messaging Features

noteNow is a real time messaging system specifically designed for internal company networks. noteNow combines the core features of email with the real time presence of instant messaging into a single, simple, lightweight system. NoteNow main features are:

- *Real Time Messages*

Messages are delivered to each user instantly.

- *Message Retrieval*

  Messages can be retrieved automatically on startup. User will not miss any messages if they logout or are gone for the day.

- *NT Domain Support*

  Users are identified by username or domain. This means if they move to a different machine, their noteNow preferences and settings will follow them.

- *Integrated Instant Messaging*

  No need to switch between applications.

- *Comprehensive Administration*

  Every message is logged. User network administrator has the ability to remotely configure the end user's noteNow desktop application.

- *Current User Status*

  Every user's current status and where abouts are displayed in real time.

- *Near Zero Maintenance*

  Message logs are automatically truncated, users are added automatically, and user default preferences and groups can be set.

2.3.3.3 How noteNow Real Time Messaging Works and The System Requirements

noteNow is an excellent solution for environments that require simple, easy to use, messaging for workgroups of any size. noteNow is

ideal for temporary office/workforce, telemarketing, and call centers. noteNow can also be used as a backup system to user existing email system, especially if user company outsourced its email services.

The *Figure 14* diagram illustrates how the noteNow desktop, administration, and service are organized.
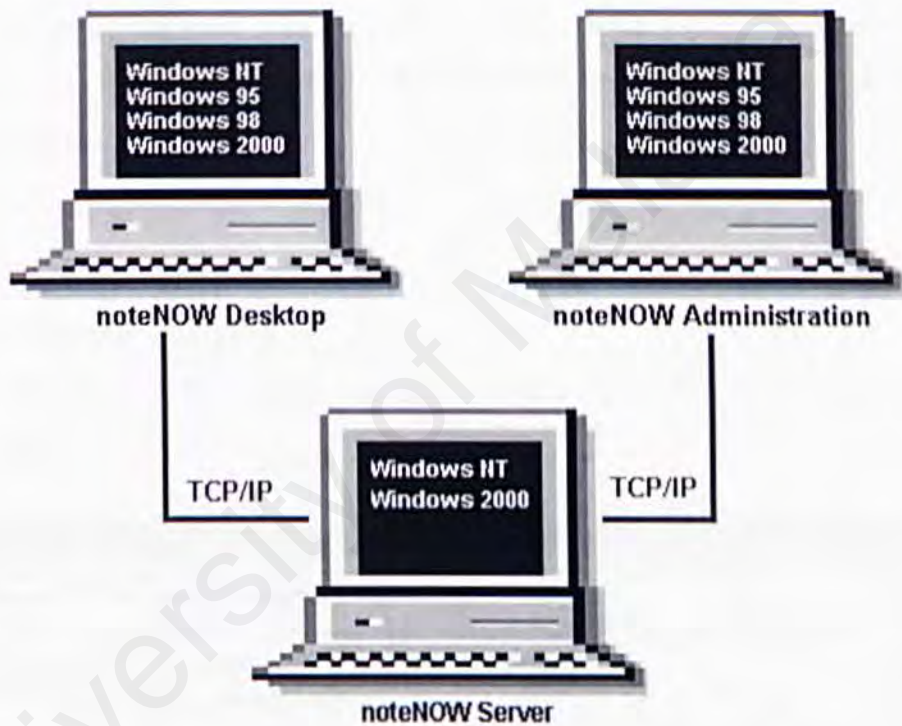
Figure 14: How The noteNow Desktop, Administrator, and Service are Organized

The noteNow server manages all of the noteNow user information and message logs. noteNow identifies users by their MS Windows login and domain name (or computer name, if not logged into a domain), which enables noteNow to save a user's settings regardless of which physical machine they are currently using. In an "open seating" environment, noteNow users can move between machines without any problem.

The noteNow server (actually an NT service) is extremely light-weight and does not require a large server type system, an NT Workstation with 300 MHz system is all that is needed. Some customers intentionally install noteNow on a separate inexpensive system for redundancy. If the larger Email server goes down, the users will be able to continue to use noteNow while their email system is being repaired. The noteNow desktop runs on 95/98/Windows ME, NT, Windows 2000.

noteNow supports TCP/IP. The noteNow desktop can be either Windows 95, 98, ME, NT, 2000, the noteNow server can be NT or Windows 2000.

2.3.3.4 Screen Samples

Here are a few screen samples for the noteNow Real Time Messaging.
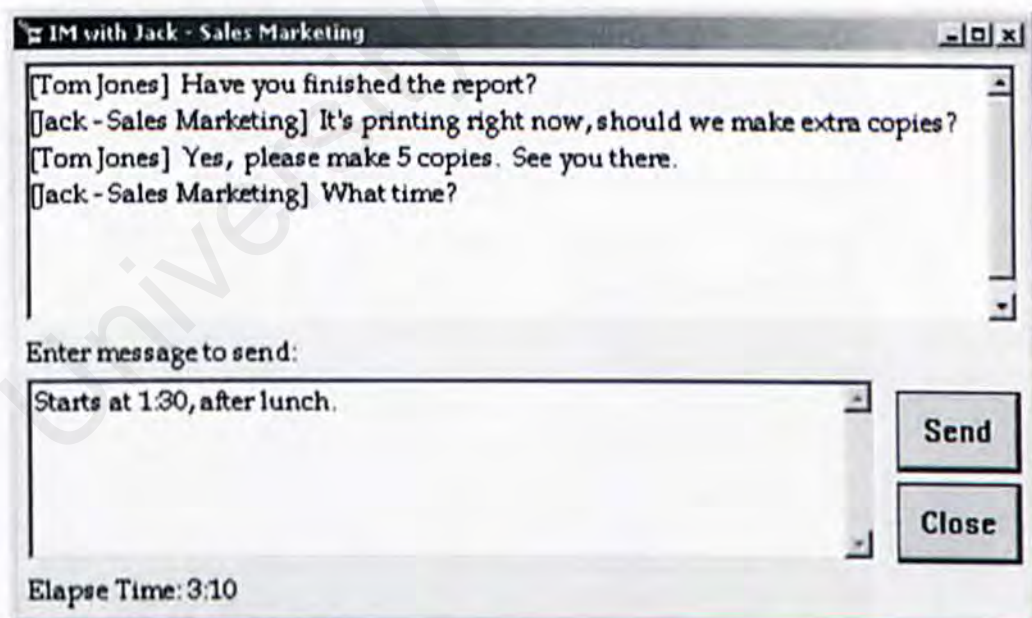
Figure 15: noteNow Real Time Messaging Instant Message Screen
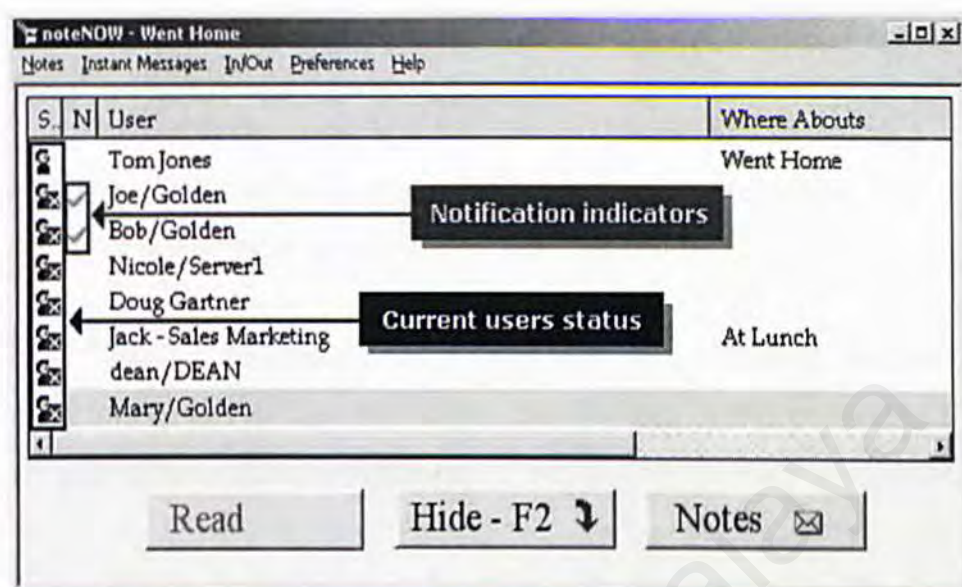
Figure 16: noteNow Real Time Messaging In/Out Box Screen
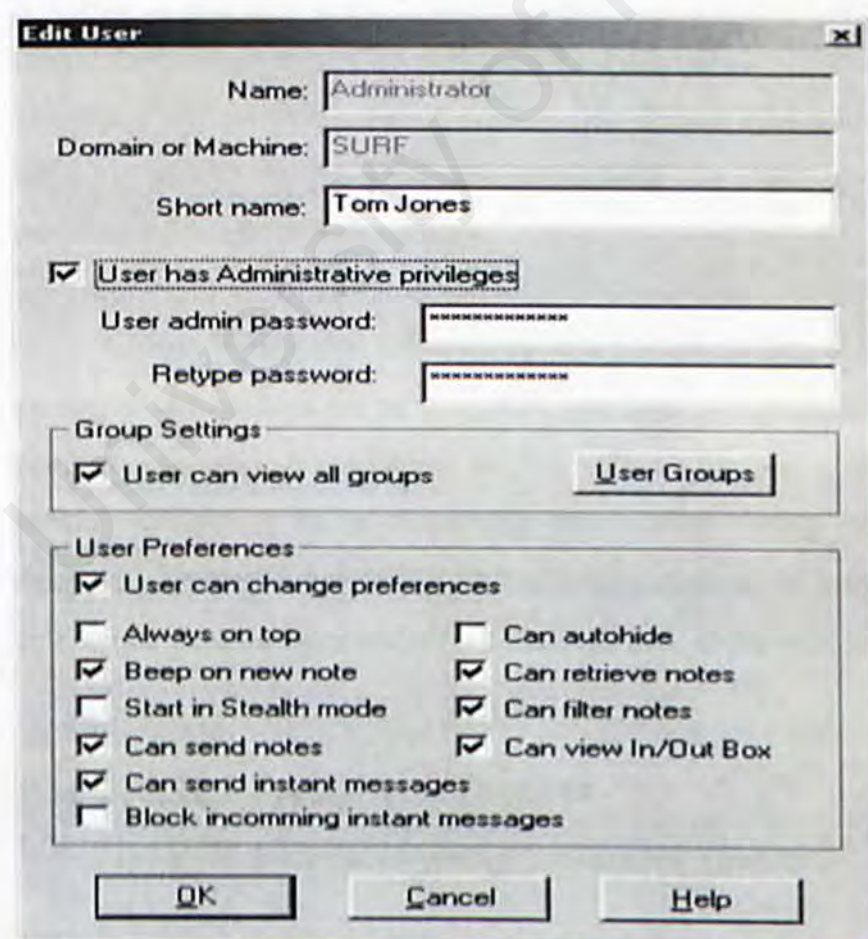
Figure 17: noteNow Real Time Messaging Administrator Control Screen

2.3.4 JBlurb Professional

2.3.4.1 Introduction

Jblurb Professional is a real-time collaboration software that can bridge the communication gap between corporate centers either between the home and office or a multi-office organization.

JBlurb Professional is a tool that can be used to extend organization private network across the Internet, while preserving the security of their local environment.

JBlurb Professional is bundled with two programs: the Jblurb Professional Edition Server and JBlurb Professional Edition Client Software. Using the JBlurb Professional Server, organization will be able to host their JBlurb Private network, administrate user accounts and access privileges, and monitor network activity. The JBlurb Professional client software should be installed and configured on each workstation participating in user private network.

JBlurb Professional offers a rich suite of tools to keep organization moving at the speed of business. Instant real-time communication, group conferencing, and presentation delivery allow flexible collaboration between colleagues while eliminating time wasted during face-to-face meetings. Secure document sharing and management allow teammates to collaborate on documents and other files regardless of physical location.

2.3.4.2 JBlurb Professional Features

JBlurb Professional provides a few features. They are:

- *Instant Messaging*

  Real-time communication allows staffs to make decisions at the speed of business.

- *Group Conferencing*

  Contact user business partners and hold an online meeting within minutes. Gather ideas and make decisions faster using JBlurb Professional's group brainstorming tool.

- *Presentation Delivery*

  Conduct user Microsoft PowerPoint presentations in real-time regardless of their colleagues' physical location.

- *Document Management*

  Keep entire organization on the same page with centralized workgroup folders. Multiple folders of documents can be shared from a user workgroup server so members of his network can remotely view and edit pertinent organizational documents.

- *Secure Document Sharing*

  Distributed teams can work together and collaborate on documents and other file types using JBlurb Professional's peer-to-peer document sharing.

- *128-Bit Encryption*

  The JBlurb Professional platform uses Secure Socket Layer (SSL) transmissions, the worldwide security standard for online purchases and transactions. Instant Messages, Conferences, Presentation Delivery, and File Transfers are all secured using 128-bit encryption.

- *Private Networking*

  JBlurb Professional gives user the ability to host their owns secure private network.

- *Access Control*

  With the JBlurb Professional Server, user has the power to control accounts and access rights for members of their private network. A JBlurb Professional private network is as flexible as most LANs. Set user-specific access rights to shared folders and network features.

2.3.4.3 JBlurb Professional System Requirements

JBlurb Professional Edition Server requires the following hardware and software:

Hardware/Software	Requirements
CPU	Intel Pentium-233Mhz or comparable CPU
OS	Windows 95, Windows 98, Windows Me, Windows NT 4.0, or Windows 2000 systems
RAM	128 Megabytes of physical RAM is highly recommended, though the software may function with only 64 Megabytes or less
Disk	20 Megabytes of available hard disk space are required before installation

Table 2: System Requirements For Jblurb Professional Edition Server

JBlurb Professional Edition client software requires the following

hardware and software:

Hardware/Software	Requirements
CPU	Intel Pentium-166Mhz or comparable CPU
OS	Windows 95, Windows 98, Windows Me, Windows NT 4.0, or Windows 2000 systems
RAM	64 Megabytes of physical is highly recommended, though the software may function with only 32 Megabytes or less
Disk	15 Megabytes of available hard disk space are required before installation

Table 3: System Requirements For Jblurb Professional Edition Client Software

2.3.4.4 Screen Samples

Here are a few screen samples for the JBlurb Professional.
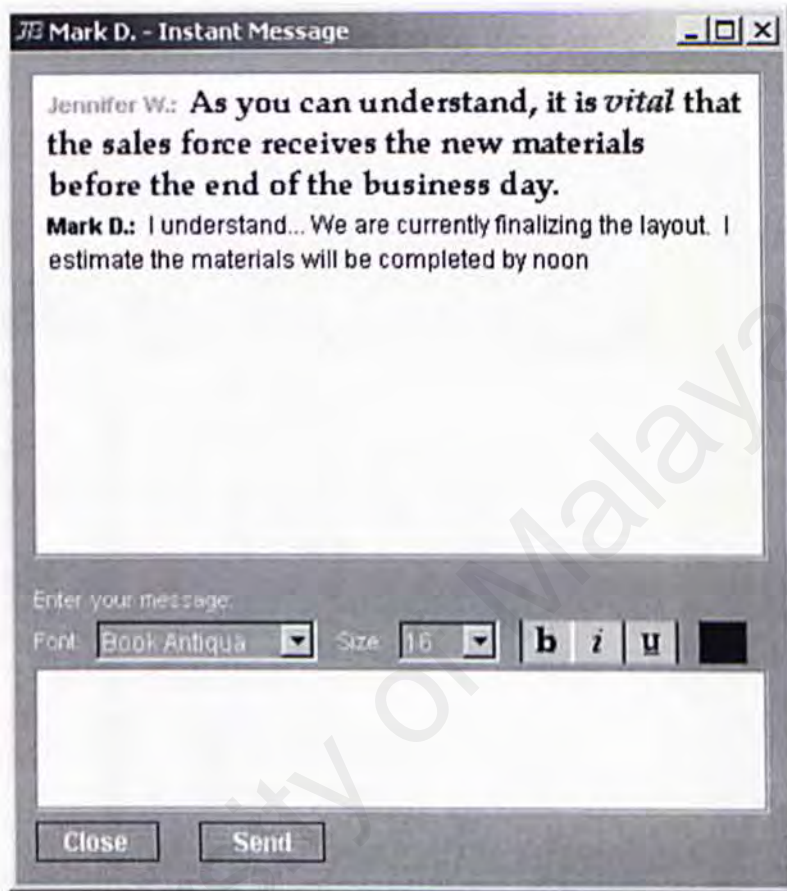
Figure 18: JBlurb Professional Instant Messaging Screen
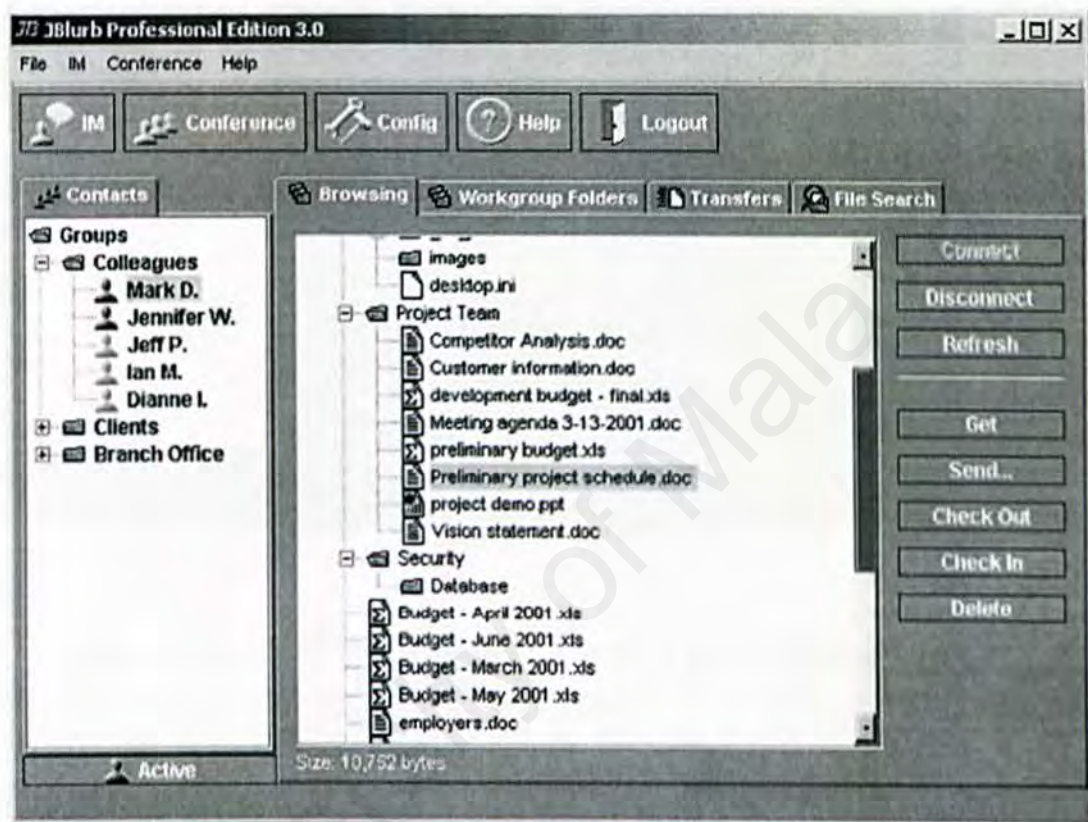
Figure 19: JBlurb Professional Peer-to-Peer Document Sharing Screen
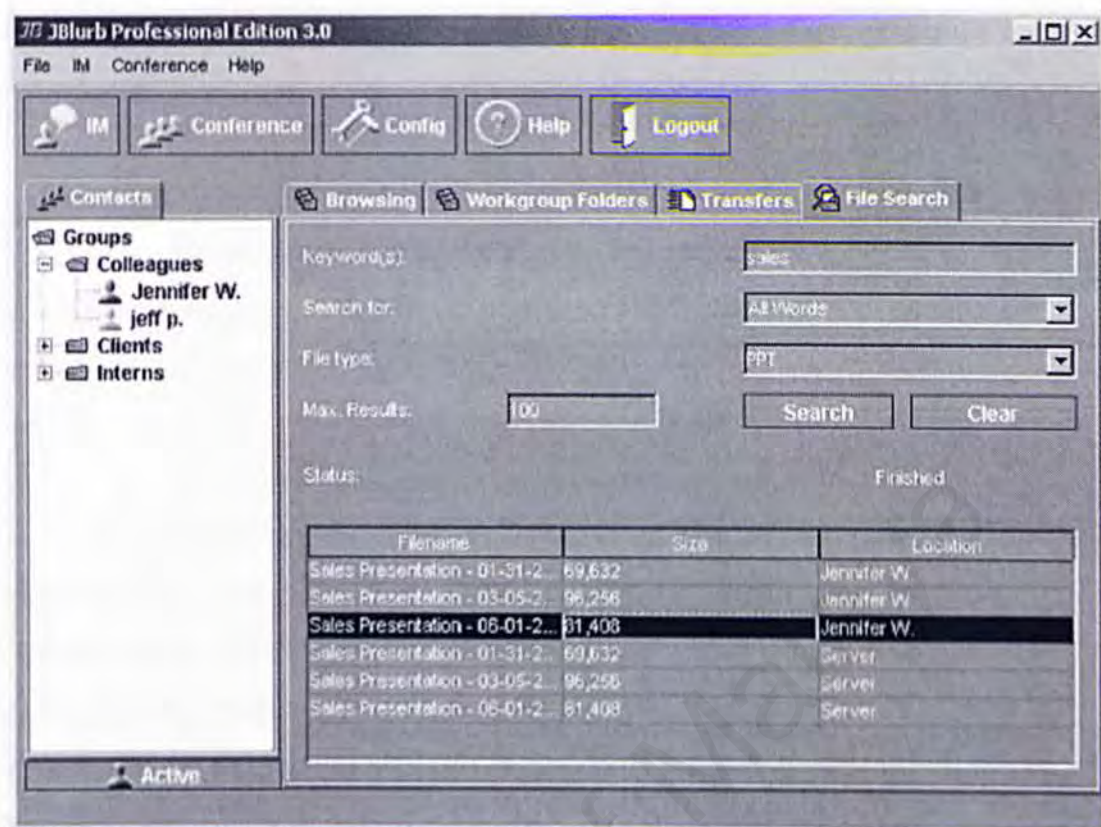
Figure 20: JBlurb Professional Full Network File Searching Screen

2.4   Technology Review

In this section, from the research that I have done I have found out that there are a few tools that are available for the development of the systems mention above. The tools are available on the market and it can be use to develop for the development of other systems too. Some examples of the tools are Java, Visual Basic and C++.

2.4.1   Java

For the above system, which is the meetingmaker, Java Language is being used for the development. With this language the meetingmaker system can be use on any platform of operating system. User can use the meetingmaker

Java client either through their web browser, or as an independent application on their desktop.

To use the meetingmaker Java Client as an independent application, user must have a supported Java Virtual Machine (JVM) installed and running on their desktop computer.

The Java Virtual Machine, or JVM, is an abstract computer that runs compiled Java programs. The JVM is "virtual" because it is generally implemented in software on top of a "real" hardware platform and operating system. All Java programs are compiled for the JVM. Therefore, the JVM must be implemented on a particular platform before compiled Java programs will run on that platform.

The JVM plays a central role in making Java portable. It provides a layer of abstraction between the compiled Java program and the underlying hardware platform and operating system. The JVM is central to Java's portability because compiled Java programs run on the JVM, independent of whatever may be underneath a particular JVM implementation.

The "virtual hardware" of the Java Virtual Machine can be divided into four basic parts: the registers, the stack, the garbage-collected heap, and the method area. These parts are abstract, just like the machine they compose, but they must exist in some form in every JVM implementation.

The size of an address in the JVM is 32 bits. The JVM can, therefore, address up to 4 gigabytes (2 to the power of 32) of memory, with each memory location containing one byte. Each register in the JVM stores one 32-bit address. The stack, the garbage-collected heap, and the method area reside somewhere within the 4 gigabytes of addressable memory. The exact location of these memory areas is a decision of the implementer of each particular JVM.

Even though the meetingmaker system mention above are using Java as the development language, some other programming language can also be used to develop other similar system. Two examples of these programming languages are mention below.

2.4.2 Microsoft Visual Basic 6.0

The Microsoft Visual Basic development system version 6.0 is the most productive tool for creating high-performance components and applications. Visual Basic 6.0 offers developers the ability to create robust applications that reside on the client or server, or operate in a distributed n-tier environment. Visual Basic 6.0 is the Rapid Application Development (RAD) tool available either as a stand-alone product or as a part of the Visual Studio 6.0 suite of tools.

Visual Basic can be used to develop components for any tier within a solution. On the presentation tier, Visual Basic can be used to author Win32-, Dynamic HTML-, or HTML-based clients; on the middle tier, Visual Basic can be used to author thread-safe components for use in Microsoft Transaction Server; and on the data tier, Visual Basic can be used for database and schema design as well as for stored procedure authoring and debugging.

All areas of data access have been improved to make visual basic easier to perform most common database activities. The most significant features include these:

- Universal Data Access, with integrated ADO/OLE DB support

- Visual Database Tools, integrated into the Visual Basic environment

- New Oracle schema and stored procedure design capabilities

- Data Environment Designer for authoring ADO-based data access components

- New Integrated Report Writer

- Hierarchical FlexGrid Control for displaying hierarchical data

- Ability to create Data Sources

- Ability to create OLE DB Providers

- Ability to easily remote data from machine to machine, tier to tier

- Advanced Data Binding

2.4.3 C++ Language

C, the predecessor to C++, has become one of the most popular programming languages. Originally designed for systems programming, C enables programmers to write efficient code and provided close access to the machine. C compilers, found on practically every Unix system, are now available with most operating systems.

C++ represents a significant extension of C abilities. We might then consider C to be a subset of C++. C++ supports essentially every desirable behavior and most of the undesirable ones of its predecessor, but provides general language improvements as well as adding OOP capability. User can simply create structured code that uses only C++'s non-OOP features.

C++ gains many of the attractive features of the C language, such as efficiency, closeness to the machine, and a variety of built-in types. A number of new features were added to C++ to make the language even more robust, many of which are not used by novice programmers. Most of these features can be summarized by two important design goals: strong compiler type checking and a user-extensible language.

C++ also enables programmers to incorporate new types into the language, through the use of classes. A class is a user-defined type. The compiler can treat new types as if they are one of the built-in types. This is a very powerful feature. In addition, the class provides the mechanism for data abstraction and encapsulation, which is the key to object-oriented programming.

2.5 MIS System

In this section, comparison will be made between the proposed system and the existing system. The proposed system will be compared with the above four systems and some other similar systems that exist in the current market.

Currently, most of the existing system only provides function either to send messages or keeping minutes of meeting. For example, the Flash Messaging System only enable user to send and received messages. Sometimes however, these functions are insufficient for the staffs in an organization. It is because of this that the proposed system,

which is the MIS system had combines these two functions together, is being developed. This new system will provides more functions and consistent way to retrieved and sends messages between staffs.

Besides that, there are a few of the current system that does not provide contact details for another staffs to know their whereabouts. This will be troublesome in case the staff need to be contacted during emergency. For example, the noteNow Real Time Messaging System will help in detect the present of other noteNow users. However, it does not provide further contact details to enable the user easily reach by others. With the proposed system, this feature will be included for convenience purposes during urgent or emergency cases.

In the proposed project, one of the features is to enable the staff to store minutes of meeting for future references. Minute of meeting is one of the most important documents to management level for decision-making. However, for some existing system such as the Meetingmaker System, it does not provide additional features to store the meeting information, which is important for organization. The system is a group-scheduling tool that only helps to schedule meeting and plan other activities.

In some current messaging system, the arriving of new messages will not be notified or inform to the user. However, this problem is solved by the MIS system. The MIS system will notify the user whenever a new message arrived by pop up an icon informing the user the arrival of the message. This additional feature help to alert the user or the staffs in an organization to view their message quickly, which help to allows staffs to make decisions at the speed of business.

2.6   Chapter Conclusion

This chapter will discuss the findings from the literature review conducted during this phase. The research will include the current existing system, which had some similar features with the proposed system and the technologies used in developing those current

existing system. Besides, issues relating to the MIS system are also included. Information such as the importance of keeping minutes of meeting is also explained.

After conducting a literature review, it is learn that there are many systems out there that have some similar functions with the MIS system. However, it is learned that many tools can be used to develop different systems.

Chapter 3: System Analysis and Requirements

3.1 Techniques Used

In determining the requirements for the MIS system, a few techniques had been use. The techniques include brainstorming, discussions, the Internet and library.

3.1.1 Brainstorming

Before the project can even begin, an initial brainstorming session is held together with my project supervisor Miss Rafidah Mohd. Noor. The purpose of this session is to first understand and grab the overall concept behind the project at hand. Then we define the project and draft out a few functions that the MIS system should have. Brainstorming is also a good way of planning for our next move.

3.1.2 Discussions

Discussions with a few friends have been conducted to define the system requirements. The discussions had help me to understand more and better how is the MIS system going to work and flow. Besides, the discussions also guide me throughout the design parts where I can draft out the systems interfaces more clearly.

3.1.3 Internet

Nowadays the Internet has become the main place where most people find resources and information. It has become a major resource to obtain the latest information. Besides that, the Internet provides faster and a more efficient way to get information. The information obtained is then used a guidelines to help in

defining the system requirements of the MIS system. Thus, the Internet is used as one of the techniques to do research on the MIS system.

3.1.4 Library

Besides the Internet, the library also helps in the finding of important information. The library database provides a lot of useful information where it guides me in finding and searching more relevant information for the development of the MIS system.

3.2 Project Development Model

One of the key factors in completing any system development project is to adopt a methodology. A development methodology is an assortment of rules and standards that govern the approach taken to all tasks associated with the development process. There is no one right way to develop any system. Therefore, it is less important *which* particular methodology is adopted than it is *some* methodology be adopted [STA96].

In developing the MIS system, the System Development Life Cycle (SDLC) model is chosen. The process of system development consists of various step, each step may be performed using different techniques and tools.

SDLC was choose in developing the MIS system because it can be thought of as the set of activities that systems analysts, designers and users carry out to develop and implement an information system. It is an organized process for developing and maintaining systems. It helps establish a systems project plan because it provides an overall picture of activities needed to develop a system. There are many variation of the basic development life cycle. But there are some essential steps, as shown in *Figure 21*, which are common to all, to be taken in developing any system.

The SDLC approach that will be adopted in the proposed project although each phase is presented discretely, it is never accomplished as a separated step. Instead, several

activities can occur simultaneously, and activities may be repeated. That is why it is useful to think of the SDLC as accomplished in phases (with activities in full swing overlapping with others, and then tapering off) and not in separate steps [KEN98].

The SDLC approach encompasses the activities of initial strategy, determining information requirements, system analysis, system design, development, testing, implementation and maintenance.
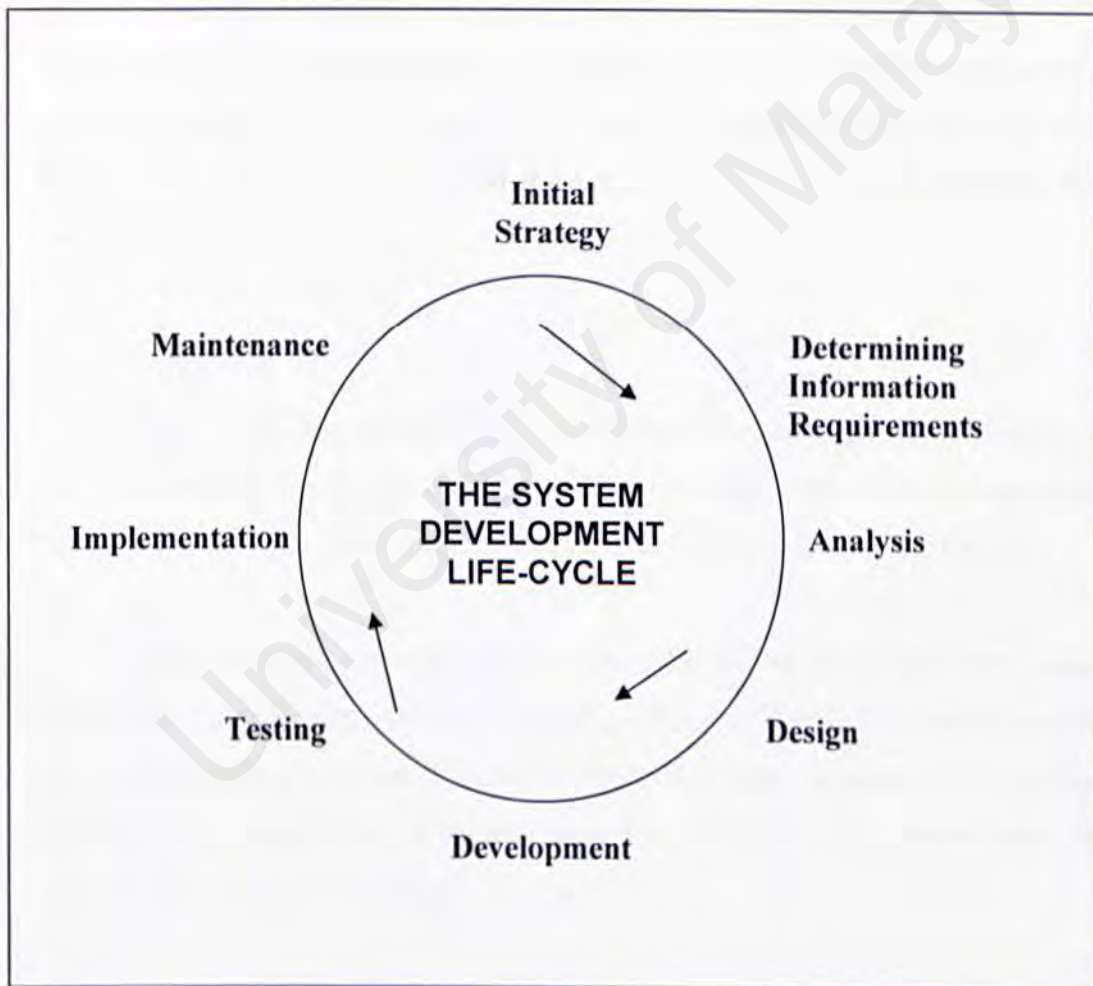
Figure 21: The System Development Life Cycle

3.2.1 Initial Strategy

In the first phase of the SDLC, it is important to identify the objectives. This stage is critical to the success of the rest of the development of the system. This phase consist of summarizing the knowledge obtained, estimating the scope of the system and documenting the results. The output of this phase is a feasibility report containing a problem definition and summarizing the objectives.

3.2.2 Determining Information Requirements

The next phase is to determine information requirements for the particular users involved. There are a few tools used to define information requirements such as observing the business environment, investigating data and also prototyping. In this phase, it is important to understand what information users need in the proposed system.

3.2.3 Analysis

This stage is a detailed study conducted with the purpose of wanting to fully understand the system and to identify the basic information requirements. The system analysis phase is concerned with data gathering and data analysis.

Data will be gathered from sources like written materials from books, Internet and also library database. Data Flow Diagram (DFD) is chosen to analyze the collected data because it enables the information domain and functional domain to be modeled at the same time. It is to be used to graphically show the flow of data through the system.

Analysis of the facts gathered about the system should lead to an accurate system requirements specification.

3.2.4 Design

The system design phase is the phase in which requirements produced in the previous phase are translated into a representation of the system. The many aspects of the system which must be consider include the output requirements and formats, input requirements and formats, file design, procedure design, the hardware and software to be used.

3.2.5 Development

This stage translates and implements the detail design representation of the system into programming realization. It involves the final definition of data structures, physical storage methods and provision of all necessary software programs. The purpose is to bring the working version of the system to a usable stage. Throughout development, and also as a separate stage after development is complete, thorough testing is necessary.

Programming language such as Microsoft Visual Basic 6.0 will be used in coding the information and functional domain as well as the control of the proposed system. Besides, Microsoft Visual Basic 6.0 will also be used to create the interfaces while Microsoft Server SQL 7.0 will be used to develop the system database.

3.2.6 Testing

Testing will be critical step in assuring the quality of the developed system and will represent the ultimate review of specification, design and coding. Before the system can be used, it must be tested. The testing step will follows after every step of development. A series of tests to pinpoint problems is run first with sample data and eventually with actual data.

3.2.7 Implementation

The final stage of the development will be system implementation. The system will be implemented in its target software and hardware environment. The whole system will be revise to uncover the necessity to add further enhancements.

3.2.8 Maintenance

Maintenance process should be an ongoing activity in real development projects. Monitoring and necessary adjustments continue so that the system produces the expected results and also to determine if it meets systems objectives and user requirements. Unforeseen problems may need to be overcome.

A system must also be reviewed continually to ensure that the changing needs of users and the changing needs of the environment within which the system exists are accommodated. However, system enhancements and maintenance will only be carried out in the proposed project if time constraint allowed.

3.3 Functional Requirements

A functional requirement describes an interaction between the system and its environment. Further, functional requirements also describe how the system should behave given certain stimuli [PFL01]. The following are the functional requirements for each of the sub-system:

3.3.1 Leave Message

The leave message module must be able to provide the users with the interfaces that can input their messages when the users are not available at the workstation. A Save button will then submit the form to a database. The Clear button would clear all the text boxes while a Cancel button will return to the main menu.

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3.3.2 Meeting Records

The meeting records module will also be able to provide the users with the interfaces that can input their meeting records. Records such as date, agenda of meeting and minutes meeting will be captured into the system. As usual a Submit button will submit the form to a database while the Clear and Cancel button would clear all the text boxes and return to the main menu.

3.3.3 Search Function

The search function module enables the users to search staff according to name, date or name and date which has already leave a message stating their whereabouts. It also allow user to search meeting records by date or meeting ID. A detail meeting records will be shown after the search.

3.3.4 Instant Messaging Module

The messaging module will provide user with the interfaces that can input their message. A Send button will submit the form to a database while the Clear button would clear all the text boxes. An alert icon will prompt the desired users that he or she has unread message.

3.3.5 Administrator Module

The administration module will allow the administrator to create a new user. The administrator will enter the user ID and password for every new staff. Besides that, the administrator will also delete user ID that is not working in the organization anymore. This module will also allow the administrator to change the administrator password.

3.3.6 Login Module

This module is for all the users to log onto the system with their own unique user name and password to use the system. If a wrong password is entered, the system will reject the access to the system.

3.3.7 Help Information

The help function module will guide user through the use of the MIS system. It provides interfaces that have instruction on the use of the system.

3.4 Non-Functional Requirements

A non-functional requirement describes a restriction on the system that limits user choices for constructing a solution to the problem [PFL01]. The following are the non-functional requirements for the MIS system:

3.4.1 User Interfaces

The system should provide user-friendly interfaces. The system shall have to use menu and graphical interface. The use of mouse, icon and menu should be common and familiar functions as in a Window environment.

3.4.2 Reliability

The system must be reliable and produce a consistence output for every process. It must always provide quality performances and must not fail at any critical time. For example, the system should provide a consistence result each time the same inputs are entered into the system.

3.4.3 Accuracy

The system should provide the correct information when a certain input data are entered. This means the output process by the system must be accurate.

3.4.4 Efficiency

In an efficient system there should be compatibility and integration between the different subsystems involved. For example, the speed at which data

is input should closely match the speed at which data is processed to avoid backlogs of work on one hand or idle processing capacity on the other. The aim should be to achieve smooth interfaces between processes.

3.4.5 Flexibility

The system changes should be easily implemented. Changes may often take the form of upgrades or enhancements.

3.4.6 Acceptability

An effective system is one that users want to use it, and it is acceptable by people whose works are affected by it. The user must feel comfortable and wiling to use the system.

3.4.7 Security

The system should ensure that only an authorized person allow modify the system. The system should be able differentiate between a normal user and a super user and only give privilege to the correct users. Communication with the system needs to be established with validation control to ensure authenticity of the data transfer.

3.4.8 Documentation

The system must be fully documented, using declared standards and providing comprehensive guidance to all present and potential users.

3.5 Software and Hardware Tools

3.5.1 Software Tools

Based on the comparisons made in Chapter 2 (Literature Review) on the software and tools available, the following are the software to be used in developing the MIS system.

Platform: *Microsoft Windows 98*

The main reason this platform is chosen because it is user friendly. It provides support for applications, which is required to develop the MIS system. Besides that, this platform proves to be more reliable than Microsoft Windows 95 and it provides faster processing power.

Software Tools: *Microsoft Visual Basic 6.0*

One of the great strengths of Visual Basic is its capability to enable user to quickly and effortlessly turn out application interfaces that have functionality as prototypes and beyond. Visual Basic's *Rapid Application Development* (RAD) environment is useful for rapidly refining interface design and development approaches. Additionally, in today's world, applications must be written that can be easily and quickly changed in response to external events. Visual Basic can used for creating the user interface and other parts of the application that might be subject to frequent change.

Microsoft Visual Basic 6.0 also introduces component technology, which means component software could be 'glued' together to form a sophisticated program. Besides, the syntax of Visual Basic is similar to the fundamental programming languages such as BASIC and QBASIC, which is easy to learn.

Database: *Microsoft Server SQL 7.0 (MSSQL Server)*

Microsoft SQL Server 7.0 was chosen to store all the input from the MIS system. This is because this SQL Server is one of the most popular relational databases on Microsoft Windows. MSSQL Server 7.0 supplied important new syntactic structures to simplify programming and provide better control to the programmer.

Besides, it is capable of handling large amounts of data and many concurrent users while preserving data integrity and providing many advanced

administration and data distribution capabilities. It also integrated with complete data integrity protection, from transaction support and advanced security to objects that support the business rules as an implicit part of the database. It is a first-class administration tools that perform on a low-cost platform.

3.5.2 Hardware Tools

In developing the MIS system, there are some hardware requirements, which need to be included to assist the development of the system. The hardware recommended is as below:

- 200 MHz Intel Pentium III Processor or higher
- 64 MB RAM Memory
- 15" Monitor
- Keyboard and mouse as input devices
- 1.44 MB floppy disk drive

3.6   Chapter Conclusion

This chapter mainly discuss about on selecting the suitable software and hardware tools to develop the system. Microsoft Visual Basic 6.0 software is selected in developing the MIS system. A description of the MIS system functional and non-functional requirements are also is discuss in this chapter. System Development Life Cycle (SDLC) model is used in assist the proposed project development.

Chapter 4: System Design

System design is a process through, which requirements are translated into a representation of the system. Through out this stage, a through description will show the logical flows of the system as well as how the requirements is being implemented and fulfill one by one. Design is a multi-step process in which representations of data structure, program structure, interface characteristics and procedural details are shown.

This chapter consists of four major parts. They are:

1. System Architecture
   - Shows the flow of how the data is store into the data store
2. System Structure
   - Shows the flow of the necessary action to be taken in its daily work
3. Data Design
   - Shows the attribute that is being stored in the database
4. Interface Design
   - Show what are the criteria of selecting such placement on the interface

4.1   System Architecture

The system architecture in the MIS system can be divided into a few modules. *Figure 22* is the context diagram for the MIS system while *Figure 23* is the Data Flow Diagram (DFD) Level 1 for the MIS system.
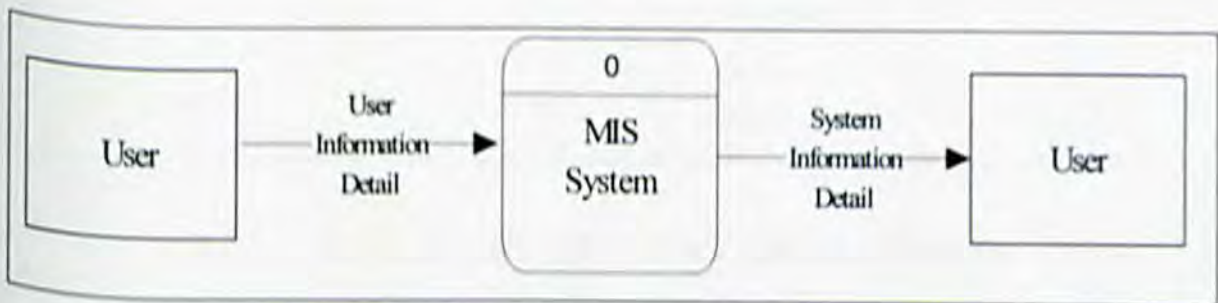

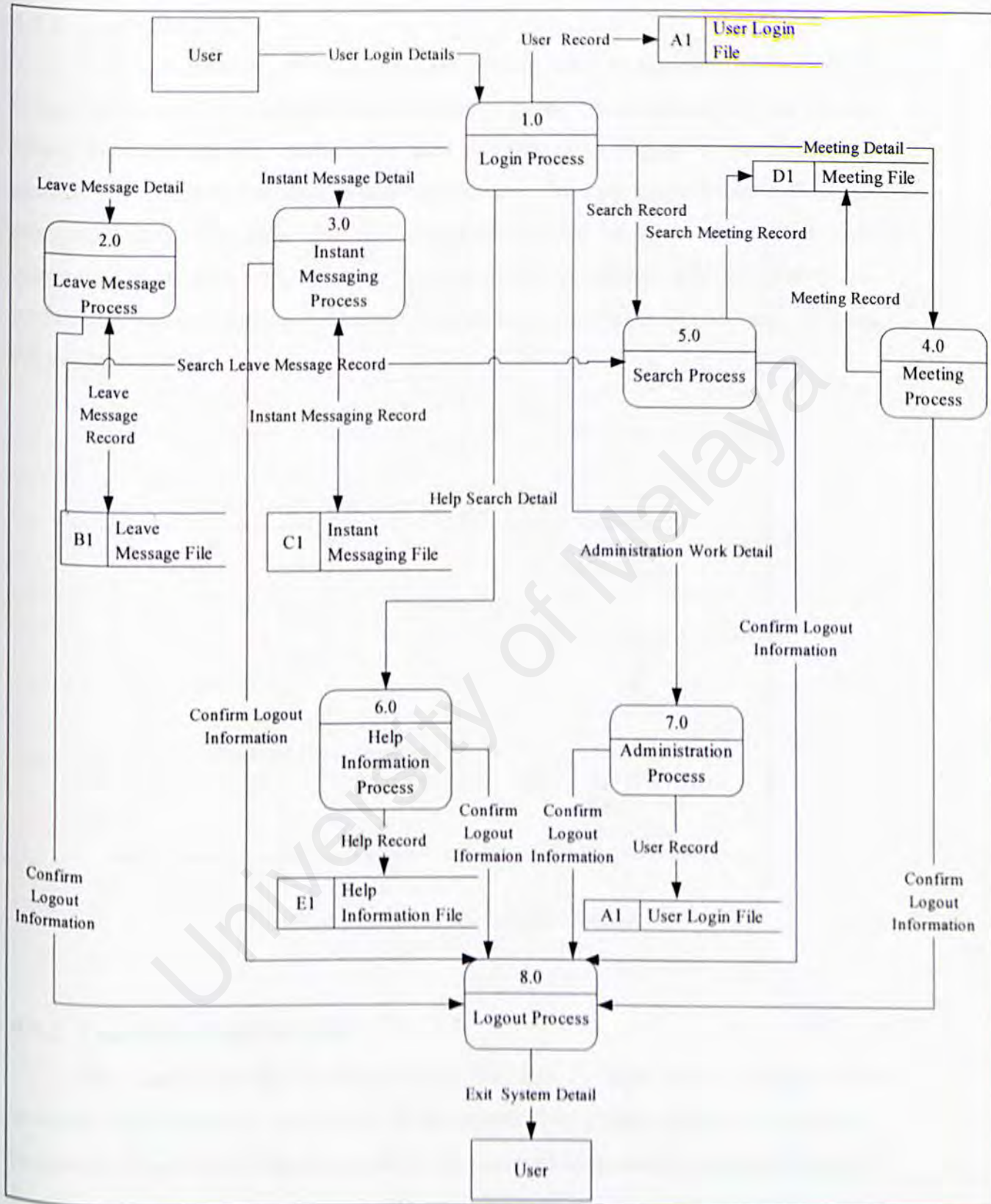*Figure 22: MIS System Context Diagram (DFD Level 0)*

Figure 23: MIS System Level 1 Data Flow Diagram

4.1.1 Login Module

The Login module serves as the main interface of the MIS system. The user need to input their user ID and password for verification by the system before they can use the system functions. In this module, the user is allowed to change or maintain their password by selecting the change password button. The user needs to enter their old password first and then enter their new password. Verification of the old and new user password will be done before the new password can be updated and use. The Login module also acts as a medium to connect to other modules. *Figure 24* illustrates the Data Flow of this module.
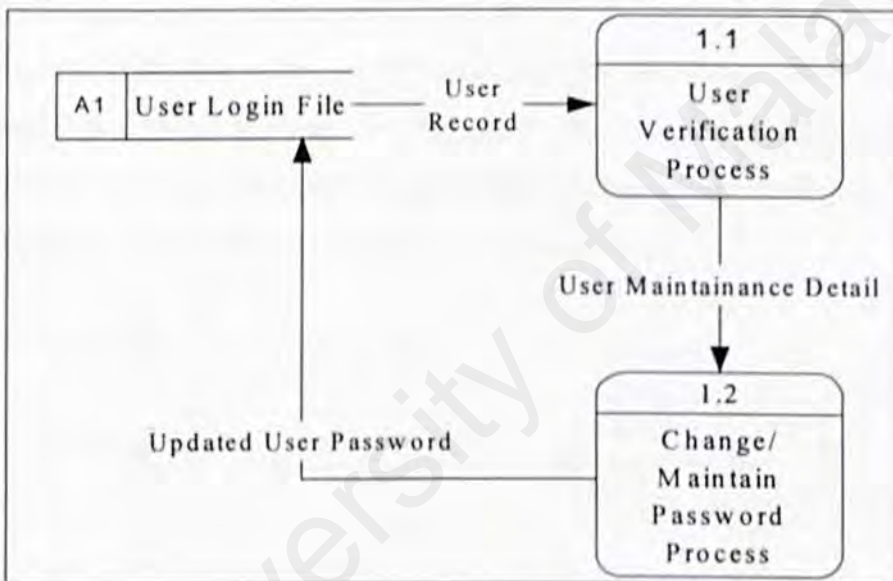
Figure 24: DFD Level 1 Login Process

4.1.2 Leave Message Module

The Leave Message module allows the user to leave their message down whenever they leave their workstation or the organization. Contact details do not have to be entered. However, the contact details of that user will be provided during searching for the user whereabouts. This is to provide easy access to get the contact detail from the system, rather than to search for it manually from the filling cabinet. The message will be store into the relevant database.
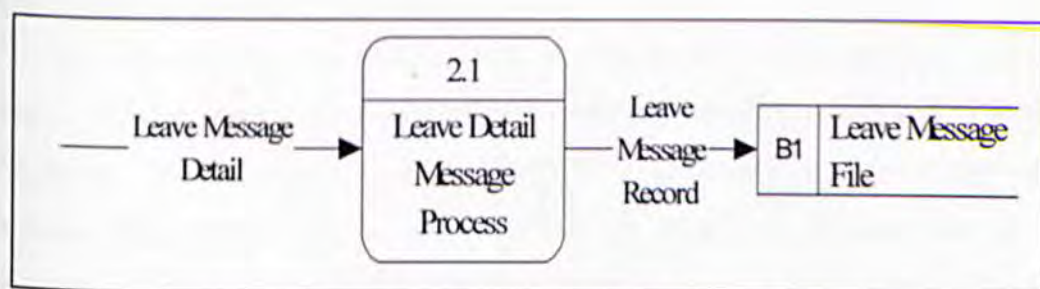
Figure 25: DFD Level 2 Leave Message Process

4.1.3 Instant Messaging Module

The main function of the Instant Messaging module is to enable the user to send or receive messages from other user. This module allows user to write down their message and send it to their colleague. Besides, user can also check if they have receives any new messages. After viewing the message, user can either choose to keep the message or delete it away. The special feature that appears in this module is that an alert icon will pop up to inform the user that he had a new message.

Figure 26: DFD Level 2 Instant Messaging Process

4.1.4 Meeting Record Module

The Meeting Record module only allows certain user to access it such as the secretary of a department. This is to provide additional security as only the invitees of the meeting can view the meeting record. Verification of control will be done to check the user status. This module enables secretary to insert minutes of meeting into the system. This meeting record will be kept as future reference.
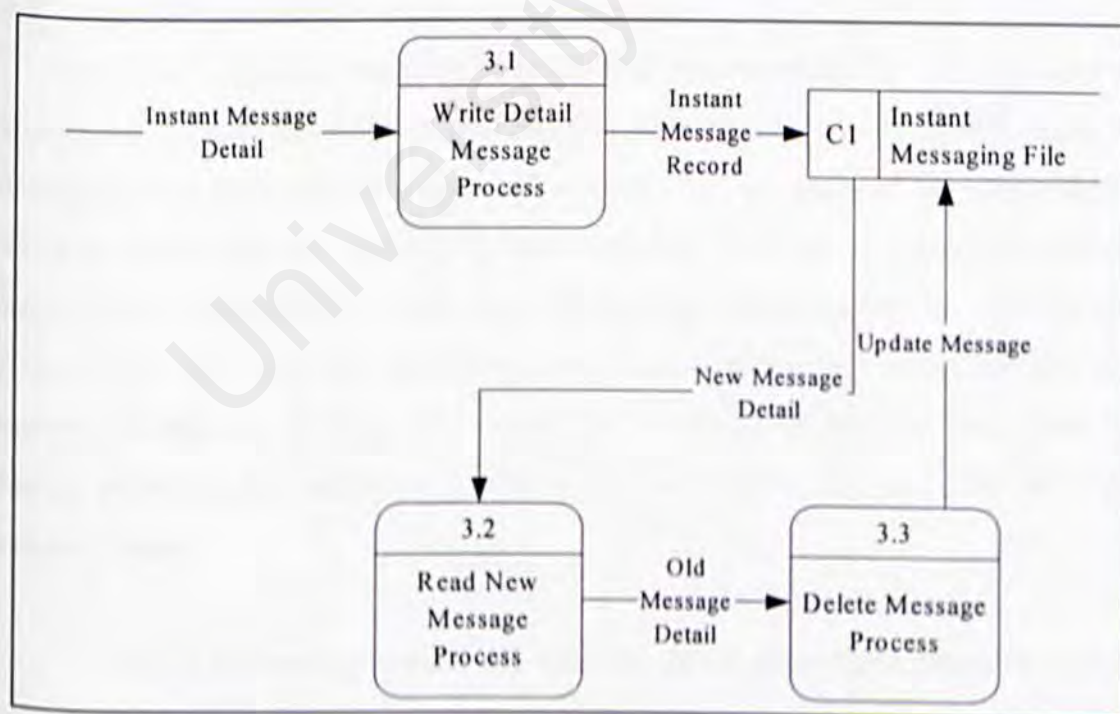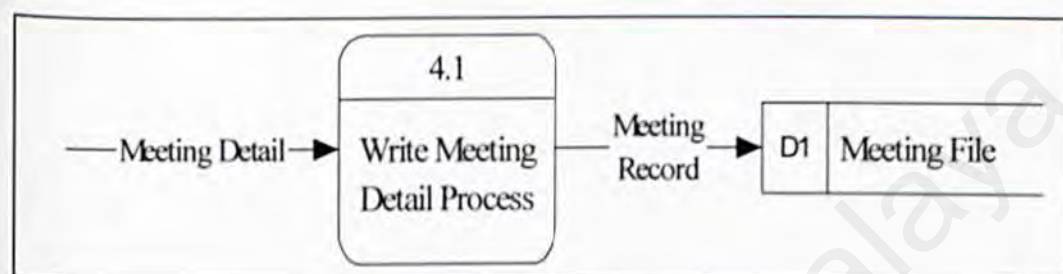

Figure 27: DFD Level 2 Meeting Record Process

4.1.5 Search Function Module

The Search Function module can be divided into two parts. The two functions are searching for the user whereabouts and searching for meeting records. Searching for the user whereabouts will need the user to select either the user name of the person that he wish to search, by date or searching by name and date. Once the relevant information is being selected, message that was left down by the user will be prompt out. The status of the user or the user whereabouts will be known including the contact number and other important information. However, if the user that is looking for does not leave down any message informing his whereabouts, the system will inform the user that the search produce no result.

Searching for meeting records will need the user to enter the relevant date that the meeting was held or searching by meeting ID. If there is any meeting held on that particular day or the meeting ID is correct, the result of the meeting will be listed out include the date and time of the meeting was held and also the agenda of the meeting. The user just needs to choose the relevant agenda to view the detail of the meeting record. The system will provide a more detail information regarding the meeting to the

user. However, if there is no meeting held on that day, a message will prompt out to inform the user.
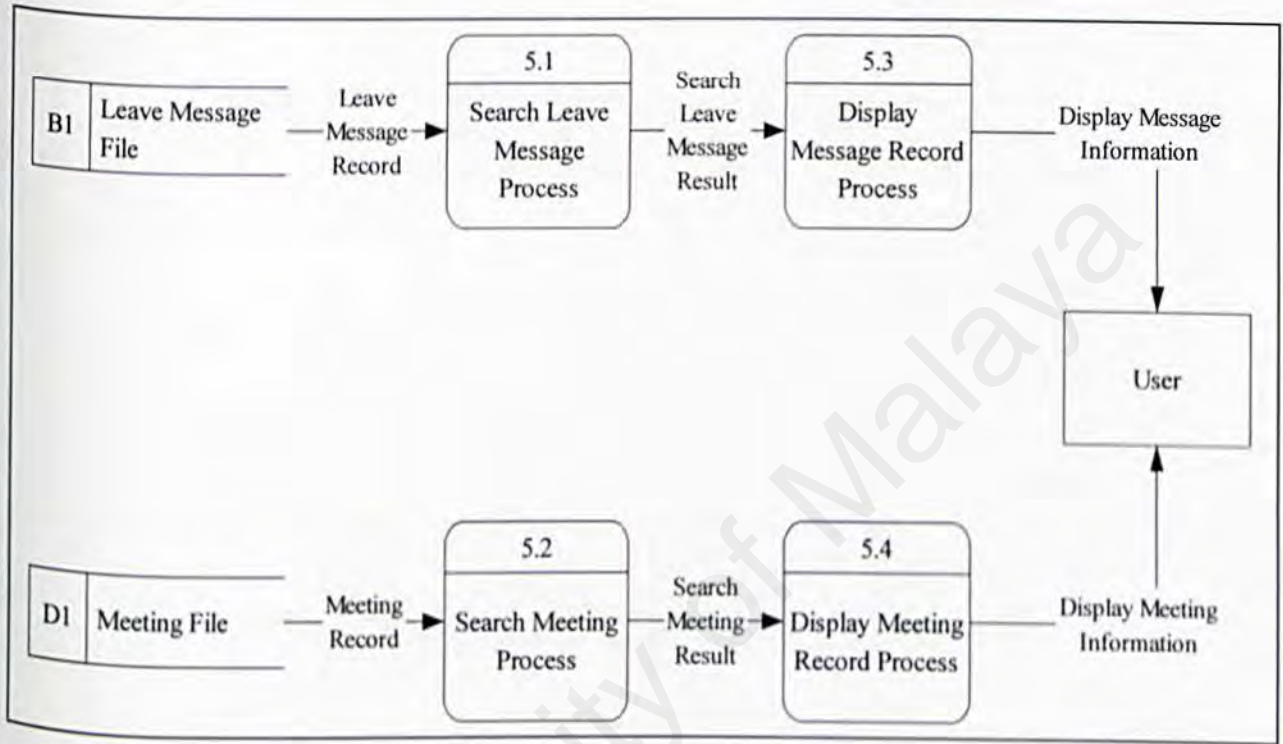
Figure 28: DFD Level 2 Search Function Process

4.1.6 *Help Information Module*

This Help Information module contains information on guiding the user how to use the MIS system. User just needs to select the relevant topic to view the detail information. This module contain guidance information such as guiding user how to log into the system, how to change their password and other useful information. All the help information is well kept into a database.
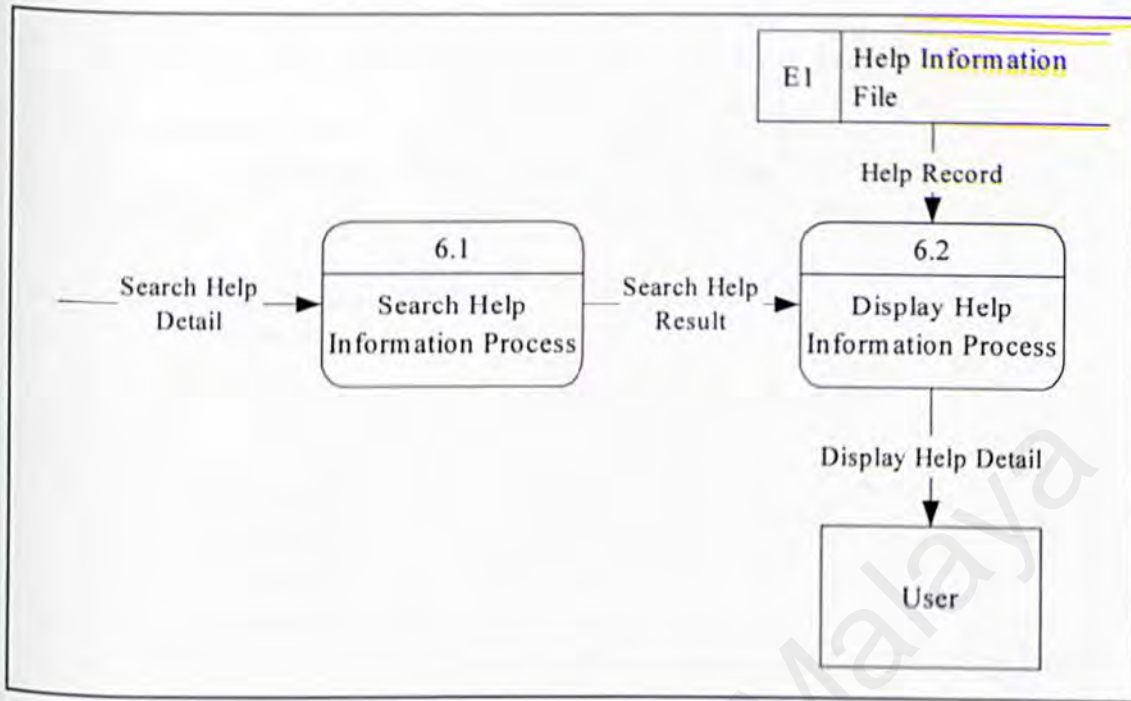
Figure 29: DFD Level 2 Help Information Process

4.1.7 *Administration Module*

The Administration module will restrict the administrator with the correct password to access to it. In this module, the administrator can either choose to change the administrator password or to add or delete user. The administrator is in charges of assigning the user name and password to the new user. However, the user is allows to change their password later on. The administrator would also be assign to maintain the system database.
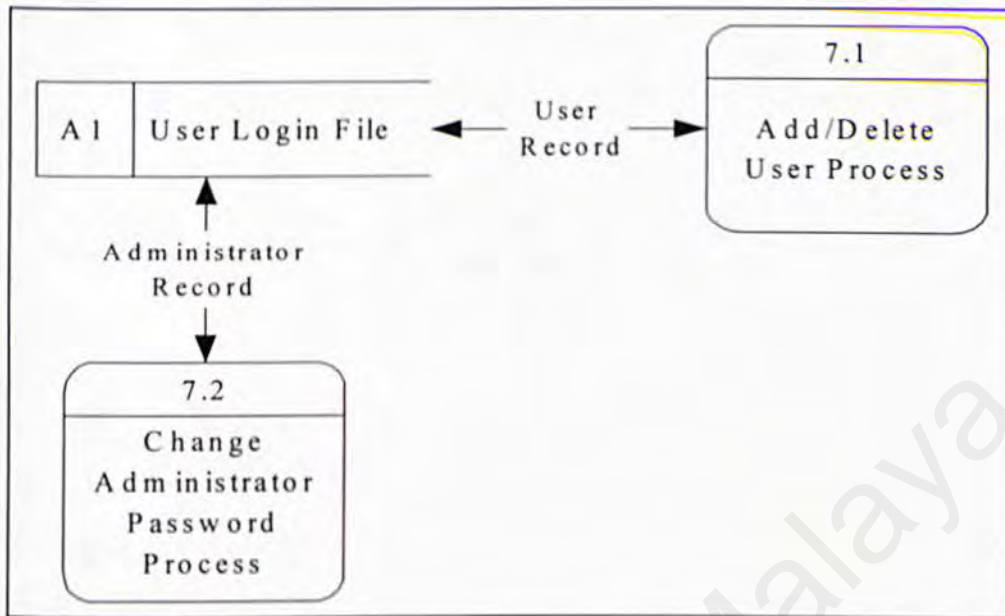
Figure 30: DFD Level 2 Administration Process

4.2 System Structure

The system structure can be divided into a few modules. *Figure 31* shows the flow of the MIS system structure.
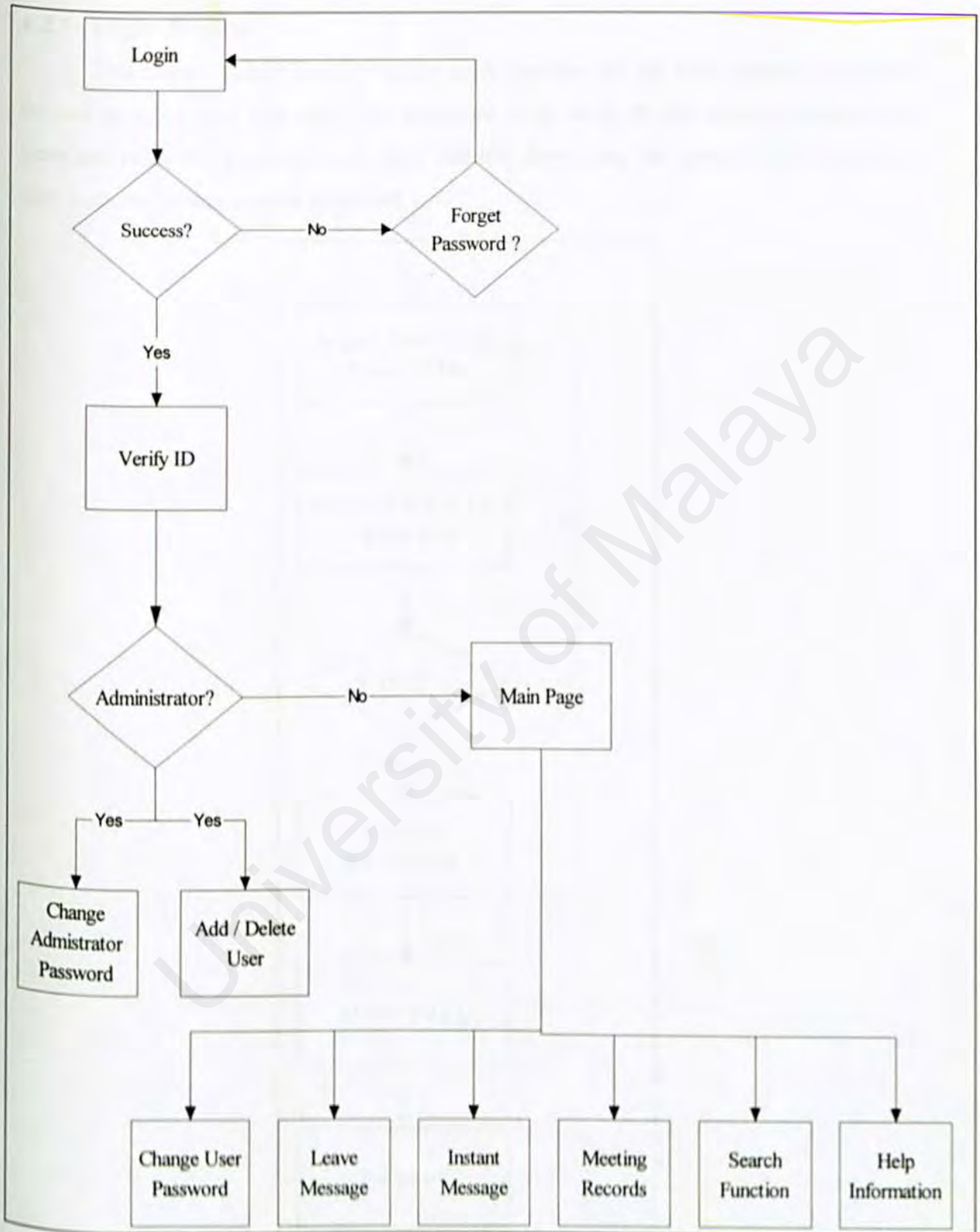
Figure 31: MIS System Structure Flow

4.2.1 Login Module

This Login module function as the main interface for the MIS system. It enables the user to input their user name and password to be verify by the system. If their user name and password does not match, they will not allow using the system. In this module, user is allows to change their password too.
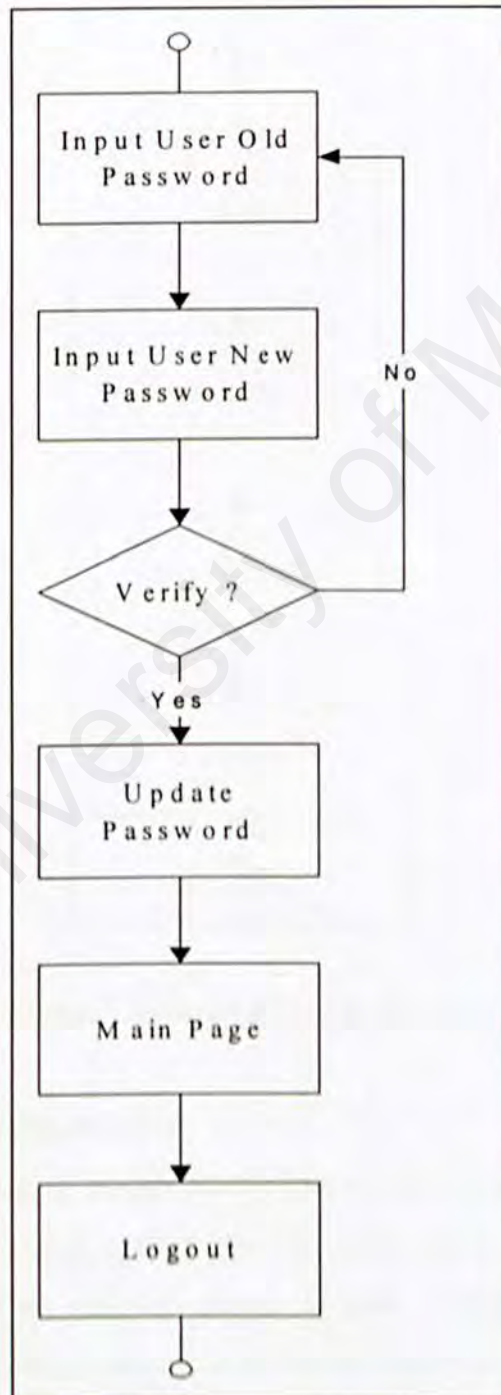
Figure 32: User Changing Password Flowchart

4.2.2 *Leave Message Module*

The Leave Message module allows the user to leave down their message whenever they want to leave their workstation or the organization. This is to inform other user on their whereabouts and the contact detail that they can be reach. *Figure 33* shows the flowchart for the leave message process.

Figure 33: Leave Message Flowchart

4.2.3 *Instant Messaging Module*

The Instant Messaging module enable user to send or receive message. User can write their message and send it to other user. The system will send an alert to the user if there is new message. They can also check for new or read previous messages. The flowchart of the instant message process is shown in *Figure 34.*
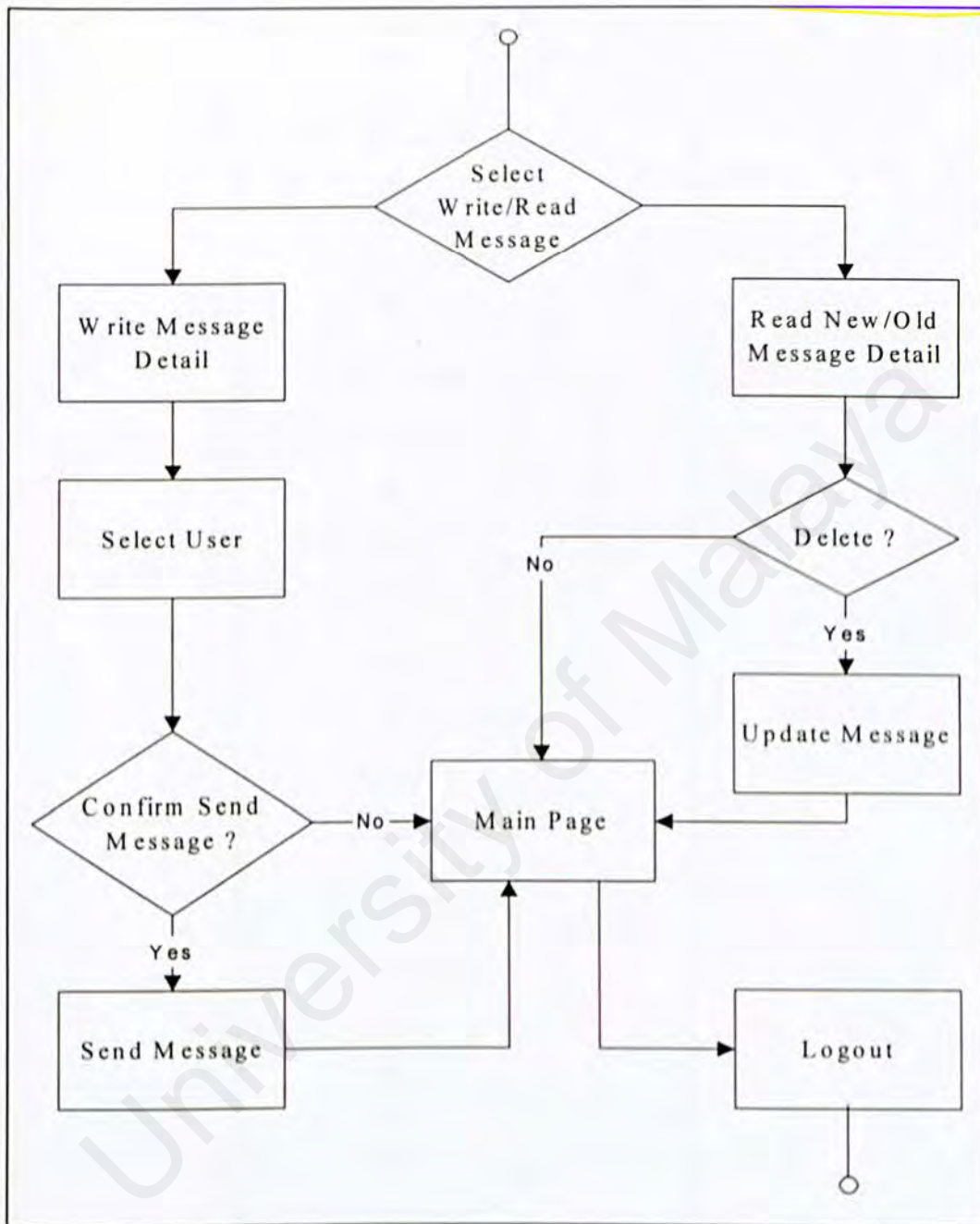
Figure 34: Instant Messaging Process Flowchart

4.2.4 Meeting Record Module

The Meeting Record module allows certain user to access to it. Only the secretary can insert the meeting detail into the system to keep it as a future reference. The flowchart is shown below in *Figure 35*.
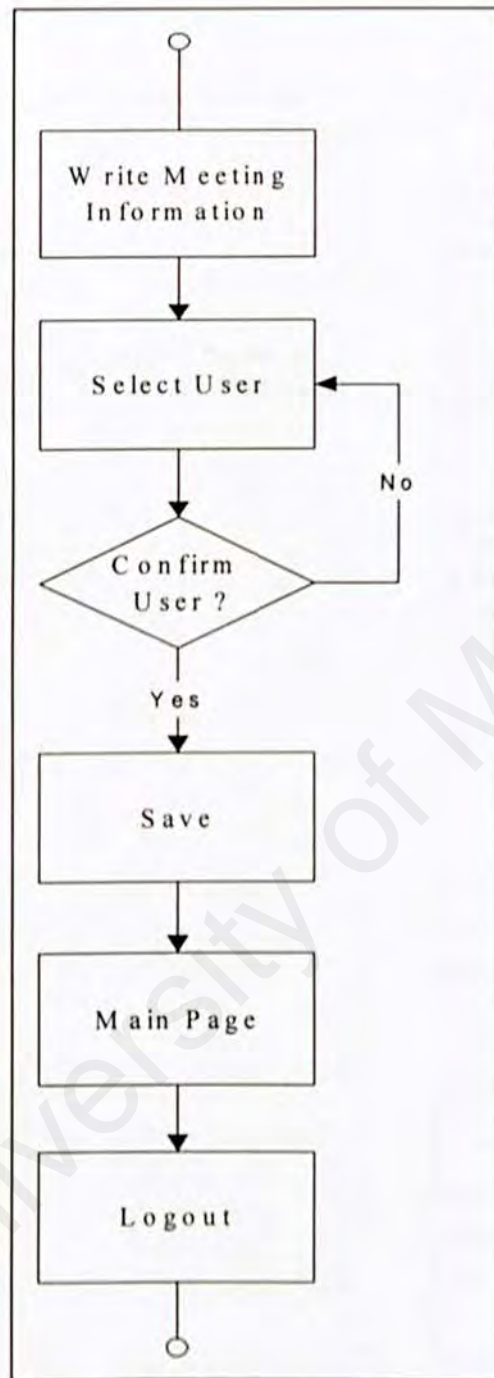
Figure 35: Store Meeting Record Process Flowchart

4.2.5 Search Function Module

The Search Function module can be divided into two parts. The Search Function module can search for user whereabouts and also search for meeting records. The flowchart is shown below for the two processes.

73
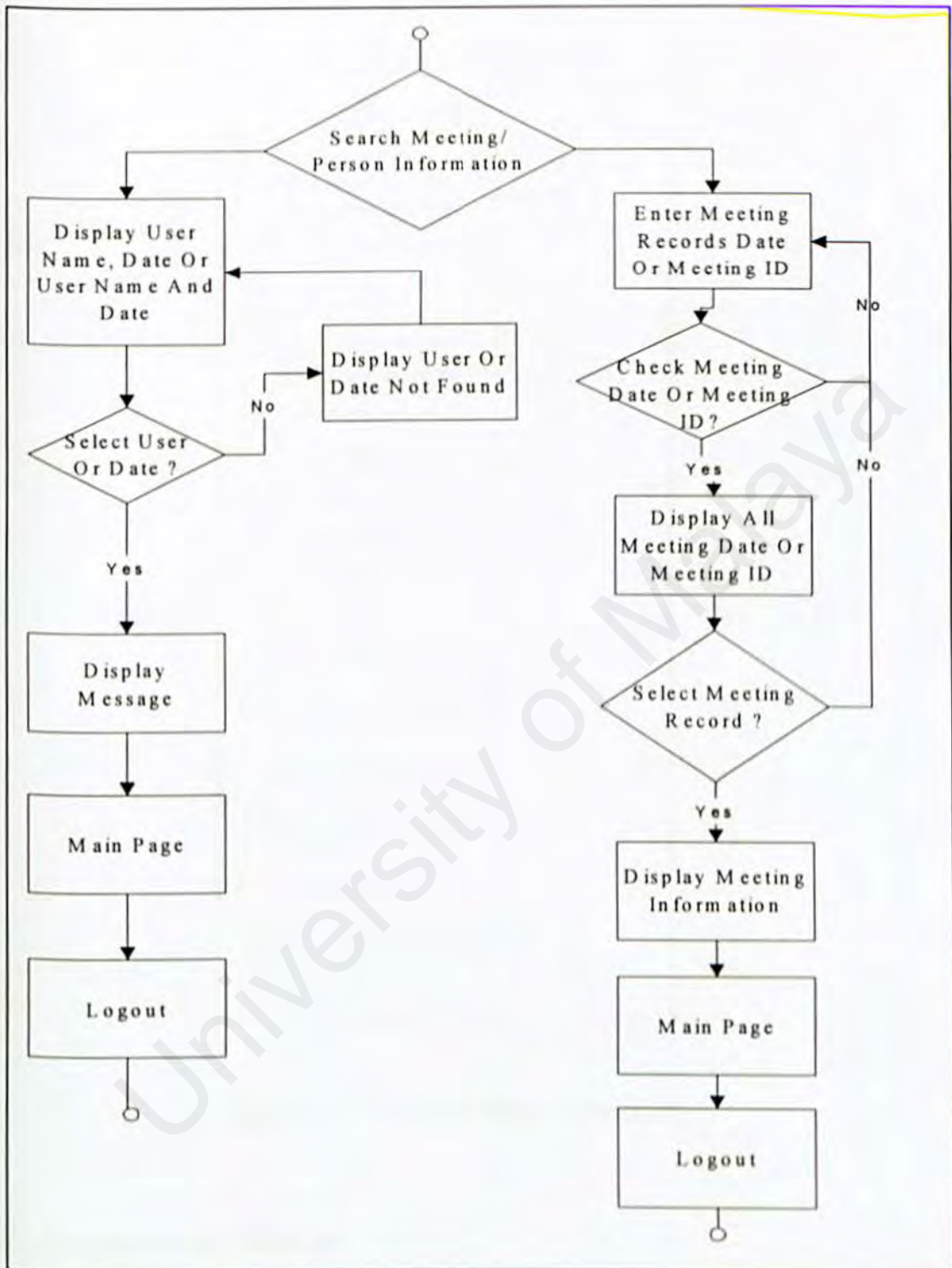
Figure 36: The Search Function Flowchart

4.2.6 Help Information Module

The help information contain information on guiding the user how to use the MIS system correctly. The help information can be retrieve from database.
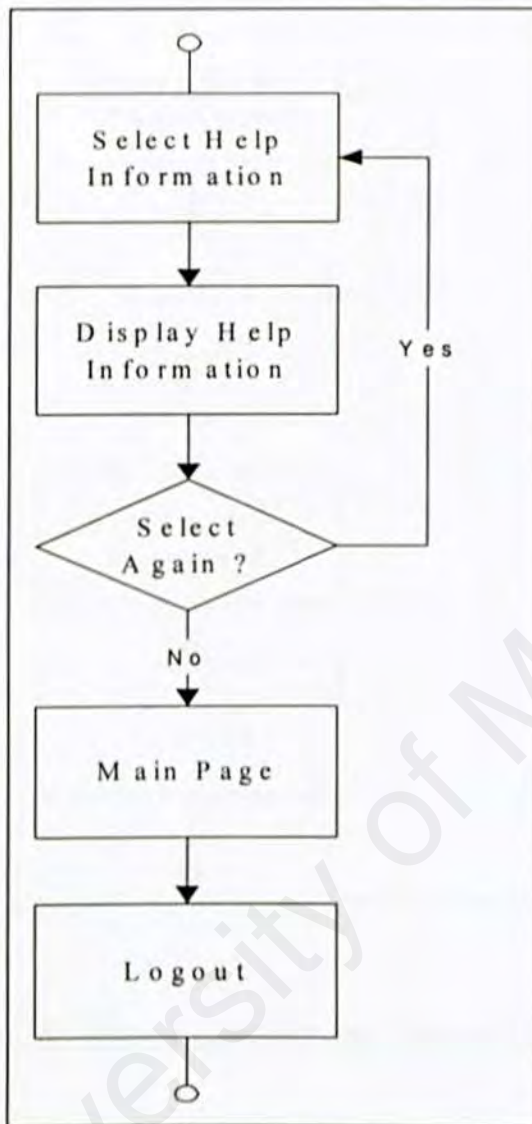
Figure 37: Help Information Flowchart

4.2.7 *Administration Module*

The Administration module allows the administrator to change the administrator password. Besides, the administrator had the authority to add and delete user. Below are the two flowcharts showing the process.
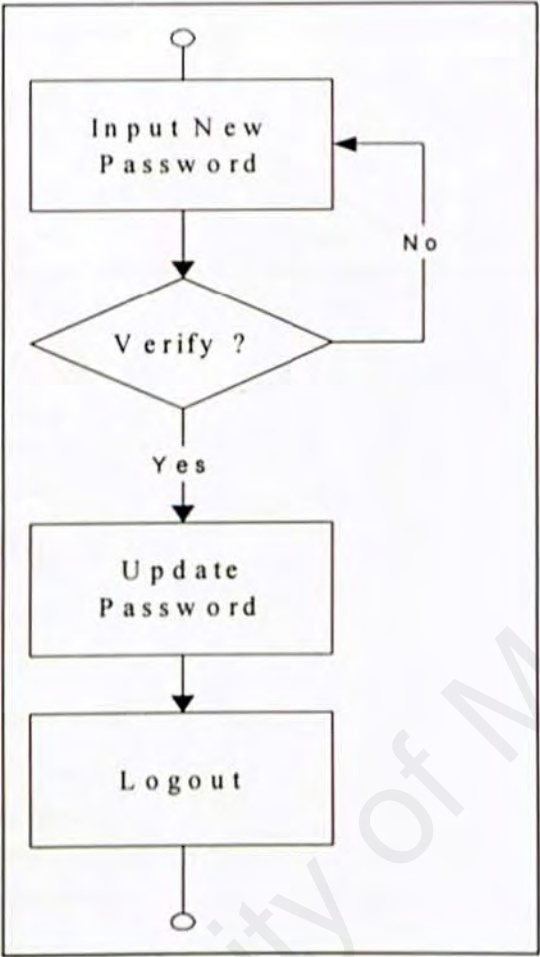
Figure 38: Change Administrator Password Flowchart
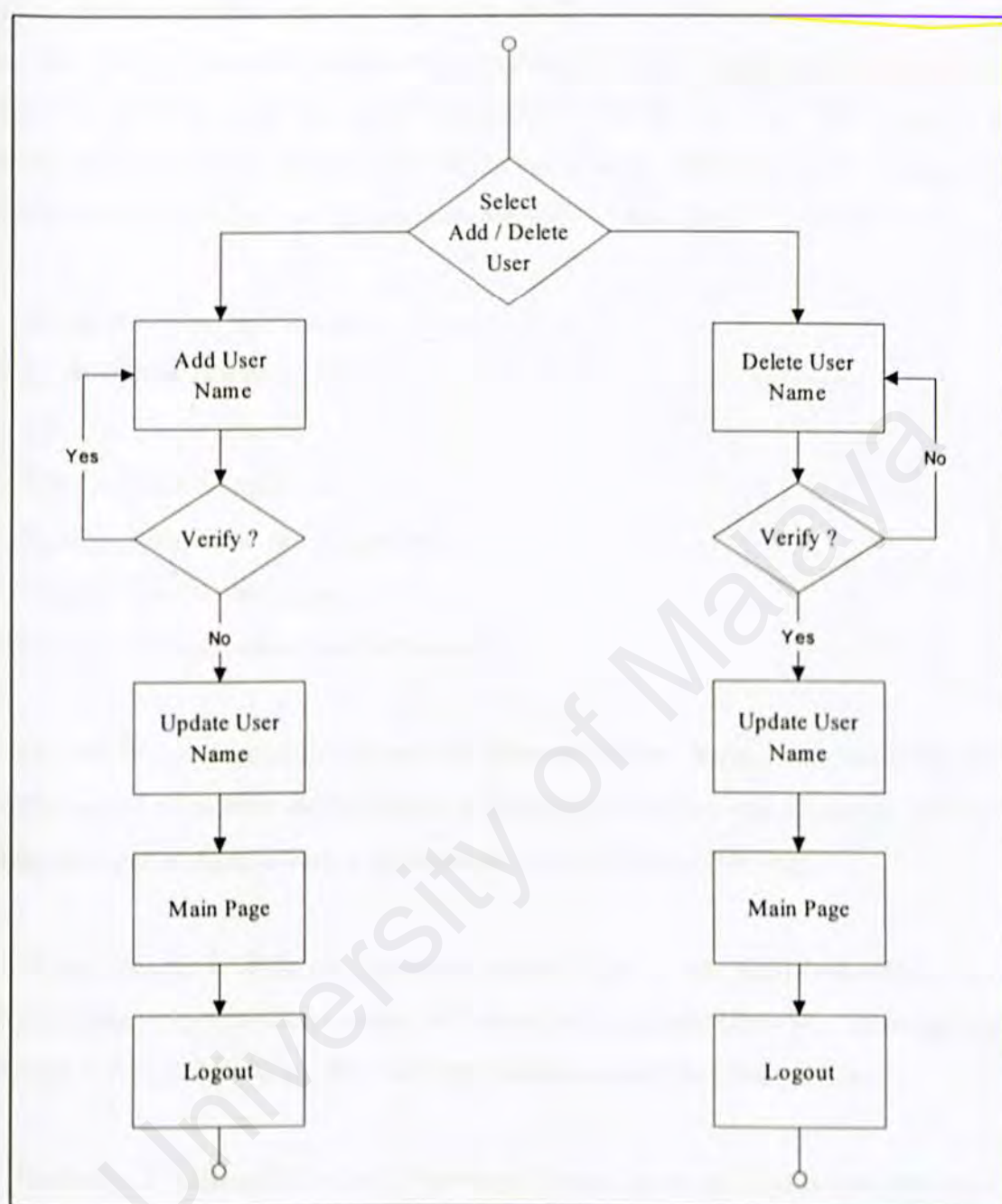
Figure 39: Administrator Add/Delete User Flowchart

4.3   Database Design

A database is an integrated collective of data. Database design is concerning about the structure of the database underlying the application. The primary objective of architecture design is to develop a modular program structure and represent the control relationships between modules.

A database system involves the data itself, the hardware on which the data resides, the software (*database management system or DBMS*) that controls the storage and retrieval of data, and the users themselves [DEI99]. For the MIS system, a centralized database will be used to store all the information. There are several important advantages that accrue from having centralized control of data [DAT75]. They are:

- Redundancy can be reduced
- Inconsistency can be avoided
- The data can be shared
- Standards can be enforced
- Security restrictions can be applied
- Integrity can be maintained
- Conflicting requirement can be balanced

One of the most important aspects of database system is *data independence*. An application is said to be *data independence* if the storage structure and accessing strategy cannot be changed without affecting the application significantly [DEI99].

There are three different database models that exist nowadays. They are hierarchical database, network database and relational database. However, in designing the database for the MIS system, the relational database model had been choose.

Basically, a relational database consists of tables, made up of columns and rows of data. A table is a logical grouping of related information. Each piece of information is confined to a single column in the table. A row in a table represents an individual entity with the type of the table.

For the MIS system, the database design consists of seven tables. They are the *User* table, the *Goup* table, the *GroupUser* table, the *UserMessage* table, the *UserMsgHistory* table, the *MeetingRecord* table and the *MeetingAttendAbsent* table. Below are the seven tables and their description.

User

This table store users information. It consists of the user ID, user name, password and also user house phone number and mobile number.

Field Name	Data Type	Description
UserID	Nvarchar(15)	User unique ID – login purpose
UserName	Nvarchar(50)	User full name
Password	Nvarchar(15)	To authenticate user
LogInTime	DateTime(8)	User login time
UserHouseNum	Nvarchar(12)	User house number
UserMobile	Nvarchar(12)	User mobile number

Group

This table store information about the user group status. Each user will have their owns unique group ID and department. This will help to differentiate user and control their access level.

Field Name	Data Type	Description
GroupID	Int(4)	Group unique ID
GrouprName	Nvarchar(15)	1 – Information Technology 2 – Human Resource 3 – Finance And Accounting 4 – Marketing And Sales 5 – Production And Manufacturing

GroupUser

This table stores the user ID, group ID and user control.

Field Name	Data Type	Description
GroupID	Int(4)	User group unique ID
UserID	Nvarchar(15)	User unique ID

| UserControl | Nvarchar(20) | User level of control |

UserMessage

This table is to store information about the message that the users send and leave. It includes information such as the person who wrote the message, the date and time the message was send and short description about the message. The information in this table will be for temporary purposes. As the user is able to delete their message after they had read it.

Field Name	Data Type	Description
MessageID	Int(4)	Each message with unique ID
UserID	Nvarchar(15)	Person who send the message
SendTo	Nvarchar(15)	Person ID who receive the message
DateSent	DateTime(8)	The date the user send or leave the message
TimeSent	DateTime(8)	The time the user send or leave the message
Subject	Nvarchar(300)	The message subject
Description	Nvarchar(2000)	Brief description about the message
MessageType	Char(10)	The type of the message I – Individual G – Group L – Leave Message
MessageStatus	Int(4)	The status of the message 0 – Default 1 – Read 2 – Unread
MessageImportance	Nvarchar(10)	The importance of the message – Low – Medium

		– High

UserMsgHistory

The information that contain in this table is the same with the *UserMessage* table. The information in this table will be remains forever. This is because user will be able to view their previous message. So, this table will keep all previous message even the user had deleted the message away.

Field Name	Data Type	Description
MessageID	Int(4)	Each message with unique ID
UserID	Nvarchar(15)	Person who send the message
SendTo	Nvarchar(15)	Person ID who receive the message
DateSent	DateTime(8)	The date the user send the message
TimeSent	DateTime(8)	The time the user send the message
Subject	Nvarchar(300)	The message subject
Description	Nvarchar(2000)	Brief description about the message
MessageType	Char(10)	The type of the message I – Individual G – Group L – Leave Message
MessageStatus	Int(4)	The status of the message 0 – Default 1 – Read 2 – Unread
MessageImportance	Nvarchar(10)	The importance of the message – Low – Medium – High

MeetingRecord

This table store information for all the meeting record. Information about the meeting such as the meeting agenda, the date and time the meeting was held, the venue of the meeting and other relevant information.

Field Name	Data Type	Description
MeetingID	Nvarchar(30)	Each meeting record with unique ID
UserID	Nvarchar(15)	User that enter the meeting record
MeetingNo	Int(4)	The number of the meeting was held
Date	DateTime	The date the meeting was held
Venue	Nvarchar(100)	The venue of the meeting
TimeStart	DateTime(8)	The time the meeting start
TimeEnd	DateTime(8)	The time the meeting end
Agenda	Nvarchar(300)	The agenda of the meeting
MinutesMeeting	Nvarchar(2000)	Brief description of the meeting
NextMeeting	DateTime(8)	The date of the next meeting

MeetingAttendAbsent

This table store information about the meeting attendees and absentees. Only the meeting attendees and absentees are allows viewing the meeting records. This purpose is for controlling the user access.

Field Name	Data Type	Description
MeetingID	Nvarchar(30)	Each meeting record with unique ID
MeetingAttendee	Nvarchar(15)	User that attend the meeting and able to view the meeting record
MeetingAbsentee	Nvarchar(15)	User that absent from the meeting but able to view the meeting record

4.4   System Interface Design

Interface has played a major role in the current system that is under development in the market. This is due to the undesirable needs for graphical interface from user as it is seen as a highly motivated tool to give comfort and grasp the power of computer in the multimedia world. However, there are three user interface constraints when considering the user interface design:

- Design as simple as possible
- Highly user friendliness
- Involve short learning curve

Based on the three constraints mention above, the user interface design of the MIS system is shown as below.

4.4.1 Layout Of Main Menu


```
Messaging Information System - [Main Menu]                    _ □ ✕
Option  Maintenance  Messaging  Meeting  Search  Help  Exit
                     Leave Message
                     Send Message
User(s) Logge___     Received Message
- Administrator
```

1.0 Menu Drop Down
2.0 Icon Button
3.0 Date, Time & User
     Identification

27 Dec 2001   8:26 PM   Administrator
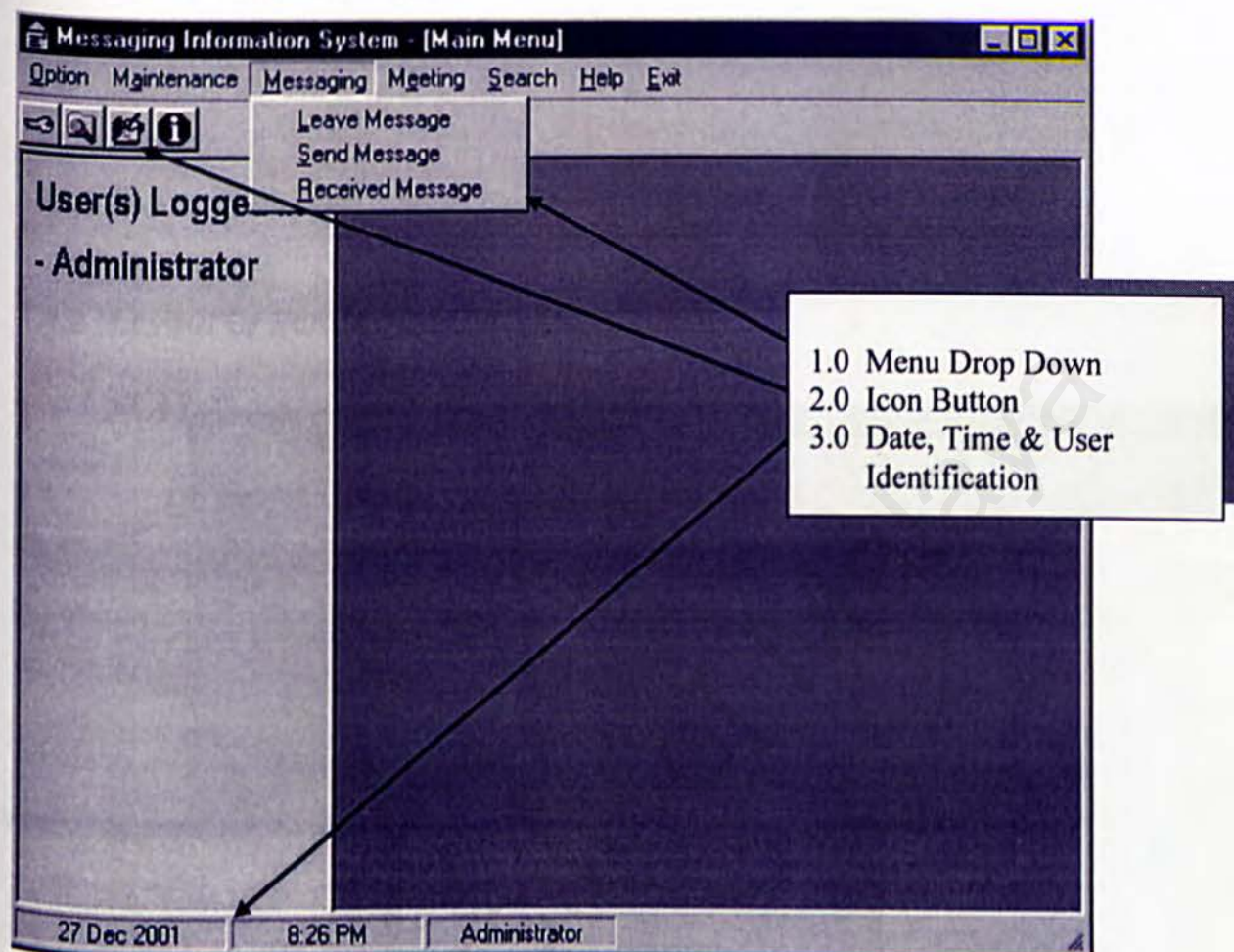
1.0

- Menu drop down is a very common thing upon the graphical user interface. Its functionality is to allow the grouping of all common categorization together as to have a more systematic approach

- This is done as to provide a better flow of usage within the system to the user.

2.0

- This button contains 4 general categories, which are Logout, Search, Send Message and Help.

- It is design as to provide a better interactive. When the mouse move over the button, description will appear as to inform its functionality of the button as to drag the user attention as when he or she is currently at.

3.0

- Users need to identify certain basic things such as Date, Time and who is currently log-on.

- This provides better control and security to the user as it gives assurance.

4.4.2 Layout Of Forms And Buttons

1.0

- Buttons are put outside the frame as to differentiate the Command Button of activation. This will attract the users attention as that the Buttons are all being group and categorized with proper names for its functionality.

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2.0

- The system will actually change the colour of the button from black to gray and from click able to none, if the functionality does not permits the user from doing so. This will help to prevent unnecessary errors and access.

3.0

- Information is categories by using a box that looks like a frame. This is to give the user better view on what that has been abstract is base on such details. For example, if the form is to abstract New User Details, then text box that are contains within that particular frame will only represent the New User Details.

4.0

- This is to provide a better understanding and to get more accurate information from the user. With selection technique, the user just has to click the button and choose the correct date and time from the display and get the desired data.

4.4.3 Layout Of Information

Add User

This module allow you to create a new user in order for him/her to have access to the system.

To Add a New User from the Main Menu

1. Select the **Maintenance** option from the Main Menu. A drop down me displayed.
2. Select the **New User** option.

To create a New User in the System

1. Provide a unique user Id for the user
2. Enter the full name of the user
3. Enter a default password for the user.
4. Re-enter the password that have been created.
5. Enter the contact number of the user.
6. Select the group which the user belong to.
7. Click the **Add New** Button or press Enter

Important
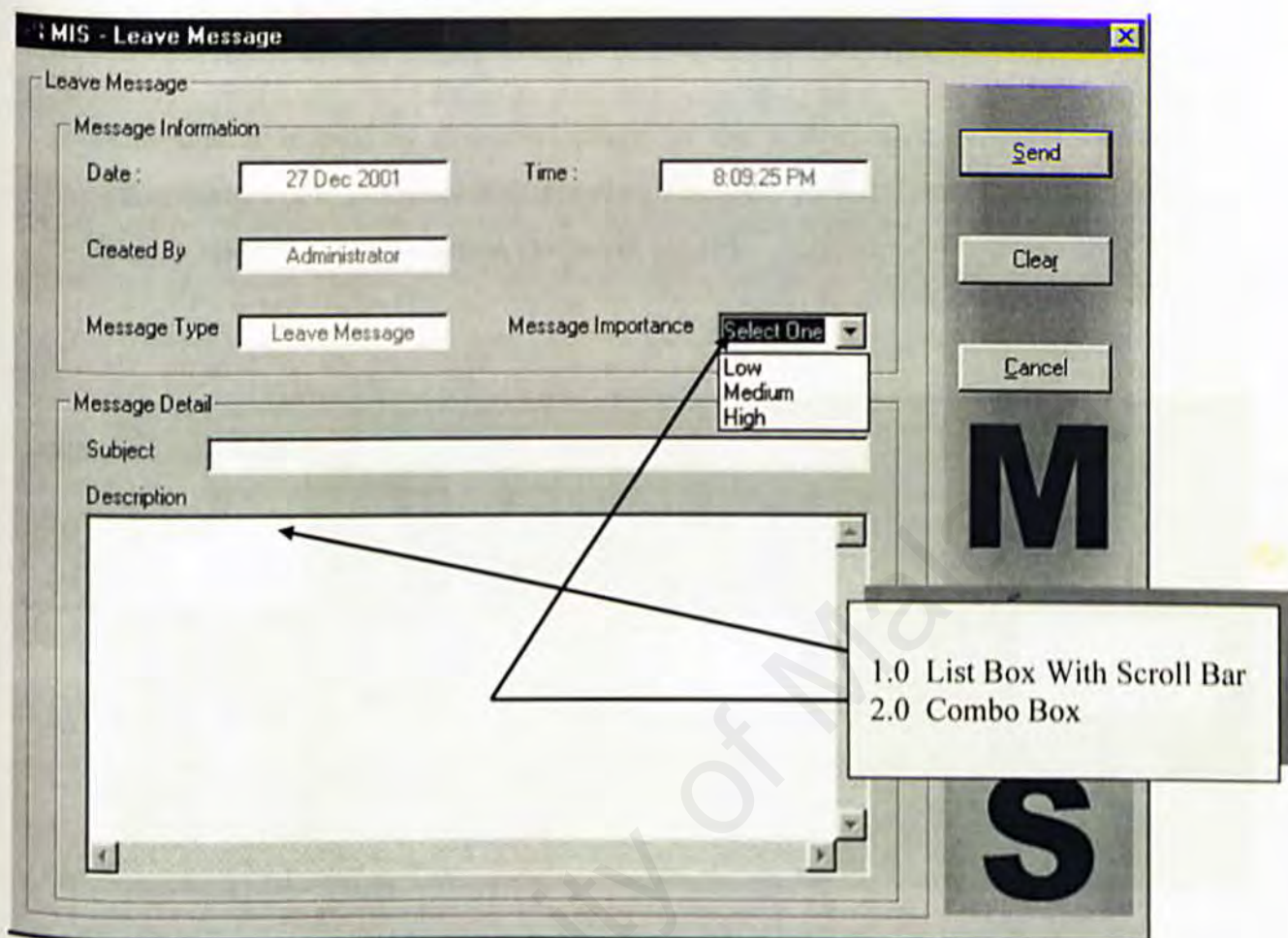
Make sure that the user Id is unique.

1.0 Information Layout

1.0

- The information layout is important for the user to be able to read the information correctly and accurately.

- Alignment and text position will have to arrange nicely to allow optimum understanding and a good interface design. This is to avoid the information from being too stagnant and dull.

4.4.4 Type Of Control Being Used

1.0

- List box with scroll bar is used in this system to allow the user to move the position of the reading information between left and right or up and down. Besides that, information entered can also be read by using the scroll bar is the sentence is too long.

2.0

- Combo box contain information that will be display in a list drop down format. It can contains the whole list of the request information in a read-only option or user

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can type into it and the object will search the information of the first key letter of more similar to the combo box list as the user type on it.

- This option is used in the development of the system as it provides better consistency in the information display in a read-only format. User cannot alter of simply retrieve any information that never existed.
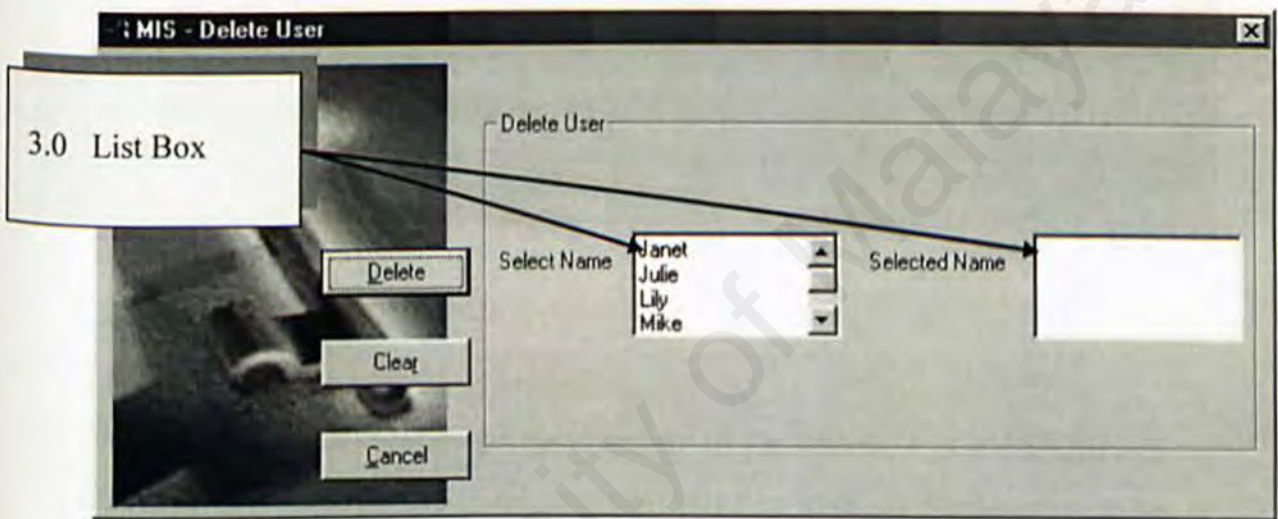
3.0

- List box is used in the system when there is necessary on hand display of all the information at once glances. This is done as user can only select the necessary information.

- This is basically used mostly in the library display information such as date, country and state as well as category.
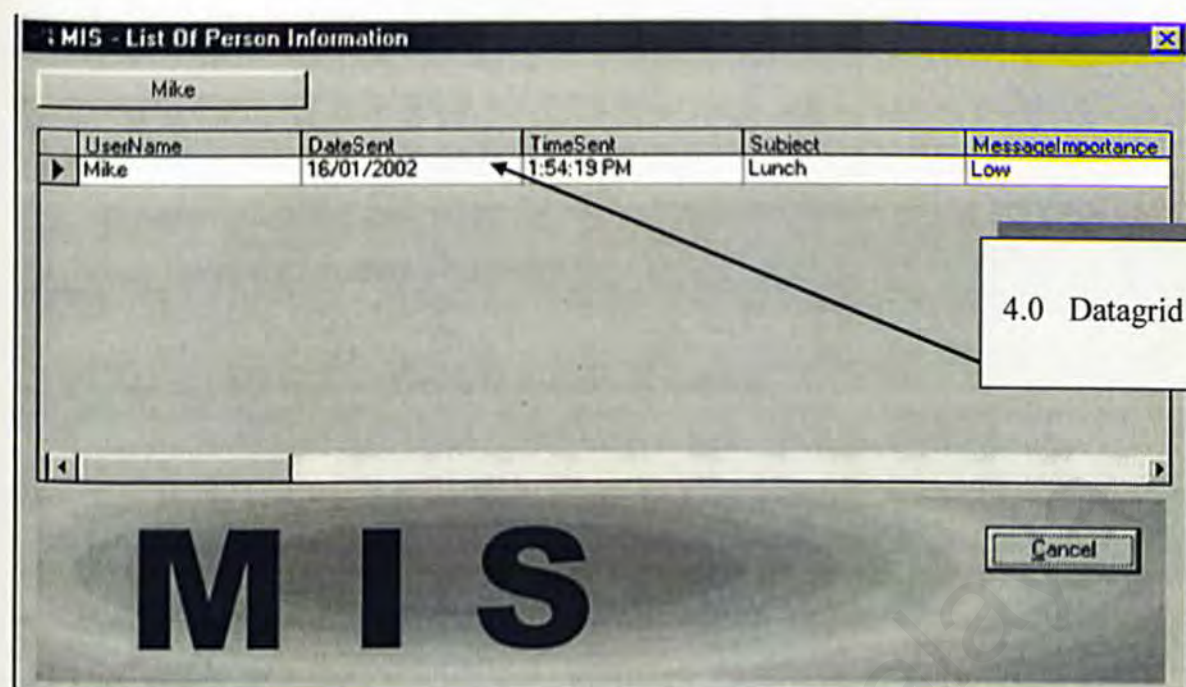
4.0

- Datagrid play major roles in the development of the system. It is the fastest and easiest and productive ways of retrieving information from the database and to be display to the users.

- User tends to feel more secure when information can be grasp within one interface and datagrid permits such flexibility at ease.

4.5 Expected Outcome

The MIS system is a stand-alone system for the use of a small to medium size organization. It works in a Local Area Network (LAN) using centralized database. The main features or functions expected from this project are as below.

- Enable staffs to send and receive messages within organization
  - the MIS system should be able to let the users to send and receive messages among themselves. Any arrival of new messages will be inform by the system to the users by pop up an icon informing them.

- Easier to search for other staffs whereabouts
  - the system should enable staffs that leave their workstation to leave down messages informing their whereabouts. Users contact details will be provided when searching for users whereabouts.

- Enable staffs to store and retrieve minutes of meeting
  - the system should only allow certain users to store the minutes of meeting. Besides, the minutes of meeting can only be view by certain users.

- Enable the administrator and users of the MIS system to change their password
  - the system will allow administrator to change the administrator password. Besides, it also should enable users to change the user password.

- Enable the administrator to add or delete users
  - the MIS system enables the administrator to add or delete users manually. This is to enable a new user to use the system while prevent any unauthorized users from using the system.

- Provide information guiding users on how to use the MIS system
  - the system provides a help file containing information regarding the MIS system. It helps to guide any users that are unfamiliar with the system.

4.6 Chapter Conclusion

This chapter marks the end of the analysis and initial designing of the system. It contains the designing of the database and also the user interfaces. From here onwards, pieces of the system will be put together in the development process.

Chapter 5: System Implementation

5.1 Introduction

System implementation is a process of transforming the design specification and data models into an executable software. It involves coding step that translates a details design representation of software into a program language realization. Proper implementation is essential to provide a reliable system to meet organization requirements.

5.2 Development Environment

Development environment has certain impact on the development of a system. Using the suitable hardware and software not only help to speed up the system development but also determine the success of the project. The hardware and software tools used to develop the entire MIS system are as below:

5.2.1 Hardware Requirements

As mention in Chapter 3, the hardware used to develop the system are listed below:

- 200 MHz Intel Pentium III Processor or higher
- 64 MB RAM Memory
- 15" Monitor
- Keyboard and mouse as input devices
- 1.44 MB floppy disk drive

5.2.2 Software Tools / Components Requirements

The software used in developing the MIS system basically consisted of tools and components. The tools include all the application used to design and develop the MIS system whereas components consist of all the technology used to support the functionality of the system. *Table 4* and *Table 5* below listed all the tools and components used in developing the MIS system.

Software Tools	Purpose	Description
Window 98	System Requirement	Operating System (OS)
Microsoft Visio 2000	Data Modeling and Process Design	Design of DFD and Flowchart
Microsoft Server SQL 7.0	Database	Build the database to store and manipulate data
Microsoft Visual Basic 6.0	System Development	Coding the system
Macromedia Fireworks 4	Interface Design	Design better interface for the system
Microsoft Project 2000	System Planning	Design project schedule for development of the system

Table 4 : Summary of Software Tools Used

Components / Control	Purpose	Description
Calendar Control	Support Calendar Function	Calendar Display
HelpBreeze HTML Help Edition	Developing On Line Help File	Display On Line Help For MIS System
Microsoft ADO Data Control 6.0	Create Connections Between Data-Bound	To Retrieved and Manipulate Data From

	Controls and Data Providers	Database
Microsoft DataGrid Control 6.0	Display Data	Displaying Lists Of Messages / Meeting Records
Microsoft DataList Controls 6.0	Input Data Into Database	Displaying List Of UserName To Be Selected Into Database

Table 5 :   Summary of Components / Software Used To Support The
Functionality of The MIS System

5.3   Development of MIS System

In this section, the development of the MIS system will be explained in further details. It focused on the analysis of usage of the software tools and components being used.

5.3.1 Development Tool – Microsoft Visual Basic 6.0

Visual Basic is one of the most popular programming tools in Windows environment due to its RAD (Rapid Application Development) capability associated with it. Visual Basic has been chosen to develop the MIS system due to the following reason:

- Visual Basic is a visual programming language that enables the developer to rapidly create a window-based application. It provides a complete set of built in window objects like buttons, text box, list box, combo box, menu frame and etc.

- The syntax of Visual Basic is similar to the fundamental programming languages such as BASIC and ASP. Besides, I had been exposed in using

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ASP Programming Language during industrial training. Therefore, it is easy to learn and understand.

- Visual Basic introduces component technology (more details below), which means component software could be 'glued' together to form a sophisticated program.

- Visual Basic allows user to create, run, test and debug Windows program in one application easily. All modules of a project such as forms, general modules and classes are well organized.

5.3.2 Microsoft ADO Data Control 6.0

The ADO Data control uses Microsoft ActiveX Data Objects (ADO) to quickly create connections between data-bound controls and data providers. Data-bound controls are any controls that feature a DataSource property. Data providers can be any source written to the OLE DB specification. It is easy to create data provider using Visual Basic's class module.

The ADO Data control has the advantage of being a graphic control (with Back and Forward buttons) and it also allow to create database applications with a minimum of code. Additionally, Visual Basic includes several data-bound ActiveX controls such as the DataGrid, DataCombo, Chart, and DataList controls.

In the development of the MIS system, the ADO Data Control is used for open a specified database table or define a set of records based on a Structured Query Language (SQL) query or stored procedure or view of the tables in that database.

5.3.3 Microsoft DataGrid Control 6.0

The DataGrid control is a spreadsheet-like bound control that displays a series of rows and columns representing records and fields from a Recordset

object. DataGrid can be used to create an application that allows the end user to read and write to most databases. The DataGrid control can be quickly configured at design time with little or no code. When the DataGrid control's DataSource property is set at design time, the control is automatically filled and its column headers are automatically set from the data source's recordset. Then the grid's columns can be edit, delete, rearrange, add column headers to, or adjust any column's width.

At run time, the DataSource can be programmatically switched to view a different table, or it just modify the query of the current database to return a different set of records. In the development of the MIS system, the DataGrid Control is used for viewing data from database.

5.3.4 Microsoft Calendar Control 8.0

The Calendar control makes it easy for users to view and set date information via a calendar-like interface. Users can select a single date using a mouse. Buttons at the top of the control are used to scroll months and years in and out of view.

In addition, the control has the ability to display up to 12 months at a time. This can be helpful when it want to give users the ability to view date information around the date of interest.

In developing the MIS system, the Calendar Control is used to give users the ability to choose a date with the click of a mouse rather than typing a date value.

5.3.5 Microsoft DataList Controls 6.0

The DataList control is a data-bound list box that is automatically populated from a field in an attached data source, and optionally updates a field in

a related table of another data source. The DataList control is code-compatible with the DBList control. However the DataList control is optimized to work with ActiveX Data Objects (ADO).

The DataList controls strongly resemble the standard list box controls, but there is some important differences that give it a great flexibility and usefulness in database applications. The DataList controls can be automatically filled from a database field from the data control to which it is bound. In addition, they can optionally pass a selected field to a second data control.

For the development of the MIS system, the DataList control is used for supplying values from one table to input values into a second table. For example, in the MIS system, the names of users are stored in one table and it is being show in the list box to be selected and stored the values into another table.

5.3.6 HelpBreeze HTML Help Edition

HelpBreeze HTML Help Edition is a complete, WYSIWYG authoring environment for developing Microsoft HTML Help systems. HelpBreeze has been one of the leading commercial authoring tools for Microsoft Windows Help since its introduction in 1993. Currently, thousands of developers and technical writers use HelpBreeze to create online help systems for Window applications or as stand-alone information resources. HelpBreeze HTML Help Edition is a stand-alone authoring tool, which is dedicated specifically to HTML Help.

HTML Help is the next generation help system from Microsoft and is now the standard online help system in Windows 98, Windows 2000 and later. HTML Help is also used in Office 2000. HTML Help incorporates many of the features of its predecessor, Windows Help (or WinHelp), and also adds a number of new capabilities. HTML Help uses HTML as the format for help topics and adds a number of features which are vital to online help systems, including as a table of contents, keyword index and full-text search.

5.4 Component Technology

In visual programming world, component is defined as common use object or program with 2 characteristics. There are:

- Changeable properties or attributes.
- Can be 'glued' with order components to form an sophisticated application

5.4.1 Advantages Of Component Technology

The benefits of component-oriented approach include:

- **Shorter Implementation Phase**

  The usage of components eliminates the lines of code significantly. This in turn shortens the development cycle.

- **Code Reusability**

  The customizable characteristic of components enables it to be used in various applications.

- **Code Encapsulation**

  The component container hides the detail of internal data structure and code from the programmers. The programmers only have to deal with the interface parameters of the components.

5.5 Criteria Of MIS System

The programming tool that used to implement MIS system is Microsoft Visual Basic 6.0. In order to use it, a good understanding of the way Visual Basic works, and some new terminology and programming concepts associated with it is necessary. In addition, there are a few criteria that have to be considered in developing the MIS system which are shown below:

5.5.1 *Simplicity*

A good program should keep its statement as simple as possible. The guidelines below are followed to maintain simplicity of the MIS program.

- Avoid the use of complicated tests
- Eliminate tests on negative conditions
- Use spacing and readability symbols to clarify statement content
- Avoid heavy nesting of loops or conditions. For example:

```
For I = 0 To ListGroupSel.ListCount – 1

    a = ListGroupSel.List(I)

    Set rstGroup1 = New ADODB.Recordset
    rstGroup1.Open "select * from [Group] where GroupName = '" & a & "'", _
        cnn1, adOpenKeyset, adLockOptimistic

    b = rstGroup1!GroupID

    rstGroup1.Close
    Set rstGroup1 = Nothing

    rstGroupUser.AddNew
    rstGroupUser!GroupID = b
    rstGroupUser!UserID = varUserID

    If OptAdmin.Value = True Then
            rstGroupUser!UserControl = "Administrator"
    ElseIf OptSec.Value = True Then
            rstGroupUser!UserControl = "Secretary"
    ElseIf OptAdmin.Value = False Or OptSec.Value = False Then
            rstGroupUser!UserControl = ""
    End If

    rstGroupUser.Update

Next I
```

- Use parentheses to clarify logical or arithmetic expressions. For example:

```
Dim rstUserMsg As ADODB.Recordset
Dim rstUser As ADODB.Recordset
Dim k As Integer

If (CboPersonName.Text <> "Select One") And (TxtStartDate.Text <> "") _
    And (TxtEndDate.Text <> "") Then

' Open User table

Set rstUser = New ADODB.Recordset
rstUser.Open "select * from [User] where UserName = '" &
        CboPersonName.Text & "'", _
cnn1, adOpenKeyset, adLockOptimistic
```

5.5.2 Code Efficiency

In developing the MIS system, code efficiency is very critical. Therefore useful guidelines are being practiced as below:

- When possible, avoid the use of multi-dimensional arrays
- Use integer arithmetic and Boolean expressions, whenever possible. For example:

```
'Source: http://www.vbcode.com

For Each ctrl In Me.Control
        If TypeOf ctrl Is TextBox Then
ctrl.Text = ""
End If
Next

ListGroupSel.Clear
OptAdmin.Value = False
OptSec.Value = False
```

- Carefully evaluate nested loop to determine if statements or expressions can be moved outside. For example:

```
If TxtNextMeeting(9).Text = gDate.Text Then

    rstMeeting!NextMeeting = TxtNextMeeting(9).Text

Else

    rstMeeting!NextMeeting = ""

End If

rstMeeting.Update

For I = 0 To ListNameAttendSel.ListCount - 1

    a = ListNameAttendSel.List(I)

    Set rstUser = New ADODB.Recordset
    rstUser.Open "select * from [User] where UserName = '" & a & "'", _
        cnn1, adOpenKeyset, adLockOptimistic

    b = rstUser!UserID

    rstMeetAttAbt.AddNew
    rstMeetAttAbt!MeetingAttendee = b
    rstMeetAttAbt!MeetingID = sMeetingID
    rstMeetAttAbt.Update

Next I
```

- Simplify arithmetic and logical expressions by putting command in order the system to be understandable. For example:

```
' Get data from the user.
   varUserID = Trim(LCase((TxtUserID(1).Text)))
   varUserFullName = Trim(TxtUserFullName(1).Text)
   varUserPwd = Trim(TxtPwd(1).Text)
   varUserReenterPwd = Trim(TxtReenterPwd(1).Text)
   UserHouseCon = Trim(TxtHomeCon(1).Text)
   UserMobileCon = Trim(TxtMobileCon(1).Text)

   UserHouseCon1 = CboHome & "-" & UserHouseCon
   UserMobileCon1 = CboMobile & "-" & UserMobileCon

' Proceed only if the user actually entered something for both
' the User ID and User Full Name.
   If (TxtUserID(1).Text <> "") And (TxtUserFullName(1).Text <> "") Then

     ' Proceed only if the length of the User ID is not less than
     ' 5 digits and more than 10 digits.
      If Len(TxtUserID(1)) >= 5 And Len(TxtUserID(1)) < 10 Then

        If CStr(ListGroupSel.List(0)) <> "" Then
```

5.5.3 Data Integrity

Data integrity is important to the MIS system since the data kept may critical to the users, such as meeting records information. The following rules should be implement to ensure data integrity.

- Validate all input data
- Keep the input format simple and uniform
- Check the important combinations of input items

5.6   Chapter Conclusion

This chapter explained details about the implementation of the MIS system. It provides information on the software tools and components that are being used to develop the system. Besides, the criteria used to code the system are also being explained. It were used as a guidelines to produce a more consistence and effective program.

Chapter 6: System Testing

6.1 Objectives

Testing is a process of executing a program with the explicit intention of finding errors, that is, making the program fail [JAM89]. All of the system's newly written or modified application programs as well as new procedural manuals, new hardware, and all system interfaces must be tested thoroughly [KEN98].

Testing is done throughout systems development, not just at the end. It provides a method to correct logic error and for testing system reliability and stability. It is meant to ensure that the programs are executed correctly and conforms to the requirements specified.

Although testing is tedious, it is essential series of steps that helps assure the quality of the eventual system. Testing is accomplished on subsystems or program modules a work progresses. The system as a working whole must also be tested. This includes testing the interfaces between subsystems, the correctness of output and the usefulness and understandability of system output.

If testing is conducted successfully, it will uncover errors in the software. As a secondary benefit, testing demonstrates that software functions appear to be working according to specification.

6.2 Guidelines

There are several numbers of rules that can serve well as guidelines for testing the MIS system. There are:

- Testing is a process of executing a program with the intent of finding an error.
- A good test case is one that has a high probability of finding an as yet undiscovered error.
- A successful test is one that uncovers an as yet undiscovered error.

6.3   Testing Strategies

The philosophy behind testing is to find errors. Test cases are devised with this purpose in mind. A test case is a set of data that the system will process as normal input. However, the data are created with the express intent of determining whether the system will process them correctly. There are two general strategies for testing software for the MIS system. There are the strategies of code testing and specification testing.

6.3.1 Code Testing

The code testing strategy examines the logic of the program. To follow this testing method, test cases that result in executing every instruction in the program or module is develop. Then every path through the program is tested.

Although the code testing method can be performed in its entirety, it does not guarantee against software failures. This testing strategy does not indicate whether the code meets its specifications nor does it determine whether all aspects are even implemented. Code testing also does not check the range of data that the program will accept, even though, when software failures occur in actual use.

6.3.2 Specification Testing

To perform specification testing, it is important to examine the specifications stating what the program should do and how it should perform under various conditions. Then test cases are developed for each condition or combination of conditions and submitted for processing. By examining the

results, it can determine whether the program performs according to its specified requirements. Specification testing is not complete testing. However, the assumption is that, if the program meets the specifications, it will not fail.

6.4 Level Of Tests

Regardless of which strategy is follows, there are preferred practices to ensure that the testing is useful. The level of tests and types of test data are important aspects of the actual test process. Systems are not designed as entire systems nor are they tested as single systems. The testing process for the MIS system is divided into several levels. It involves unit testing, integration testing and system testing.

6.4.1 Unit Testing

In unit testing, the program making up a MIS system must be tests. The software units in the MIS system are the modules and routines that are assemble and integrated to perform a specific function.

Unit testing focuses first on the modules, independently of one another, to locate errors. This is to detect errors in coding and logic that are contained within that module alone. Those resulting from the interaction between modules are initially avoided.

The test cases needed for unit testing should exercise each condition and option. If the module receive input or generates output, test cases are also needed to test the range of values expected, including both valid and invalid data.

6.4.2 Integration Testing

Even though modules work individually, they may not work when we combine them. Data can be lost across an interface; one module can have an inadvertent, adverse effect on another, sub functions when combined, may not

produce the desire major function; global data structure can present problems. Therefore, integration testing is necessary during combining the modules.

Integration testing is the process of verifying that the system components work together as described in the system and program design specifications.

A test data that cover a variety of processing situations are creates for integration testing. First, typical test data are processed to see if the system can handle normal transactions. If the system works with normal transactions, then variations are added, including invalid data used to ensure that the system can properly detect errors.

6.4.3 System Testing

The last testing procedure done is system testing. System testing does not test the software per se but rather the integration of each module in the system. It also tests to find discrepancies between the system and its original objective, current specifications, and systems documentation.

Adequate time must be schedule for system testing. System testing includes reaffirming the quality standards for system performance that were set up when initial system specifications were made. This will include measures of error, timeliness, ease of use and also proper transaction of information.

The primary concern in the system testing is the compatibility of individual modules. Areas where modules have been designed with different specifications for data length, type and data element name are finds. Sorting and reindexing procedures assumed to be present in lower-level modules must be tested at the systems level to see that they in fact exist and achieve the results modules expect.

When system tests using test data prove satisfactory, it is a good idea to try the system with several "live data". This step allows an accurate comparison of the system output as well as a good feel for how actual data will be handled.

6.5   Chapter Conclusion

This chapter mainly discuss about on testing the system functions individually and also overall testing for the system. Testing is an important period for assessing how end users actually interact with the system. Although much thought is given to user-system interaction, it can never fully predict the wide range of differences in the way users will actually interact with the system.

Chapter 7: System Evaluation And Conclusion

7.1   System Strengths

MIS has shown the following strengths:

7.1.1 User Friendliness

The MIS system is user friendly by implementing GUI (Graphic User Interface). All modules are equipped with very easy to use controls. The dynamic menu system and graphical tools bar are intuitive. Besides, the user interface is designed in consistent manner in order to ease the users' perception and shorten the learning curve. The flow of the system control is also very easy to follow.

7.1.2 Mouse Driven

For the users' sake, the MIS system is designed in such a way to minimize the keyboard input. Most of the operations are carried out through mouse clicks. The users just have to move the screen pointer to the targeted feature and click the mouse. The system would response accordingly. This will ease the users' task and save a lot of time. Nevertheless, the system does provide keyboard input as alternative to the mouse click for those who do not familiar with mouse.

7.1.3 Security

The MIS system is embedded with security. It enables the system administrator to assign appropriate access rights to different users. The system will then prohibit non-authorized users from accessing particular form or part of database. For example, only certain users are assigned as secretary, which enables them to add meeting records into the system. Normal users are unable to access to that form. This assures data privacy and security.

7.1.4 *Custom Password System and Authentication Control*

The MIS is a system equipped authentication control where user has to key in his/her user ID and password in order to log into the system and access data. User can customized their password instead of generated by the system.

7.1.5 *Integrates Multiple Features*

In the MIS system, there are numerous forms and features that are integrated into a single system. This also means that the user can use any one of the features provided and is not just limited to one or two features.

7.1.6 *On Line Help System*

The on line help system built into the MIS system contains necessary information and guidance for user to use the system. It is context sensitive, which means the users are given automatically the suitable help topic relevant to the operations carried out by the users.

7.2   **System Limitations**

Several limitations exist in this system. These include:

7.2.1 *Platform*

The MIS system only can run under *Windows* environment but not under other environment. This is due to the tool use to develop it. Since Visual Basic is used to develop the system, and the tool only can use to develop window-based application, so the MIS system cannot run under other platform other than *Windows*.

7.2.2 Send Text Messages

The MIS system only allows users to send text messages. The MIS system is unable to support attachment of files.

7.2.3 Store Meeting Records

The MIS system is capable to store meeting records and enable users to view it. It does not provide any other functions such as printing meeting record or generates meeting reports.

7.2.4 Only Administrator Allow To Add New User And Delete User

The MIS system only allows the system administrator to add new user into the systems in order for him to use the systems and for others too see him in the systems. Users are unable to access the system if they are not added into the system. The users are also unable to create themselves in order to access the system. The MIS system also only allows the administrator to remove user from using the system.

7.3 Problems And Solutions

I have encountered with several problems during the process of developing the MIS system. These include:

7.3.1 Difficulty In Choosing a Development Tools

During analysis of tools that are available, I found it is quite hard for me to determine suitable tools for developing the system since I lack of information on these tools. But after searching from the Internet, the problem was solved since all of the information that I need are available through the net.

7.3.2 Inexperience In The Choosing Programming Language

Since I had never used Visual Basic language before, I had difficulty in understand how certain functions or features worked. At first, I found that the syntax of the language is quite different from procedural language and it was quite difficult to understand. However, after I tried my effort to find information from Internet and books, I became familiar with the language and found it easy to learn and useful. Besides, some of the logic and codes are similar with ASP programming language, which I had been exposed to during my industrial training. Therefore, it is easy to learn and understand.

7.3.3 Difficulty In Determining The Appropriate User Interface Standard

The function perform by the MIS system is rather simple. After all, I have to make sure the user interface is as simple as possible for the sake of user. Besides, the user interface also should not be too dull in order to attract user to use it. Besides using Visual Basic as one of the development tools to create the user interface, I also used Macromedia Firework 4.0 to help me to create a better and attractive user interface.

7.3.4 Difficulty In Debugging Error

Since I had not familiar with Visual Basic programming language, I had difficulty in finding and debug the error that are generated. At first, I found it hard to understand the errors. However, after I had tried to find the solution from books and Internet, I had successfully understands and debug it.

7.4   Future Enhancements

Many new ideas bloom while the system is being developed. However, the time constraint restricts me to incorporate everything into the system. It is hoped that the following features could be further enhanced in future:

7.4.1 Upgrade User Friendliness

Make use of multimedia to upgrade the user interface of the MIS system. Multimedia tools such as Macromedia Firework, Macromedia Flash and Adobe Photoshop can be use to create better user interface.

7.4.2 Attachment Of Files

Currently, the MIS system can only support text messages. It is hope that in future, the system can support attachment of files for more information sharing purpose among the staffs in an organization.

7.4.3 Printing Function And Generating Report

The MIS system allows the users to store and view meeting records. However, in future enhancement the MIS system should equipped function like printing meeting records or generating meeting report.

7.4.4 Add More Relevant Features

At the moment, the features in the MIS system are limited such as sending messages, searching for users whereabouts and storing and viewing meeting records. It is hope that in future, others relevant features like storing and viewing seminars, appointments or conferences information can be added into the system.

7.5 Overall Conclusion

In conclusion, I feel that the MIS system has achieved its objectives. The system has successfully implemented 6 main features for the use of the staff in an organization. This computer-base MIS system provides organization staffs to share and exchange information more easily. It is a concept that is gaining more popular in a corporate world where society starts to perceive the importance of information technology.

MIS system is found to be a rather practical and useful tool to the corporate users for managing their daily work. It provides a systematic mechanism for sending and viewing information in an organization. It also serves as an alternative communication bridge among staff members who may not be able to meet with each other, due to the fast pace of today's life. It also let the users know the contact information and the whereabouts of the staff at their fingertips. Besides, the MIS system is also able to store and view meeting record which help management level for decision-making.

The MIS system will be one that is suitable for a medium size organization. An interface will be created as a communication to the database. The database wills manage all the retrieval and storage of information from the system. It will be a centralized database that handles all the system process.

The system will deliver a simple messaging system for communication. However, the MIS system is not escapable from its limitations. But all this can be overcome in time to come, by making the necessary future enhancements.

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