Intranet System for Small and Medium-Sized

Organization in Malaysia

Chong Yi Ching   (WEK 010052)

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Supervisor: Encik Mustaffa Kamal Mohd Nor

Moderator: Puan Siti Hafizah bte Abdul Hamid

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Abstract

An Intranet system is a company wide-software and information distribution system that uses Internet tools and technology to provide a common multimedia interface within an organization and achieve a better result than the conventional means of data access and transfer.

This project is aim at developing an Intranet system for small and medium size organization in Malaysia. It will be develop as enhancement toward the earlier or existing Intranet system used in Malaysia. This Intranet system will target at user who located in managerial, executive, and operational level of an organization.

There are six main objective should be achieved by this system, which are provide tool for employee to manage their time more effectively, create an integrated system, reduce workload and redundant tasks, speed up the data retrieved process, provide cost effective system, and develop a secure web page.

The expected outcome of this project will consists of nine main modules, which are login and logout, bulletin board (Announcement), events calendaring, task management, project management, contact directories, discussion forums, fault reporting and knowledge base. Functional requirement for all this modules will be explained in more detail in chapter four (system analysis). It also includes the explanation of the chosen hardware and software that will be used to develop this project.

Many researches have been done through out this project. All the research will be explained in detail in literature review chapter.

Acknowledgements

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Chapter 1 - Introduction

1.1 Project Background

Today, the world is moving towards the information technology age and Malaysia is heading towards that direction too. The rapid development and advancement in information technology (IT) had imposed radical changes in our life. No matter where you are, computers are used widely to simplify tasks. Information is no longer recorded using the manual system or traditional method of ink and paper but is stored in databases, which are resided in the server.

In fact, the world has reached a stage where everything seems to be computerized or is going on the computer, and its influence seems inescapable. Nowadays, nearly every modern organization uses computer-based information systems as a key enabler for their competitive strategy and many daily activities. Computer-based information systems allow for the quickly accessing, storage and routing of information to the appropriate decision maker. Perhaps nothing as important has happened to and for business over the past decade as the advent of powerful, relatively inexpensive, easy-to-use computer system. To see this phenomenon, we just need do an observation on the situation around a workplace. In an organization, a worker may use a personal computer and e-mail. The paychecks are probably generated by computer and automatically deposited in the worker's checking account via high-speed networks. All of these show the information technology is a more fundamental and important part of our learning and work than ever before.

Intranets are one of the most exciting and important new technologies happening in organizations today. In the late 1990s, International Data Corporation (IDC) estimated roughly 30 million intranet users existed in the United States alone. In addition to forecasting additional growth in the USA, analysts also predicted even greater rates of intranet adoption in Europe. Needless to say, this large user base represents a broad spectrum of small- and medium-sized businesses and not just Fortune 1000 corporations. [1]

To meet the demands of the modern organizations that are very keen on do things cheaper, faster and better in order to stay competitive, an Intranet is the best solution. It is because Intranets help business do just that by providing the information they need and helping them communicates more effectively. With the proper corporate culture and management, an intranet can promote learning and spawn the innovation that allows organizations to do things cheaper, faster and better. It will help an organization to maintain its competitive position and give it an edge over its competition with other companies. Whatever the scope -- organization-wide, departmental, or workgroup -- intranet services promise to grow institutional knowledge and increase employee effectiveness. Online news, secure document sharing, and email are just a few examples of intranet applications. Building intranets using common Web technologies can also dovetail nicely into an organization's external marketing and ecommerce strategies.

Due to the great impacts bring by the rapid development and use of Intranets in organizations nowadays, this project is carried out to built an example of Intranet system and evaluate the impacts of an Intranet system on organizations in Malaysia. In overview, there are two types of organizations in Malaysia will become the target of our

studies and research for this project, which are government and non-government organizations.

In this project, a lot of studies and researches have been done to obtain a greater understanding on the Intranets. The areas that we have surveyed including the definition of Intranets, history of Intranets, common components of an intranet, intranets popularity, network topology for an intranet and most importantly, how an intranet affects the growth of an organization and what critical impacts it had imposed in the daily operations of an organization. To gain more practical information of the Intranet system in an organization in Malaysia, we have made some interviews with several IT workers in order to let them share their valuable opinions and knowledge about Intranets with us.

Through this project, an example of Intranet system will be developed as enhancement toward the earlier or currently existing Intranet system in most Malaysian organizations. The proposed intranet system is focus on a small and medium-sized company that would contains common application for an Intranet.

Throughout this report, we will use "Intranet System" to refer to our project title for better understandability and simplicity.

1.2 Project Motivation

Based on our research, the usage of Intranet system is popular among the large organization or enterprise in Malaysia. However, there are still many small and medium-sized organizations do not implement an Intranet system yet.

There are many small to medium-sized organization resist investing in an Intranet system because most of them think that only the large organization will gain the benefits from the implementation of an Intranet system. In fact, this perception is wrong. The benefits of intranets to a small business, even a home business, do not substantially differ from the benefits reaped by large firm.

Due to that, we intend to develop an Intranet system for small and medium-sized organization in Malaysia. We hope that this project can let people realize that whatever the scope- organization-wide, departmental, or workgroup- intranet services promise to grow institutional knowledge and increase employee effectiveness.

1.3 Project Aims

This project is aim to develop an Intranet system for *small and medium size organization in Malaysia*. Different agencies used different criteria to classify small and medium size enterprise (SMEs). In other words, the terms SMEs still appears to have been differently defined by the various supporting agencies. More recently (as reported in the New Straits Times of January 19, 1998, The Ministry of International Trade and Industry reclassified SMEs as follow: [2]

> ➢ A small-scale firm is a company "with less than 50 full time employees, and with an annual turnover of not more than RM10 million".

> A medium-scale enterprise is a company "with between 51 and 150 employees, and with an annual turnover of between RM10 million and RM25 million".

1.4 Project Objectives

The objectives to develop the proposed system are:

- **To provide tool for employee to manage their time more efficiently and help them to remember important dates or events**

With the events calendaring application and task application, employee can manage their time more efficiently by schedule their tasks and events properly.

- **To create an integrated system**

The computerized of the resources and processes of activities can reduce manual work. However, if the management is using different software or application to administrative activities, it can result in inconsistency of information. Therefore, standardize and centralize the way of information management are essential to manage the intranet system information efficiently and systematically.

- **To reduce the workload and redundant tasks**

With database processing, the duplication of data is minimal. For example, all the information related will be stored only once. Whenever these data are

needed, the DBMS can retrieve them, and when they are modified, only one update is necessary. This is because data are stored in only one place.

• To speed up the data retrieved process

The user can directly go to browser and search for the needed information within seconds or a minute only. Instead of, go to cabinets to find out the information. This is because there are no redundant of data and all the information is only store in one place.

• To provide cost effective system

Intranet system is paperless environment. This can save the cost for generating many paper base documents. Besides, transferring on-line documents through Intranet takes only short period of time, avoid from suffer loss or damage of important documents. If the document transfer fails on the Intranet, user can always try again since the cost will be same.

• To develop a secure web page

Security is always will be the most concern issue in any design of web-based system. Highly secured online system with advance authentication and access control is required to reduce the disaster result from the effort of automate the manual process. Thus, Intranet system provides a login utility before user can enter the system.

1.5 Project Scope

1.5.1 Project Target User

This project is developing focus on small and medium-sized organization in Malaysia. Due to the time constraints and limitation of resources, this Intranet system is developed as a very small portion for enterprise collaboration.

In overview, the Intranet System's user will involve managerial, executive, and operation level of an organization. All the internal user of the organization only can access this Intranet System. In this project, we do not allow the outsider like suppliers, clients and co-worker to access the Intranet System.

1.5.2 Functional Scope

Functional scopes of the four modules (project management, task management, events calendaring and bulletin board) of the Intranet system are as follow:

i. Be able to keep track of personal appointments, group meetings, company-wide events

Intranet system will help the users to keep track of personal appointments, group meetings, organization events through events calendaring. This application can allow users to post meetings and events quickly and easily. It provides a visual calendar of events displayed in a monthly format with each date having hyper linked hyper linked titles to the events for its day.

ii. **Be able to schedule and mange daily individual task as well as group of user daily task**

Intranet system will help the users manage and schedule multiple individual task and organization task. Users can view their task list and task information easily. Assignee will be able to assign task to particular person or group.

iii. **Be able to view the important news and announcements**

Using the bulletin board application, the users can view the important news and announcements published at the Intranet system main page once they login successfully. Group announcements are the fast way to communicate throughout the organization. Use the news and announcements system to communicate general information to users. This application is very useful for displaying latest important news, new product release, useful file, and articles on a web site.

iv. **Be able to manage the project information**

Intranet system will help the administrator to manage and schedule the project organization. Through the use of a simple interface, administrator can create new project, assign project leader and project participant, add steps to the project and mark steps as complete.

v. **Be able to search information**

Search function in two modules: announcement and task management will

help the user to retrieve useful and meaningful information they need from

the database in fast and convenient way.

1.6 Project Constraints

Generally, every project development faces its own set of constraints. The same applies to this project too. However, this is a non-commercial software development process but merely a final year thesis for computer science and IT undergraduates, so tight budget is not the major issue for this particular project.

There are several major constraints have been identified when we carry out this project. They are the limited time, lack of experiences and limited human resources.

1.6.1 Limited Time

As can be referred in the project schedule earlier, we have been given roughly two-semester time to finish the project, starting from the feasibility study phase till the project maintenance phase. This excludes the public holidays, exam time and so on. Besides that, this project is not a full time development, as we also have to concentrate on other subjects, which we take in the same time. There are also assignments of other subjects that we need to complete in the same moments. So, the time allocated is really very limited and tight.

1.6.2 Lack of Experiences

Next major constraint is due to our inexperience. We are always trained in theory while practically in some small software applications development during our lab sessions and assignments. So this is our first time to

undertake such a large scale of software development project. And thus we admit that the project management is not very efficient.

Then, we also admit that we have limited skills and knowledge about the Intranet system that we are going to develop. The concept of Intranet is a still very new to us. So, we spend many times on researches and studies on this project. There are many more things that we have to learn up in order to develop an intranet system.

1.6.3 Limited Human Resources

In our view, it is rather difficult for only two persons to complete the whole system as the scope of this project is rather large and there are a lot of business constraints and logics that we have to consider when developing the system. In fact, we would suggest that additional one or two persons are needed to ease the development.

Apart from these major constraints mentioned, several minor constraints have been identified as well. These are the limited reference books, budget and some technical constraints.

Although UM library is a good place for us to find the reference books for this project, it is hard to get the books sometimes because there are a limited amount of them. So they are either in order process or have been borrowed out.

Limited budget that we refer here is our personal budget to buy reference books and to upgrade the personal computer. The reference books sold are rather expensive. So, we have to limit ourselves to only few references.

Last but not least, greater hardware and software requirements are needed in order to implement this project. So, we have to upgrade the specifications of the personal computer to the recommended requirements stated in order to run and develop the intranet system.

1.7 Expected Outcome

The expected and planned outcome of this project will consists of 9 main modules, which are login and logout, bulletin board, events calendaring, task management, project management, contact directories, discussion forums, fault reporting and knowledge base.

Each of these modules is independent but interrelated. The login module is implemented as security checking to allow only the authenticated user to access the Intranet System.

With the main modules that we state previously in the Intranet System, this system is expected to help the organization manage the task and project, publish news and announcements, tracking an event, manage contact and forum information, reporting system problem, and promote knowledge sharing.

1.8 Project Limitation

Intranet System requires a browser that can understand VBScript, the default supporting language for ASP and also Java Script such as Internet Explorer. User using browsers that do not support these features will not be able to use the available functions in this system.

This system is not a multi-lingual system which we only establish the system in English version.

1.9 Project Schedule

This project is divided into two phases, which will be referred to as semester I and semester II. During semester I, research on literature review, introduction and system analysis & design are carried out. In semester II, system coding, testing, evaluation and training will be done. Documentation is done from the beginning of the project until the end of the project. Table 1.1 depicts the schedule for the Intranet System that are generated using Microsoft Project.

Table 1.1 Project schedule for Intranet System.

ID	WBS	Task Name	July 5/25	6/22	7/20	8/17	September 9/14	10/12	November 11/9	12/7	January 1/4	2/1	March 2/29
1	1	Semester I											
2	1.1	Literature Review											
3	1.2	System Analysis											
4	1.3	System Design											
5													
6	2	Semester II											
7	2.1	Coding											
8	2.2	Testing											
9	2.3	Implementation & Evaluation											
10	2.4	Documentation											

1.10 Overview Of the Chapters

Chapter I -Introduction

This chapter consists of the introduction of the Intranet System, the motivation of doing this project, project aims and objectives, scope of the project, project target, project limitation, project schedule and also an overview of the whole document.

Chapter II- Literature Review

The literature review gives brief explanation on topics researched and studied that are relevant to this project. Apart the topics including the definition of Intranet, the development of Intranet, impacts of implementation of Intranet system in an organization, comparison between existing Intranet system, case studies about Intranet system, security issues, network topology, tools and technology considerations.

Chapter III- Methodology

This chapter will describe the methodology to be used in this project.

Chapter IV- System Analysis

This chapter covers the analysis phase of the project, such as the system analysis approach, functional requirements, and non-functional requirements. It explains how the requirements for the project were acquired and analysis of the result.

Besides that, it also includes the explanation of the chosen hardware and software that will be used to develop this project.

Chapter V- System Design

This chapter consists of the introduction of system design, Intranet system architecture, process design, data flow diagram, database design, and user interface design of the system.

Chapter VI-Implementation

In this chapter, the coding tools, coding approach, internal and external documentation and coding specification are discussed.

Chapter VII-Testing

This chapter covers the purpose of testing, integration testing, testing planning and system testing process.

Chapter VII- System Evaluation & Conclusion

This chapter will discuss the strengths, limitation, problem and solutions, future enhancements for the application and the conclusion of this project.

Literature Review

Chapter 2 - Literature Review

2.1 The Purpose of Literature Review

Literature review is a background study about the knowledge and information gained to develop this project. The main purposes of literature review is to let the developer perform some study and analysis on the similar previous or current existing system, get a better understanding about the features offered in these system, let the developer to gather valuable information and ideas from the existing system. Besides that, literature review also helps the developers to obtain a better knowledge on the development methodology and to get a better understanding on the development tools that can be applied in the project.

Literature review is an important step in this project because it enables us to list out all the features in the current existing system, do comparison on the past – developed projects and studies the strength and weakness of it. We can then refer to the list of important features and incorporate the advantages or strengths into our system. Indirectly, this will help us to improve or enhance the quality and value of our system and fulfill the all the system requirements.

2.2 Information Gathering Techniques

The various resources that were surveyed can be summarized as research that was done in order to obtain and gather reliable, relevant, adequate and comprehensive information. This information gathering was done by using a number of methods such as through the Internet, lecturer supply materials and also ideals, reading from newspaper, brochures, journals, articles, books and other relevant materials.

2.2.1 Internet and World Wide Web

Internet surfing in today's world is a very efficient way of gathering information. There are a lot of information can obtained from the Internet and the World Wide Web in various kinds of forms such as articles, white papers, product documentations, web casts and e-books. From the Internet and World Wide Web, we managed to obtain a lot of information, new ideas, latest technologies and various kinds of implementation techniques and tools that can be used and applied to develop this project

2.2.2 Reference Material

Reference material such as reference books and journals that contain relevant information is a good resource for us to conduct our literature review more efficient and easier. We have used several reference books and e-books for more in depth and comprehensive explanation. These reference books and e-books that we referred are bought from the local bookstores, or obtained from my supervisor, my friends or the UM main library.

2.2.3 Discussion

Discussion with supervisor in a regular interval is very important to gather information and ideas. Advice and guidance from my supervisor, Mr. Mustaffa, is very important in developing a system that meet the requirement specification. From these discussions, we then derived the pros and cons of the system and user expectations on our system.

2.2.4 System documentation

To obtain the technical and further information about the system, we have referred to the documentation of similar systems which I obtained from the faculty document room, where there a lot of previous batch student's thesis can be used as guideline. From there we can find out the architecture and design of the similar systems.

2.3 History of Intranets

With the introduction of Mosaic in 1993, some business became intrigued by the power of the Web and Mosaic. The media wrote about some of the first organizations to create internal webs, which included Lockheed, Hughes, and SAA Institute. Each of these organizations had someone on board from an academic environment who has familiar with Internet tools. They already knew about gopher, FTP, the web, and lots of others. They were aware of what these tools could do, and they decided to try a pilot program to determine if the tools had any value in a commercial environment. They quickly found that the tools were very useful. As word got around, other companies became interested.

Many of these companies began to experiment with the Internet, most probably began by putting up an Internet gateway to hook their e – mail system to the rest of the world. Next they added Web servers and browsers for accessing the World Wide Web. In the process of doing this, they discovered how valuable these tools could be for providing access to internal information. They then started putting their policy manuals and documentation on the internal web server and secured it from the outside world. Later, they added access to Internet newsgroups, and realized they could create their own internal newsgroups as well. It all just kind of happened.

Before we knew it, these internal internets took o many different names. They became known as internal webs, internet clones, private webs, and corporate webs. Sometime in 1995, someone in the media calls them intranets and the name stuck. However, there are lots of differing stories about the source of the term intranet. One version is stated that in 1994, some one at Amdahl referred to its internal internet as an

intranet, and the media picked it up from them. Now, everyone calls them intranets. (Mellanie Hills, 1997)

2.4 An Overview of Intranet

2.4.1 What's an Intranet?

Many people are now aware of the word 'Internet' but little is known of what the term of 'Intranet' means. Simply put, *an Intranet is a company-wide software and information distribution system that uses Internet tools and technology to provide a common multimedia interface within an organization (or company) and achieve better results than the conventional means of data access and transfer*. An Intranet could be simple HTML file linked on a LAN, a full-blown sophisticated system with dedicated server hardware, or anything in between. (Paul Blackmore, 2001)

An intranet is a private space that gives employees in a company the ability to organize information, readily access that information, manage documents, enable group scheduling, provide efficient collaboration, and let individuals and departments publish information they need to communicate to the rest of the company, all in a familiar, browser-based environment. Typical intranet content could include the corporate directory, a calendar of events, a policy and procedures manual, and the company newsletter. The most important information will be industry-specific, such as supplier information and databases of products.

Physically, an intranet is formed by linking the various pieces of information and communications technologies that an organization owns or

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uses; interconnected in such a fashion that all the resources of the organization are readily available to anyone who needs them, wherever and whenever they are needed. Those resources we link together are not merely the physical devices such as computers or fax machines. The data that is stored in or accessed through the physical devices are resources too; as are the software applications that can operate on and manipulate those data resources.

A well designed and properly implemented intranet is a creative and empowering tool for the entire organization that permits any individual to bring the entire resources of the organization to bear on any specific task they undertake and to bring their own resources and expertise to bear upon the general purposes of the organization with greater effect. Whether you run a small business or a multi-national corporation, an Intranet can serve your company's specific information requirements. It can streamline information access and dissemination. In short, an intranet is a technology tool that can save you time and money.

2.4.2 What is the Intranet made of?

Attention to:

People
(World Class)

Process
(Best of Breed)

Technology
(State-of-the Art)

Intranet:
- New Roles & Responsibilities, for
- New Processes, supported by
- New Enabling Technologies
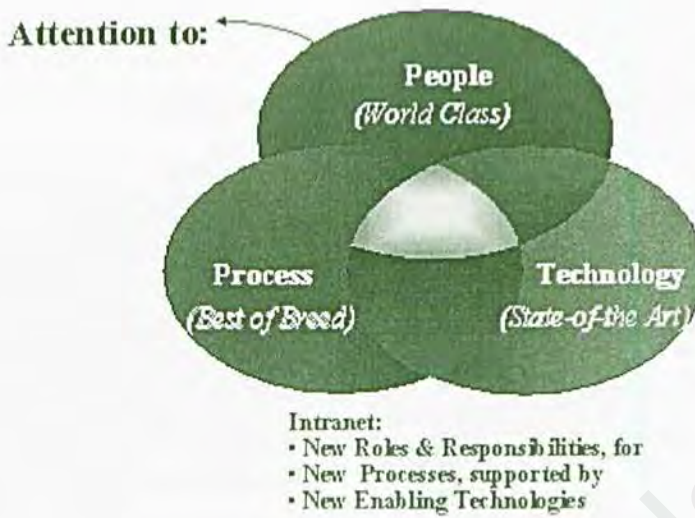
Figure 2.1: The components of Intranet

2.5 Intranet versus Internet

Generally speaking an Intranet is different from an Internet in the following ways:-

➢ **Intranet is a network within the organization whereas Internet is a world wide network.**

➢ **Intranet has access to Internet but not vice- versa.**

The main difference between the above is that Internet (International Network) is external and publishes information available to the world at large whereas Intranet (Internal Network) publishes information available to staff within the intended company, and not to the world. (Peter Griffiths, 2000).

When comparing with the Internet, Intranet sites are much faster to access the information, allowing not only text to be viewed, but also full motion video, music,

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speech, graphical displays, animations, and etceteras. All that is required on the users' personal computer is a browser. The main installation is at the server, in the setting up, installation, design and programming.

Some technical comparison between Intranet and Internet are as follow:-

Table 2.1: Technical comparison between Intranet and Internet

Intranet	Internet
Packets are private.	Packets are public
Central enforcement	No enforcement
IP protocol suite	IP protocol suite
Enterprise bears costs	Cost spread out
Enterprise management	Problematic management
Enterprise control	No controlling organization
Strong policies	Weak policies

The following table compares the advantages and disadvantages of Intranet versus Internet communication: -

Table 2.2: Advantages and disadvantages of Intranet versus Internet

Intranet	Internet
Advantages :	
Speed: all computers are connected by high-speed connections.	Access: any computer anywhere with Internet access.
Security: limited worries about unauthorized access.	Design elements: anything is possible-- great multimedia, video presentations.
Connection to other systems: other resources on the intranet are easily connected.	Control: HR controls the content, administration.
Access: all computers on the intranet have easy, instant access.	Links: take advantage of external resources by linking to vendor websites, health databases, etc.

Disadvantages :	
Access: only computers linked to the company intranet have access. Limited or no access from home, satellite offices, or any computer not on the intranet.	Limited access to intranet resources.
Limits on design: some elements, especially multimedia, may not be possible due to hardware/software restrictions	Security concerns: perception that unauthorized users could access proprietary information.

2.6 The Rise of Intranet Usage in Malaysia Organization

Many companies in Malaysia are realizing the benefits of the Internet from within their companies. These organizations are creating intranets, which are private, or internal, internets. These intranets have been established initially as an internal communication tool. Employees can send e-mail to other employees within the company. Intranets enable private and sensitive corporate information to be distributed and shared within the organization. This new medium of communication has become a very cost-effective solution, especially for geographically dispersed businesses that have employees all over the world. The time to communicate new policies, procedures, and information is immediately reduced along with postage and paper costs.

An intranet also can be used for software distribution and for providing access to vital applications. Companies are now starting to put applications like survey forms and employee benefit registration forms on their intranets to simplify basic processes. Businesses also are starting to consider replacing or enhancing their mission-critical applications (like accounting, sales order entry, oil and gas trading, and so on) with

applications that are secured within an intranet. Intranets are usually protected and secured by means of a firewall that prevents outside intruders from accessing the internal network. To the user, there is no difference between accessing the Internet and the company's intranet. Figure 2.2 depicts a typical configuration for an intranet.
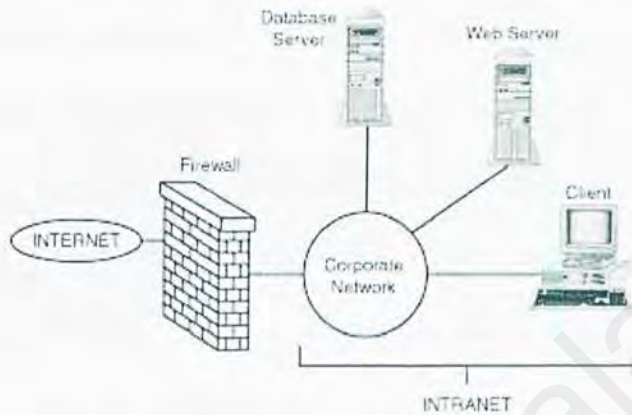
Figure 2.2: A high level view of an Intranet

The Intranet usage is not limited on commercial organization only but also on educational organizational in Malaysia. For example, Universiti Teknologi Mara (UiTM), one of Malaysia's premier institutions of higher learning, is building one of the largest campus networks in Asia with 10 Gigabit Ethernet solutions from Cisco Systems. The network, with a total capacity of 5.5 terabits per second (Tbps) – 55,000 times faster than a 100Mbps Fast Ethernet network – **will enable UiTM to deliver high-speed internet and intranet access to its 86,000 students and 8,000 staff members at its main campus here and all 14 branch campuses nationwide.**

2.7 What Drive The Development Of Intranet?

The promise of the intranet is significant. Almost every leading technology company has announced that internet computing is its primary strategic focus for the future. But, what makes intranets so important?

Intranet are important because of technological requirements imposed on our business and personal lives by the impetus for faster, better, and cheaper information. The need for information – particularly interconnected information – has become a major driving force in our economy. Thus, the requirements for efficient communication, collaboration across space and time, and effective knowledge management are driving the development of intranets. (Steve Guengerich, Douglas Graham, Mitra Miller, Skipper McDonald, 1997). Let us review these requirements to illustrate how organizations are responding to these requirements and adjusting to the changing economy, and how intranets fit into their strategic information technology (IT) infrastructure.

2.7.1 Communications

Economic forces are steadily driving organizations toward decentralization. Heightened competitive pressures obligate organizations to lower overhead costs and to increase their agility in order to respond to ever-decreasing windows of opportunity. Reducing layers of middle management can help accomplish both objectives; but efficient communication becomes crucial as companies reduce their reliance on middle managers as information conduits and push decision-making out to frontline employees. To complete in

the "nanosecond nineties" and to meet increasingly diverse customer demands, employees must have the right information, in the right form, when and where they need it.

Tying this back to the global order of things, communication is the stage of the information cycle enabled by improved copying, and communication enables improved decision making, improved productivity, and improved effectiveness. Just as the printing press was the great enabler, lowering the barriers for the average person to publish information on paper, the Intranet lowers the barriers for the average person to publish in the electronic world. Electronic publishing increases the speed and breadth of information flow across geographic and organization boundaries to a degree unobtainable with paper. The web technology, at the core of an Intranet, makes electronic publishing easy, inexpensive and accessible to the average employee. It improves information access.

Nowadays, organizations are on their way to becoming "virtual enterprises" – organizationally decentralized and geographically distributed. To succeed in today's competitive environment, however, the individual components of the virtual enterprise must be much more tightly coordinated than the comparable parts of older, hierarchical organizations ever were. Individuals, teams, and business units must function autonomously and be able to respond rapidly to market opportunities and threats. But, optimizing responses to ensure maximum benefit to the organization demands tight coordination – *coordination achieved through the improved flow of information rather than restrictive policies and hierarchy.*

Integration in a decentralized organization depends on open standards and interoperable communications. This is particularly true in today's business economy, where many companies expand through acquisitions and mergers, and rely on outsourcing for many critical functions. Even if a company is able to enforce a single internal standard, that standard is subject to change at any time.

Efficient communications must also be developed and properly staged for outside organizations. In a knowledge-based economy, market success is directly proportional to the information an organization can bring to bear, which, in turn, is largely a function of the reach of the enterprise's network. That network comprises both insiders and outsiders, as tightly linked webs of partners, customers, and suppliers replace vertical integration as a source of market power. Communication is the glue that holds the network together.

To obtain a further understanding about how the intranets contribute to a better communication, please refer a brief case of US Atlantic Command Intranet. (Section 2.16.3)

2.7.2 Collaboration

The successful of the virtual enterprise depends on its ability to bring dispersed assets – particularly knowledge and expertise – to bear on a specific project or opportunity. Problems, opportunities, and the environments in which they appear continuously grow more complex. To manage such complexity effectively, enterprises must bring experts with specialized knowledge together

to collaborate in creating solutions that are beyond individual contributions. Simple communication – transmitting information – is not sufficient.

Tools define how business is done. For example, e-mail allows instant communication independent of space and time constraints. Tools are important because they directly create and enhance value; indeed, those are the only tools worth having. Similarly, technology that fosters collaboration must provide a medium for creating productive environments. However, tools designed for support collaboration, will look quite different from tools designed to support individuals. Collaborative tools create shared space. They add a new dimension to exchanging information (communicating) – a dimension that embraces symbolic representation, manipulation, and memory. Those shared spaces should invoke the senses as well as the mind, so collaborators can experience what they are doing while they think about it. Effective collaborative tools should work in real time, they should be highly interactive, and they should readily accept new types of information – adapting to the collaborator's needs. Shared spaces should transcend space and time, allowing collaboration by groups separated by geography and schedules. Finally, collaborative environments require room for curiosity and serendipity.

Internet technologies have the potential to evoke the power of shared space. Web technology adds a new hybrid of text, image, sound and video, and computation that provides the framework for collaboration. Groupware products like Lotus Notes will interface with intranets to support human interaction, rather than merely manipulating data. The explosion of the Internet

is the best demonstration of how compelling technology can be as a medium of community.

However, the integration of an intranet as a communications, information, and project management tools across the organization is a key indicator of a successful Internet computing strategy. If the collaboration system is not well integrated – available only to limited number of people, for example – it's not going to have the impact that it should have. But, a lack of integration is sometimes the result of a lack of corporate commitment rather than unavailability of integration facilities. The adoption of strong corporate policies that support and encourage collaboration is necessary for a successful intranet implementation. In truth, the specific application that support and encourage collaboration is specific application areas are of less concern than the existence of the policy itself, along with a corporate-wide understanding of how it applies, and a demonstrable commitment from the company's leaders.

2.7.3 Knowledge Management

The goal of knowledge management is to leverage knowledge assets from one problem domain to another and from one user to another. For example, the solution one programmer develops to difficult, but generalizable software problem is instantly retrieved when another programmer encounters a similar problem. Knowledge management attempts to make knowledge a recyclable, accessible, and expanding resource.

Technology alone is clearly not the answer to effective knowledge management. Instead, it requires an architecture and infrastructure – although

not a ponderous expert-staff bureaucracy. For many organizations, intranets represent the first step toward investing in that architecture. In an organization, many managers manage "the process." They set goals, devise a detailed plan of action, and then motivate and monitor their employees' actions according to the plan. At the dawn of the Information Age, some managers already are beginning to realize that successful management always has been accomplished by managing knowledge and facilitating the flow of information. Managers, in effect, are a kind of action agent. They take in sensory information and send out action-stimulating information. As managers discover the strong "sensory" power of intranets, they will encourage all work to be done there.

As managers move out of the sensory-agent role, knowledge workers' roles will need to shift to handle the new opportunities and challenges of being wired directly into the knowledge base. Like managers, many knowledge workers will begin to view their role in terms of brokering knowledge rather than outputting content. Helping others find meaningful content for a specific problem will become more important than prepackaging the notebooks, manuals, and summaries common today. It is possible that this level, more than any other, will involve the interplay and integration of automated tools and human judgment. This also will create the biggest challenge for new organizations.

The new knowledge workers need to be more proactive than reactive. They will need to customize more of their own information flow themselves.

This means being able to determine what information they need; knowing how to find it; and knowing how to use personal agents to scan, screen, and track it.

Finally, we can expect organizations to struggle with how knowledge workers are evaluated and compensated for the value they add. Good ideas generally come from the interaction of multiple people, even when only one gets the credit. An intranet, with virtual communities and casual collaboration, will likely make evaluation and fair compensation for value-add even more nebulous.

2.8 Why Have Organizations Created Intranets?

Current research suggests that the intranet architecture is so compelling that 90% of the Fortune 200 companies has implemented an intranet. This isn't just for international corporations distributing document images world-wide. The same standards that make the Internet work are increasingly being used to make intranets inside large institutions and small companies. This is very rapidly becoming the mainstream systems architecture. - *Acordex Imaging Systems Summary Paper, 1995-2000.*

What is driving this explosion of intranets? The popularity of intranets comes from a combination of the demands on business today and the ability of intranets to help companies meet those demands.

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2.8.1 Demands on Business Today

Competition is fierce in all business today. Change occurs faster than ever and is now a fact of life in business. There are 5 major influences that drive the increasing pace of business change:-

➢ **Customers want everything faster.**

➢ **Customers want everything cheaper.**

➢ **Customers want better-quality products and services.**

➢ **Business has gone global.**

➢ **All the rules have changed.**

2.8.1.1 Customers want everything faster

Since customers want everything faster, companies have reengineered and streamlined their processes to do things faster. These companies can now operate faster. This puts increasing pressure on their competitors, who have to keep up or get ahead by speeding things up even further. Customers have started to expect receive things instantly. These days, it seems that nobody's willing to wait longer than overnight for delivery of products, such as news and software, instantly.

Speed to market is a major competitive advantage. If your product is first to the market, you can gain control of the market; you can gain control of the market and become the most profitable. This happens because cumulative experience at making a product allows you to improve the process and decreases the cost. Since your cost decreases faster than that of your competitors, you can price your product more competitively and pick

up more sales. It becomes even harder for your competitors to complete on price. Therefore, the best solution is to always try to be the one to render your products obsolete - don't allow your competitors to do it. Microsoft is one of the best examples of company that uses this strategy.

To create products faster and faster, companies are using a variety of techniques such as concurrent development and shared development. Concurrent development enables different areas to work on a product simultaneously through the use of computer-aided design and collaborative tools. Shared development is having multiple shifts work on the same product, a technique frequently used in software development. Intranets provide tools for concurrent development and shared development.

Doing things faster doesn't happen just in product business. It also happens in service businesses, where companies are intended to provide faster service. Customers today expect immediate service, and those companies that deliver instant services have a competitive advantage. Therefore, we see that Federal Express also implement an intranet. Today there are 60 Web sites running inside the company, most created for and by employees. Next, as part of a companywide Web push, FedEx is equipping its 30,000 office employees around the world with Web browsers so they will have access to a slew of new sites being set up inside the company's Memphis headquarters. (Mellanie Hills, 1997)

Companies that have engineered have found that one way to do things faster is to allow their customers to perform services for themselves. This is effectively what we are now seeing with intranets. Information Technology

(IT) groups in several companies has done that by creating intranets. They let their internal customers provide the level of services they need by creating and maintaining their own publications and information on the intranet.

2.8.1.2 Customers Want Everything cheaper

Customers want things cheaper as well as faster. This makes it even harder on companies. Many have cut costs everywhere they can, especially through downsizing. Reengineering has allowed your competitors to cut their costs because they have taken unnecessary steps out of their process. They may also have downsized along the way, so they have fewer people doing the same amount of work. This means that they can probably sell their products and services for less.

Intranets have come along and helped the remaining employees do the work that several people used to do. Intranets are relatively inexpensive, too. That's one of the reasons they have become so popular so fast.

Intranets can help you decrease your costs, too, by improving productivity and shortening product development time. People can do things faster and get more done because they have quick and easy access to information they need. Intranets improve internal communications while cutting communications costs. They can also help you cut costs by eliminating printing and publishing costs for many things that exist in paper form today.

2.8.1.3 Customers Want Better – Quality Products and Services

The Total Quality movement has spread through businesses as customers have demanded higher – quality products and services. Customers will just not settle for less. If they can't get it from you, they'll go to your competitors. To meet that challenges, companies improve their processes and incorporate quality statistics and customer feedback. Intranets have become feedback mechanisms for the quality processes by making quality statistics available to all. As companies capture customer feedback, they put it on the intranet to share with everyone as well.

AT&T, one of the largest telecommunications companies based in New York, uses its intranet to provide better – quality service to its customers. When a customer calls in, customer care representatives use their Knowledge Management System to help them quickly and efficiently solve that customer's problem.

2.8.1.4 Business Has Gone Global

Competition has really changed. Your competitors are now all over the world, not just down the street. Your customers may be global as well. Technology has made all this possible. The Internet and intranets facilitate communication with customers in other parts of the world or just down the street.

2.8.1.5 All the Rules Have Changed

A major change in business today is that the old rules no longer apply. The people who work for you used to be located in your office. Increasingly now, they may work from home, as telecommuters, or from some other part of the world. They may not even be your employees, but instead be part of your virtual corporation. You may never even have met them.

Technology has allowed you to develop partnerships with customers and suppliers, and even your competitors may be your business partners. That certainly changes things!

Marketing has changed as well. Instead of blanketing everyone with your message, you may be tailoring your messages not only to a specific market niche, but maybe to individual customers.

2.9 Managing the Intranet
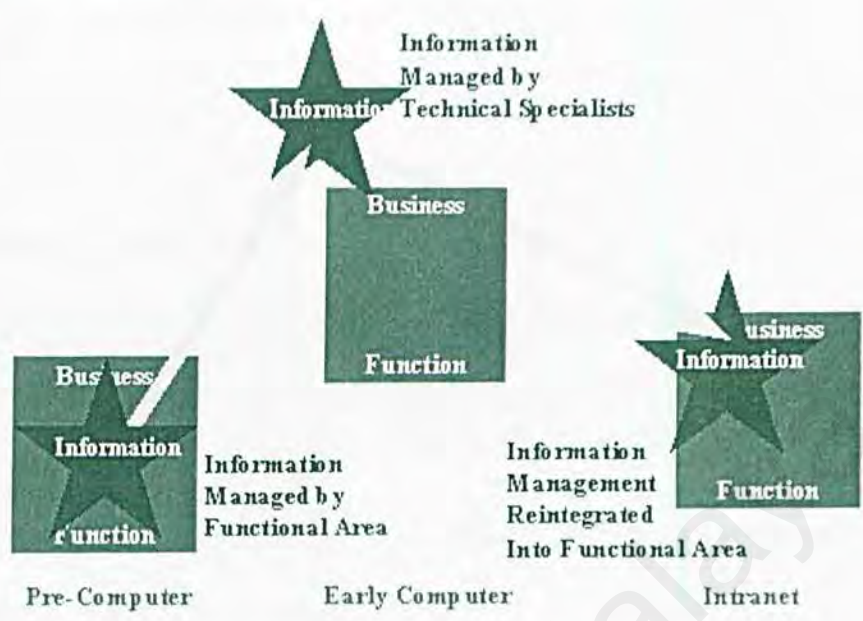
Figure 2.3: The evolution of Information Management

Although intranets offer many advantages to companies, they create a number of managerial concerns as well. Two key issues are figuring out how to integrate legacy systems into the intranet and deciding how much control of the systems should be decentralized. A large amount of the information a company wants to make available to its employees resides in legacy systems, but the proprietary interfaces on those legacy systems make it difficult to integrate them into an intranet. Enterprises have two basic options, either leave the legacy systems untouched and replicate the data for the intranet, as Microsoft did in its HR Web system, or modify the legacy systems to allow direct access to their data through a browser. With a history of failures in IT projects, many companies resist modifying working legacy systems for fear that the systems may stop functioning properly.

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Due to the ease with which Web sites can be created, many employees have built their own, leading to a proliferation of sites with company information. As employees build more and more Web sites, employees' desktops become cluttered with confusing icons and links, many of which are obsolete or incorrect. In addiction, potentially valuable company information is stored on independent sites – sites most likely not under central control. The result is problems of data redundancy, integrity, and security. Managers face the old trade-off between central control, which provides more timely and relevant data.

One proposed solution to this control conundrum is to create a corporate portal to act as the gateway to the firm's internal resources, information, and Internet services. This solution brings access to company data and applications together in a single site. Employees simply need a browser. At the same time, the portal provides IS management with a way to monitor and control the growth of internal Web sites, and the portal provides a link to Internet resources external to the company, such as sites for industry news, customers, and business partners.

Although the concept of corporate portals seems straightforward, many firms are reluctant to implement them because portals require changing existing systems and processes. These same reasons are why firms have had so many problems implementing enterprise wide ERP applications. One approach to manage the inherent problems and risks involves developing separate departmental or divisional portals, such as sales, HR, operations, and finance portals. These portals can then be linked to form a corporate portal.

2.9.1 An Intranet people framework in an organization

Figure 2.4: An Intranet people framework in an organization [3]

2.9.2 Intranet Skills & Organizational Requirements

Table 2.3: Intranet skills and organizational requirements [3]

Role	Description	Skills Required	Reporting Function
Webmaster	Day-to-day technical operation of all web servers	-Web server technology - Network technology	Information Technology
Gatekeeper	Oversees integrity and maintenance of information posted to the web	- Technical/ content management skill balance - Organization/coordination	Line of business
Content Publisher	Posts information to the web; responsible for accuracy of information & security policy compliance	- Knowledge of content - Design standards - Understanding of users	Line of business

2.10 Why Web-Based Intranet?

While the World Wide Web began its life as a platform for sharing documents over the Internet, today the Web is being used for much more than simple document publishing. A study by Watson Wyatt of large employers concluded that the use of web technology for benefits communication or administration grew to 50 percent in 1997 from 27 percent in 1996. In fact, most commercial and corporate Internet sites can be more accurately described as Web applications because they require complex processing to create a more compelling, informative experience for users. Just as Internet Web sites are evolving into sophisticated Web applications, corporations are also beginning to use Web technology within their private corporate networks, or intranets, as an effective way to build and deploy internal applications.

The Web, which is the foundational technology concept for intranets, offers users unprecedented freedom in obtaining information in the corporate data stores. It allows people to work in the manner that best corresponds to their personality, style, and work habits. In addition, however, the web offers other attractions that make it irresistible for intranet application development such as follow:-

- **It is easy.**

    Nowadays, most people can learn to use the web front end in a short time, as compared with weeks or months for many existing tools.

- **It is not expensive**

    This is probably most compelling reason for the continued growth of intranets. Some companies is still using legacy systems. These companies are already

facing the need to upgrade and /or modify the existing systems to correspond with recent technological advances, as well as to complete effectively in an increasingly global economy. Intranets offer the most efficient and cost – effective methods available for achieving the necessary changes.

- **It is consistent**

    Multiple applications can be easily built – ranging from database, to document retrieval, to bulletin boards, to E – mail and son on – all using the same browser interface. This ability can significantly reduce the time it takes to train new users.

- **Cross platform applications**

    Intranet applications are delivered as HTML pages and are cross-platform in nature. This allows organizations with heterogeneous desktop platforms to ensure that all users can access the application without leaving some users out— or requiring special versions for each platform. The client (i.e., the browser) can run on any platform with a consistent interface.

- **It is scalable**

    It is hugely scalable with many intranet sites handling tens of thousands of users and transactions a day.

- **It can be modularized**

  We can identify discrete steps or modules, the first of which are relatively inexpensive and do not irreversibly commit the company to a course of action. This makes the decision to proceed much easier.

- **It is very harvestable**

  Given the standardized, modular, semi – object – oriented nature of these applications and the basic similarity of the underlying architecture; Web-based intranet applications are very harvestable (i.e., able to taken, improved, and used by others). The HTML source code of almost any Web site can, for example, be copied and trade/service – mark rights of others), and used in any other We site. Such harvesting of material includes not only the text and HTML coding, but also the figures themselves – all through a few simple clicks of the mouse. Such easy access to the de facto image and text standards on the Web, along with access to the best practices of various Web providers, has helped to propel the development of intranets.

- **It is secure**

  Additional levels of security can be incorporated, including an application firewall, certificate authority, and/or encryption. Discretionary access controls can also be made available, for example, building menus "on the fly" based on the user profile. Few of the recent, well – publicized security breaches could penetrate the security systems that are readily available to companies today.

- **It has a bright future**

  Given the large consumer base, internet computing standards are likely to survive for quite some time – to some extent, they might be considered universal. Even if the internet as we know it ceases to exist, many of the standards upon which it is based are likely to continue to survive, given their ability to operate within virtually any communications infrastructure, including point – to – point.

2.11 Intranet Security

Security should be a primary concern in planning and implementing the intranet. If a system contains information that is useful to the employees in an organization, then it most certainly contains information useful to its competitor. Beyond the issue of commercial spying there may be intrusions by the overly curious – and sometimes malicious – hacker. Finally, almost any organization employs individuals who might, due to either ignorance or ill will, compromise the integrity of the data and systems.

There are several tools to consider as part of the security plan in intranet implementation:

- **Firewalls**

  The main purpose of a firewall is to protect the organization data and networks from intrusion by outsiders. Firewalls do this by monitoring all packets of information and deciding which ones to allow entering. (Joan Bannan, 1997). A firewall also can be used internally to block unauthorized access to confidential areas of the intranet.

A good network firewall consists of at least five hardware elements: the device that connects the network to the internet (that is, ISDN, or a CSU/DSU) modem, an external router, a computer for unsecured Web serving. Figure 2.5 illustrates this firewall architecture:-
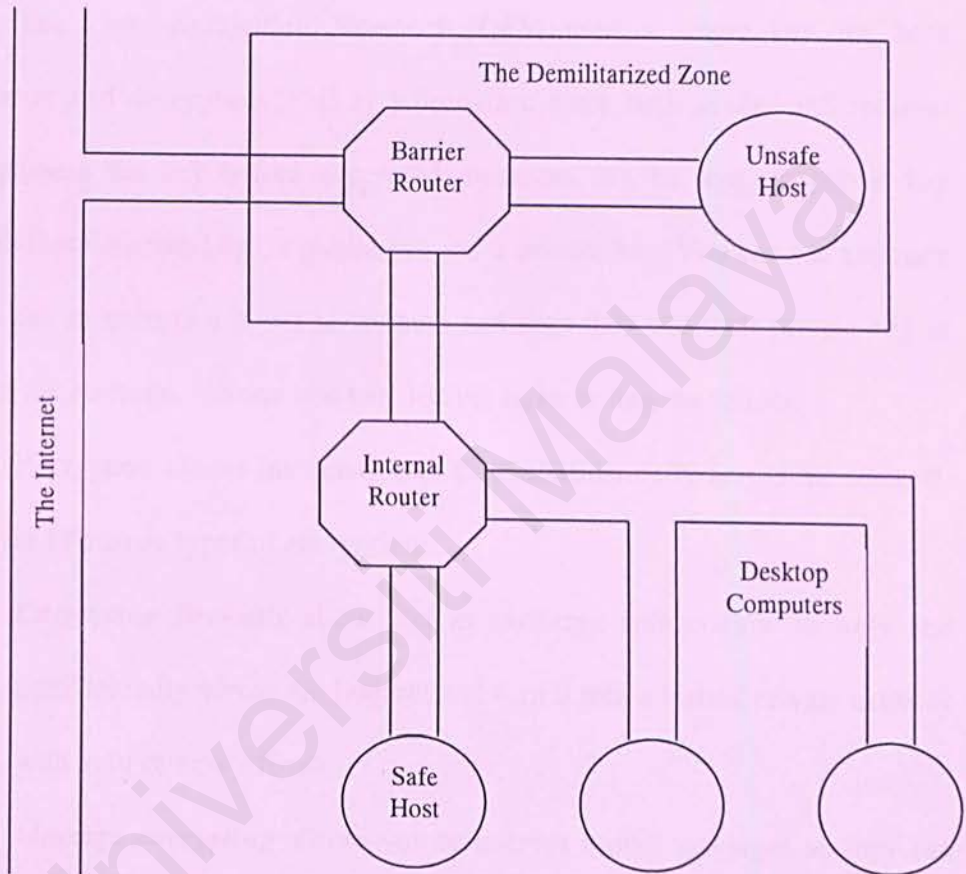
Figure 2.5: Firewall architecture

- **Encryption**

    The highest level of security is encryption. Encryption secures data during transfer and storage even if authentication and filtering techniques have failed. Encryption is also the scrambling of information to make it completely

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unreadable. On the other hand, decryption is the process of unscrambling the message once it reaches the intended receiver. In computer encryption systems, software programs called keys are used to encrypt and decrypt messages. There are single key and public key systems.

The *Data Encryption Standard (DES)* uses a single key for both encryption and decryption. This is a limitation since both sender and receiver must possess the key before encrypted messages can be sent. In public key systems there are two keys, a public key and a private key. You can use anyone's public key to encrypt a message to them and then they use their private key to decrypt the message. No one else can decrypt it, including the sender.

Encryption allows information to flow confidentially across the internet. There are two basic types of encryption:

i) *Encrypting firewalls* allow you to exchange information securely and confidentially across the Internet and turn it into a virtual private network with your remote offices.

ii) *Message encrypting* allows you to encrypt e-mail messages so they can securely and confidentially traverse the Internet.

2.12 Intranet Return on Investment

The Intranet can save money in many different ways. Some companies are reporting an incredible 100% return on investment within six months. Here are the main areas where companies will see *cost savings*: [4]

- Easier online publishing enterprise-wide means less need for printing, copying, mailroom and delivery costs.

- Single-source web site serves the entire enterprise, which means less need to distribute copies of documents, data, or media. Everyone accesses the same copy. As soon as it is updated, everyone has the latest version

- The web browser can become a "universal window" on all information; a "universal client" for all applications. Instead of having a separate software package for each type of information, you can now access everything through a single software packages. This cuts down on software purchasing costs, installation, maintenance and training.

- There are many intangible areas where cost saving may be achieved. Using an Intranet makes it much easier for people to find information they need fast. Phone tag and "floppy disk retrieval" is reduced significantly.

In addition, Intranet can also help a company to *increase productivity*. Productivity increases from intranets arise from more rapid and easier access and exchange of information. Intranets also allow for flexibility in the time of delivery of information. For example, by making training materials accessible through an intranet to

the desktop, employees can schedule training during free times, rather than be interrupted during key projects.

Benefits from increased productivity are more difficult to measure than savings from the reduced cost of printing and distributing manuals. Businesses that budget, track and bill employee time in hourly increments, such as accountancy, consulting and law firms, have an advantage in this regard.

In addition to making information more easily and quickly accessible, an intranets facilitate a global exchange of information that enables true "24x7" organizational productivity. For example, an intranet linking design centers in Asia, Europe and the US helped engineers craft the 1996 Ford Taurus.

Sales support is the arena in which intranets may ultimately generate the greatest return on investment. Here, productivity gains are measured in sales closed rather than minutes saved. Many companies are using intranets to efficiently connect the field sales force personnel to the home office and link sales representatives each other to obtain product information, or collaborate on pursuing sales leads.

By integrating its external and internal Web sites, a company can create a powerful, holistic information system to distribute and gather information from customers to tailor the sales approach to their needs, close the transaction, and provide low cost after the sale service. In today's highly competitive global marketplace, that translates into a competitive advantage in terms of shorter cycle times in identifying and closing prospects, and building ongoing customer relationships to maintain and build business.

2.13 Intranet Trends In Future

Major intranet trends are listed as follow: [5]

- Customers are becoming the focus of the system
- Information is moving to where it's needed
- The web is becoming a utility
- It's being integrated into all business processes
- It's increasing collaboration
- More interesting applications are coming to market
- More sophisticated development methods and strategies are developing
- Less is more
- More companies are attempting knowledge management
- It's leading to new business opportunities and revenues
- Training will change
- Differences in operating systems will become inconsequential

Trend 1: Customer Are Becoming the Focus of the System

When companies began to deploy web systems five years ago; the focus was on providing easier access to information. These systems soon evolved into tools that simplified and enhanced customer interactions, in addition to helping companies get to market faster and create new online business opportunities. In current year, companies focused on *helping make the customer more successful*, and in the *process reap customer loyalty and profits.*

PHH Vehicle Management Services is an excellent example of this trend. PHH is a large vehicle fleet-management firm. Its site targets clients' feel managers with custom views of data on vehicle and driver safety, asset utilization and depreciation, and vehicle model cost analyses (which shows how much it costs to use specific models of cars). PHH makes this information available to its customers so that they can manage their fleet more successfully. In return, the customers are more loyal to PHH and its services, which help PHH, become more successful.

Dell is another example of a company whose website is focused on helping the customer succeed. Its Premier Page Service simplifies the corporate ordering process for over 10,000 of its customers. Offloading the ordering process provides Dell customers with an online, single point of entry into thousands of pages of customer-specific information, support and reports. It helps customers standardize and manage their PC purchases, giving them faster access to their order and purchasing information — clearly a big win for them. And it's not a bad deal for Dell, which, as a result of offloading the more tedious aspects of customer management, can have its sales force focus at a higher level, spending more time building customer relationships and cultivating additional sales opportunities.

What can companies learn from this trend? Companies all need to focus on making it as easy as possible for customers to work with them or with each other. Companies need to become indispensable to customer. Companies need to look at whether the data collected for their own purposes could help customers.

Clearly, making it easier to do business with company can mean more profit, but, more important, in the long term it can help develop customer loyalty.

Trend 2: Delivering Information where it's needed

Companies are now delivering information to a wide variety of locations. For example, Mazda North America gets information down to the repair shop floor, where mechanics access details about a car by its VIN. In addition, Milwaukee-based Cleaver-Brooks is delivering design information to boiler rooms, helping 10,000 engineers worldwide design and specify products better, faster and more accurately.

We should not assume that only internal management or office functions need web-based information systems. We need to look for opportunities *to deliver information to whoever needs it across the enterprise.*

Trend 3: The Intranet Is Becoming a Utility

The trend of the intranet becoming critical for doing business continues. For example, 98 percent of *Cisco*'s employees use their intranet on a regular basis, and Cisco enjoys one of the highest revenue per employee in the industry. *Toshiba* reports that 96 percent of its dealers, along with all of its employees, use their "Internet FYI" system. At *Ford*, the motto is "the web is the way," and the goal is to have as many employees as possible find the highest percentage of the information they need on the intranet. Ford set up formal targets to measure this and reports that it exceeded its goals last year, as 100 percent of the vehicle teams find 90 percent of the information they need to do their jobs online. There

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are over 120,000 workstations within Ford and its suppliers, accessing thousands of sites. This capability has helped Ford reduce the time it takes to get new models into full production from about 36 months to 24 months — at a significant cost savings.

What can companies learn from this trend? At each company in which the web was becoming a critical part of doing business, we notice strong support and funding from senior management. Several of these companies started their intranets as random, scattered projects, but they now have moved to a more planned evolution process, with the levels of investment needed to support scale and widespread deployment.

Trend 4: Integration into All Business Processes

One of the key messages from the companies in this category is that value is best created by deep integration with the entire business process. At *Cisco*, each of its 16,000 employees is considered a web developer, all systems development is web-based and all web development is funded by the business. Cisco calculated its ROI for web work at $35 million per year.

This trend is closely tied to the one of viewing the web as a utility. Both require significant changes in attitude and approach by management. If the web is going to be a utility, it needs to behave as a utility — it had better be available when it's needed and be able to scale as the business grows.

Trend 5: More Interesting Applications

This is not to take away from the fascinating applications which have been received in years past, but find out a number of especially interesting ways of deploying the web. For example, there is the "Ask Mom" section on Remedy's intranet, Sandia's rumor area, the ticker that tracks the status of major projects, National Semiconductor's tools that help customers create homepages, web construction kits and services provided by other companies that provide ISP services for their employees.

Trend 6: More Support for Collaboration

More webs are helping people work with each other, not just inside corporations but also with other business partners. One of the best sites for this trend was the *Oncology Research Center*, which supports collaboration between people who would otherwise find it difficult to work together. The system continually scans cancer patient records for potential matches against clinical trials, looking for possible matches. When it finds one, it e-mails information to the physician, helping her stay aware of all possible treatment alternatives. If a doctor wants to learn more, it provides a virtual conference room so that the physician, sponsors and administrators can collaborate on possible treatments. This service provides powerful information for people who might otherwise never know of the alternatives.

Collaboration will prove to be one of the more important values of intranets. At the same time, aware that true collaboration is difficult because it

often directly challenges existing management structures, as the best collaborative environments have little formal structure.

Trend 7: More Sophisticated Development Models

As the web becomes more important to businesses, companies are become smarter about how they develop, maintain and extend their internal systems. **PHH** (refer to trend 1) has adopted the "design big, build small" approach, which allows the company to extend its web piece by piece, based on an existing model and architecture. Several larger companies, like Cisco and Ford, provide central support groups for cross-company tools and support, while allowing local groups to develop what they need to support their own business. Many of the larger sites are addressing the issues associated with scalability, such as using three-tier architectures.

We were impressed with the emerging focus on usability and stress testing, as companies looked for ways to get better feedback on how well their intranets were working.

Along with sophisticated development approaches, we saw more sophisticated funding models emerge. *Ford* adopted a one-year grace period before charging for Web support to help reduce business reluctance to using the web. We saw more support for central teams to provide common tools, and we saw more local development to support business-specific needs.

Trend 8: Less Is More

As we combed through this year's applications, we saw that while more companies are formally funding web projects, they are *not building large teams to accomplish their internal systems*. Many are deliberately keeping their teams small. At the same time, several companies noted that they are avoiding "sexy" technologies, instead looking for ones that are "application appropriate."

They build mission-critical systems with relative handfuls of people, by focusing more on planning and design (both technical and informational). One of the best examples is *Nortel*. Nortel has a well-thought-out information architecture that supports dynamic information delivery, with built in support for workflow. It leveraged the years of experience it had in information management and large-systems development as it grew their webs.

Clearly the lesson here is that successful intranet teams have figured out how to effectively leverage small teams across large corporations. These teams are given senior management support, adequate funding and focus on the issues that affect the entire corporation — scale, shared applications, publishing, policies, management and so on.

Trend 9: Creeping Knowledge Management

Companies that have started knowledge management deployments report that they are better able to compete. For example is a deployment at Cisco, where they were built around classes of people, Ford and some of the consulting companies. One example was Web Knowledgebase, which has a robust set of tools to help its staff find out who is doing what. These tools include a project

registry, a technology and a methodology library, employee profiles and discussion areas for consultants.

The successful sites seemed to focus on approaching information sharing through the sharing of stories and ideas within communities. Stories have always been how we best communicate with each other (and with later generations), and they allow readers to tailor what is learned to their own situation. Building communities creates groups who want to hear similar stories, as they share similar challenges.

Trend 10: New Business Opportunities

As companies do a better job of capturing and sharing information, some are finding new opportunities. For example, *CKS*, which focuses on capturing knowledge from it's over 2,000 employees, found that the company had skills internally that were not obvious, leading it to extend its offerings. Hire Quality moved the internal systems it had to track job candidates to the web, and in the process it found opportunities to franchise its candidate signup, recruitment and tracking tools.

Trend 11: Training will change

Since browsers are so easy to use, they require very little training. Once they are the universal front end, users will no longer need training in how to work applications. What they will need, in order for businesses to complete effectively, is training that focuses on the nuances of applications and how to get the most business benefit from them. There have been predictions for years that

computer-based training (CBT) would replace traditional classroom training. This hasn't happened, and won't, because some training works best in a classroom. However, for training that doesn't require a classroom setting, there is a real advantage to delivering it just-in-time via the internal web. Users access the most up-to-date version of the training, and it's available when they need it.

Trend 12: Differences in operating systems will become inconsequential

When people can access everything from the web browser, then differences in operating systems will become inconsequential, and distinctions between operation systems may go away. People won't worry so much about which operating they use, as their browser will provide most of the functionality they will need.

2.14 Examples of Organizations Using Intranet

From on our researches and studies, we found that the content of an intranet is based on the operations and the fields an organization involves in, which is to say that different organizations apply or use the intranet correspond to their organization's needs and business requirements. In this section, we list two examples of organizations to compare what they wish to obtain from an intranet implementation and the contents overview of their intranets.

A. Malaysia

2.14.1 Amal Asurrance, Malaysia

2.14.1.2 Company Background

AMAL Assurance Berhad was established in July 1992. AMAL is a subsidiary of Commerce Asset- Holding Berhad (CAHB) the 5th largest public listed company in Malaysia (by market capitalisation).

Amal has operations covering over 30,000 individual lives and approximately 200,000 lives in group insurance across the length and breadth of Malaysia with a turnover of over RM 52 Million in the year 1999. AMAL has more than 10 branches spread across Malaysia with a total employee base of app. 160 and an agency network of app. 400.

2.14.1.3 Intranet's Objectives

To apply an Intranet-based application to facilitate the employees of AMAL Assurance Berhad to:

- Access Company, Departmental and HR information on-line

- Get personalized information and personalized pages

- Conduct and Complete Employee Appraisal online, and

- Participate in community activities

2.14.1.4 Intranet Contents Overview

Intranet of AMAL Assurance Berhad contained the following modules:-

- General information
- Human Resource
- Site Administration
- Personalization
- Community
- Personalization

B. International

2.14.2 Indian Farmers Fertilizer Cooperative Limited (IFFCO)

2.14.2.1 Company Background

Indian Farmers Fertilizer Cooperative Limited (IFFCO) is a Major Producer and Distributor of Fertilizer in India's Cooperative Sector. The distribution of IFFCO's fertilizer is undertaken through over 35,000 co-operative societies. The entire activities of Distribution, Sales and Promotion are coordinated by Marketing Central Office.

2.14.2.2 Intranet's Objectives

To apply an Intranet-based application to achieve following objectives:-

- Increase efficiency of the working system

- Reduce overheads in daily routine works

• Identify bottlenecks in the operations & devising possible solutions

• Monitoring performance at employee level.

• Better coordination between Plants and HO.

• Simplified & user friendly system

• Web enabled Human Resource Management System to be deployed across IFFCO.

2.14.2.3 Intranet Contents Overview

Intranet of IFFCO contained the following modules:-

• Security

• Administration

• Establishment

• Benevolent Fund

• Time Office

• Contractual Labor

• Loans And advances

• Payroll

• HRD

• MIS

2.15 Comparison between the Existing Intranet System

In order to obtain a better understanding about the Intranet in real IT world, we have reviewed several existing Intranet website and Intranet solutions in market. The purpose of examining existing system is to determine weaknesses and advantages in the system. Therefore, this good point can be taken as a reference to enhance and sophisticate the incoming Intranet system.

We choose some existing Intranet systems randomly from organization in Malaysia and also international country. To make sure there are no redundancies, they are from different URLs. Moreover, each of them has their own objectives and scopes. However, these existing systems have some similarities among their characteristic.

A. Malaysia

2.15.1 DOSM (Department of Statistics, Malaysia)

2.15.1.1 Overview

DOSM Intranet was implemented in the middle of 2001 connecting the HQ and the 13 states offices via multiple servers. **The main objectives in having the Intranet are to support the department mission by strengthening organizational relationships and communications.** The Intranet enable almost all staff to communicate via Intranet Web Mail, common information distribution and sharing such as newsletter, news bulletin, telephone directory, courses program, circulars and local favorites URL. DOSM's Intranet also provides on-line services or database web applications

among the staff such as on-line Helpdesk, Personnel System and Computer Equipment Inventory.

DOSM's Intranet contained the following modules:-

- News Bulletin
- Telephone Directory
- Helpdesk
- Personal System
- Statistics Term

- Courses Program
- Circulate and Favorite URL
- Intra Web Mail
- Computer Equipment Inventory

The tools for DOSM Intranet are as follows:

- multiple servers in DOSM --> (Web hosting)
- Microsoft Windows NT 4.0 service pack 6.a --> (OS)
- Microsoft IIS 4.0 --> (Web server)
- Dell PowerEdge 1300, HP Netserver & Digital HX 6000 Series --> (Server)
- 8 mbps --> (Bandwidth in Putrajaya)
- Ceaurux --> (Firewall product from South Africa)
- Top Layer --> (Web Cache)

2.15.1.2 Screen shots

Examples screen shots of DOSM's intranet are shown as follow:-

Figure 2.6: Homepage of DOSM
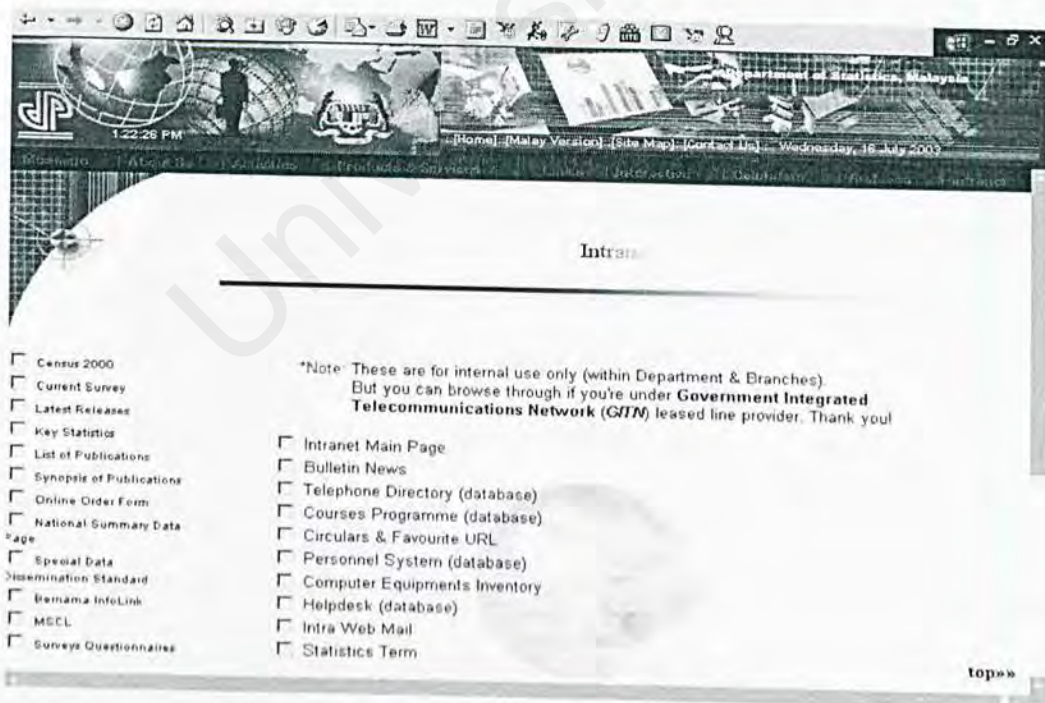
Figure 2.7: Main page of DOSM's Intranet

2.15.2 Ix Enterprise
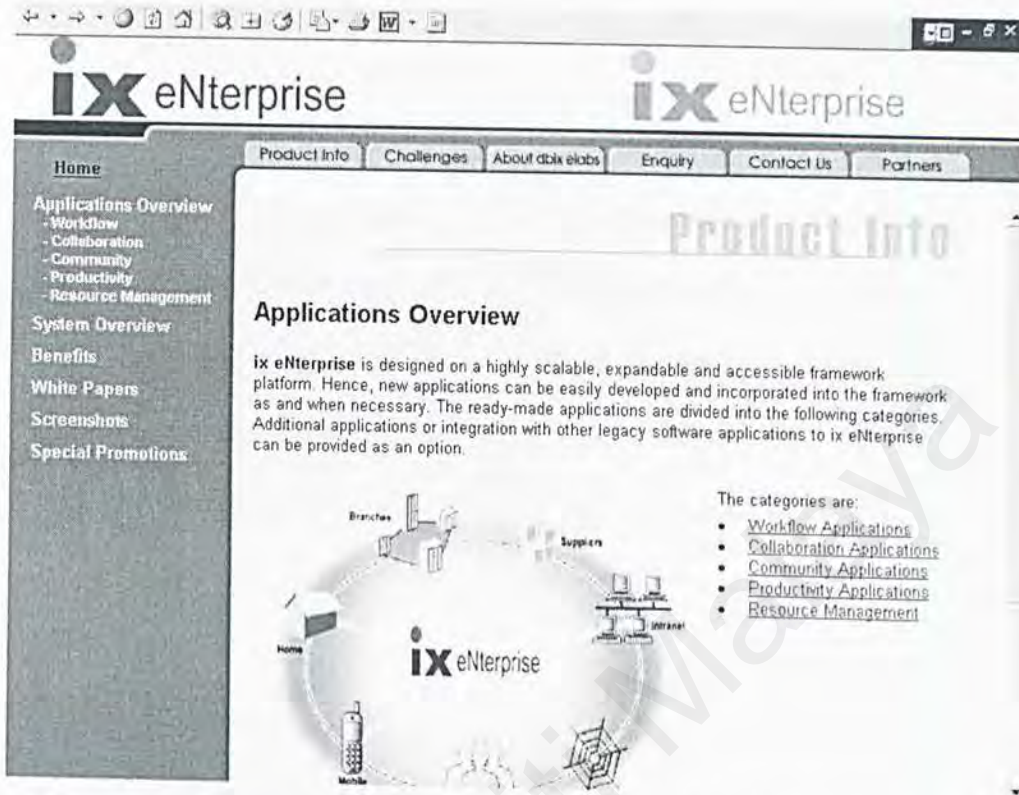
Figure 2.8: Homepage of Ix Enterprise (http://www.dbix.com.my/ix/)

2.15.2.1 Company Background

Ix Enterprise was short listed as one of the finalists in the "best software applications" category of MAS-APICTA Award 2002. It is a fully web-based, XML-compliant solution suite based on J2EE™ standards. This solution suite provides scalability for future expansion that will meet enterprise level requirements for increased number of users and volume of processes. Ix Enterprise displays a user-friendly browser-based interface that enables simple navigation throughout the application modules. [6]

2.15.2.2 Intranet Contents Overview

Intranet of Ix Enterprise contained the following modules:

- Calendaring & Scheduling
- News and Bulletin
- Claim Management
- Tasks Management
- Forum
- Meeting Facilities
- E-mail

- Contacts Management
- Employee Directory
- File Exchange
- Project Tracking
- Leave Management
- Time Sheet
- Business Representation

2.15.2.3 Advantages of Ix Enterprise Intranet System

- **User-friendly interface**

  Provides a simple, attractive and user-friendly interface which ease user navigation

- **High performance**

  It is developed to run on web server and use browsers as the interface. It means that the system can handle concurrency with multiple user access the system at the same time without any problem

- **Easy administration**

  The Intranet's administrator is provided with a set of tools that is easy to use which requires no technical expertise to administrate.

- **Easy to use**

  It is a browser-based system which means no user training is required in order to use the system

- **Up-to-date**

  It is cover sufficient services required by today typical Intranet environment

2.15.2.4 Disadvantages of Ix Enterprise Intranet System

- Lack of departmental management features such as Human Resource, Marketing, Administration, etc

- The system does not provide any reports generation tool which is useful for the management level staff

2.15.2.5 Screen shots

Example screen shots of Ix Enterprise Intranet System are shown as follow:-

Figure 2.9: The Project Tracking Application

Figure 2.10: The Billable Timesheet Application

2.15.3 Leong Hup Holding Berhad (LHHB)
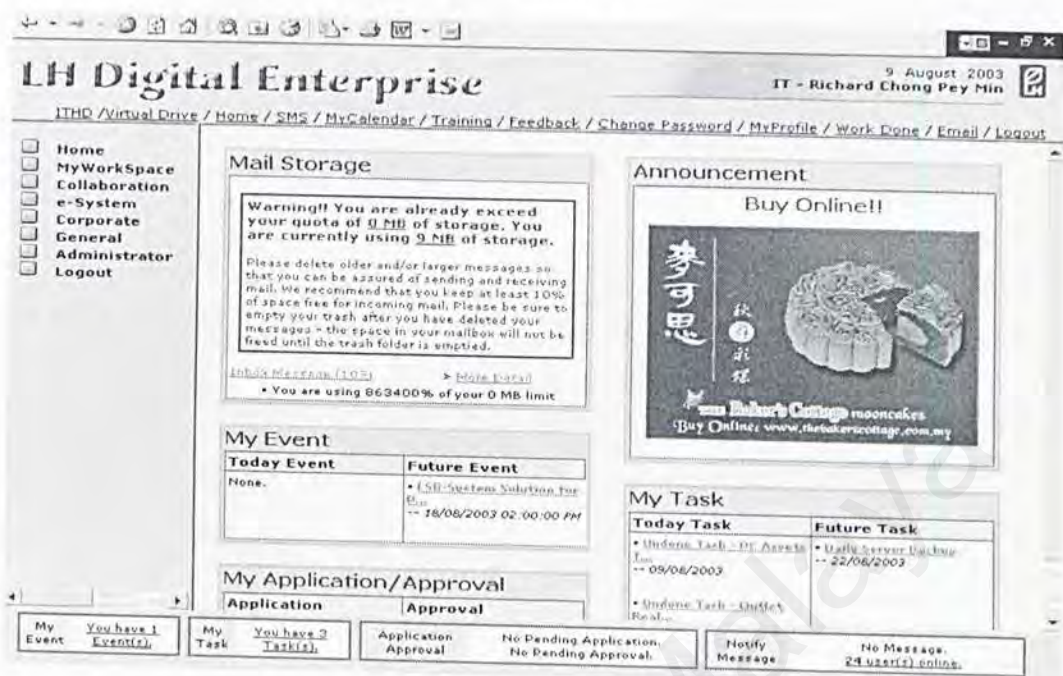
Figure 2.11: Homepage of LHHB (http://www.lhhb.com/intranet)

2.15.3.1 Company Background

LHHB is stand for **Leong Hup Holdings Berhad**. It is a listed company. LHHB is a large and well-established diversified group of companies involved in poultry farming, property development, and hotel industry and currently embarking on various expansion plans. There are total 12 subsidiaries of Leong Hup Group Of Company. 10 of the subsidiaries company are located throughout whole of Malaysia. Although the Group's focus presently will be on Malaysia, LHHB's investments in the Philippines and Indonesia will allow it to widen its earning base in the very near future. These ventures represent the gateway to further regional opportunity ahead. [7]

2.15.3.2 Intranet Contents Overview

Intranet system of LHHB contained the following features:

- Announcement
- Task Management
- Calendaring
- Short Message
- User Brief Information Listing
- E-mail
- Leave Management
- Virtual Drive

- Event Scheduler
- Claim Management
- Contact Management
- User Extension Listing
- Chat Services
- Forum
- Facility Management
- Intranet User Maintenance

2.15.3.3 Advantages of LHHB Intranet System

- **Provides many collaborative and communication tools**
- **Provides an attractive and user-friendly interface**
- **Requires no technical expertise to administrate**
- **Easy administration**
- **Ease to use**
- **High performance**

B. International

2.15.4 A Hosted Intranet Services (Intranets.com)

2.15.4.1 Overview

Intranet.com has provided a hosted intranet service, which offers a complete suite of essential intranet applications for collaborative work. A hosted intranet makes this available via the web, using just a computer with Internet access and a web browser. There is no special software to download and install.

A complete suite of intranet applications provided by Intranet.com consists of the following module:-[8]

a) Document Manager

The Document Manager allows the user to securely share documents, files and other content within his or her company and with remote workers and business partners. The authorized users have secure access to important files at any time, from anywhere. The Document Manager application runs in the powerful, industry-standard .NET architecture to optimize performance and allow for future enhancements.

b) Online Calendar

The Online Calendar allows user to keep track of personal appointments, group meetings and company-wide events. With the built-in permissions system, user can share access to the calendar with colleagues who need to

know his or her schedule, while maintaining the privacy of personal meetings.

c) Task Manager

The Task Manager can be used to keep track of personal action items, or delegate tasks to subordinates or members of a project team. The user can follow the progress of a task from start to completion, and can view status by owner, project or other criteria selected.

d) Discussion Forums

Discussion Forums can be used to exchange important ideas and information. Topics and responses appear in structured, hierarchical "threads" that make reading and responding easy. More comprehensive than chat sessions or e-mail, Discussion Forums can keep a permanent history of conversations among all users. This tool is indispensable for joint file editing, team projects, brainstorming and other collaborative work.

e) Email Accounts

The Email application is a convenient, full-featured, web-based email program accessible from the intranet site. Each user is assigned a personalized email address that uses his or her organization's intranet address. The Email Application also enables its users exchange email with anyone in the world. It let the users conveniently send and receive email while they are doing other work on their intranet.

f) **Administrations Tools**

Intranets.com provides a simple but powerful set of tools to customize the look and feel, control access, and monitor usage of the intranet. Intranets.com also provides a wealth of customization and configuration options so that users can easily integrate their intranet site into their daily operations.

g) **Database Manager**

The Database Manager allows users to organize, store and share their important business information with ease. Sales reports, client records, project deadlines, knowledge bases and inventory reports are finally located in one centralized place

h) **Announcements**

Announcements module enables important company-wide information to be posted on intranet home page where the employees can't miss it. Announcements keep everyone in the group up-to-date on the most critical information they need to get their job done.

i) **Contact Directories**

Outside contacts and intranet member information can be stored in the Contact Directories application. The Contact Directories application is

designed to hold information for contacts both inside and outside the user's company.

j) **Opinion Polls**

The Opinion Polls application allows the user to build consensus among co-workers, or simply understand what the group is thinking so that he or she can make better informed decisions for their business.

k) **Expense Report**

The Expense Reports application provides a standard interactive form for employees to submit all work-related expenses for reimbursement. Expense Reports application can be customized to meet the company's needs by defining expense categories, mileage reimbursement rate and local currency.

2.15.4.2 Strengths of Intranets.com Hosted Intranet Services

After analyzed all the modules provided by Intranets.com hosted intranet services, we found that there are several useful features offered that should become a guidelines for us in our system design later. **The advantages of this intranet solution are as follow:-**

1) **Good GUI (Graphical User Interface) design by incorporating human engineering factors into design such as follow :-**

   - Use simple, grammatically correct sentences.

- Message, instructions, and information are displayed long enough to allow the system user to read them.

- With respect to errors, a user is not be allowed to proceed without correcting an error.

- Provide instructions for the system user on how to proceed, back up, exit, and the like.

- The screen is formatted which the various types of information, instructions, and messages always appear in the same general display area.

2) **Customized option built into service. The applications can be fully customized, but creating new applications requires considerable effort.**

3) **Online documentation is available with customizable solution.**

4) **Fast and easy. This customizable intranet application service can be up and running in minutes.**

5) **Compatible with major operating systems, network systems, browsers and etcetera.**

6) **High reliability which it has been extensively tested before released to the market.**

7) **Stress on user-friendliness by taking into account of expert user and novice user.**

2.15.4.3 Screen shots

Examples screen shots of Intranets.com Hosted Intranet Services are shown as follow:-

Figure 2.12: The Online Calendar application
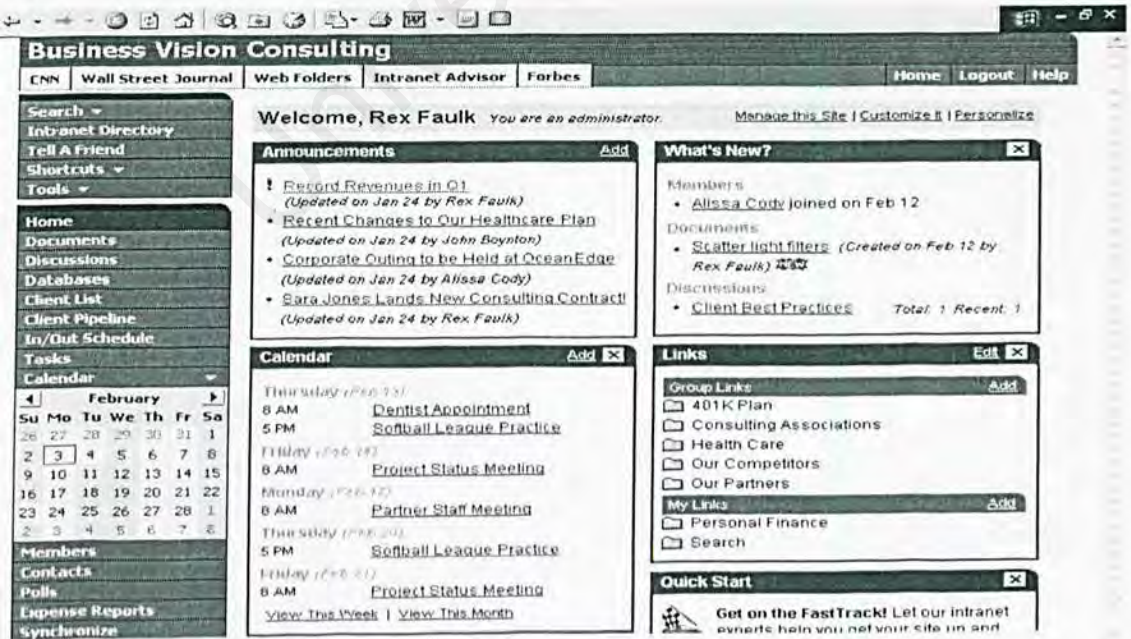
Figure 2.13: The Announcements application

After review the different existing intranet systems stated above, we summarized and compare some main features of these systems in the table shown as below :-

Table 2.4: Summary of comparison between existing systems

Features	Organizations			
	Malaysia			International
	1	2	3	4
User Validation (Login ID and password)	√	√	√	√
Graphical User Interface (GUI)	√	√	√	√
Navigation Button	√	√	√	√
Search Function	√	√	√	√
News Bulletin / Announcement	√	√	√	√
Online Calendar / Scheduling		√	√	√
Task Management		√	√	√
Help Desk	√			
Discussion/ Forums		√	√	√
Employee Directories/ Contact Management	√	√	√	√
Expense Claim		√	√	√
Opinion Polls				√
Chat Services		√		
E-mail Accounts	√	√	√	√
Web Links	√			
Facility Management	√	√	√	
Leave Management		√	√	
Document Management		√	√	√
Simplicity (Easy to use and understand)	√	√	√	√

Notes:

1 – Department of Statistics, Malaysia (DOSM)

2 – Ix Enterprise

3 – Leong Hup Holding Berhad (LHHB)

4 – Intranets.com

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2.16 Case Studies about Intranets

2.16.1 A new system in University Putra Malaysia (UPM) intranet , e-Klinik

In this year, University Putra Malaysia (UPM) had successfully launched a medical information system which is accessible via UPM intranet. This new system, simply called UPM e-Klinik is a complete and comprehensive information system that takes care of the medical information needs of the students, staff as well the general public within the compounds of the campus. The e-Klinik system runs on Sun Fire 280R Server, which operates on Sun Solaris 8 Operating System alongside the Oracle 9i RDBMS and Orion Application server. The entire system is developed using Oracle 9i J Developer.

The e-Klinik system is built as a web-based application, which operates at all the time and can be accessed using Microsoft Internet Explorer. Primarily, it caters for medical and dental consultations. This system is integrated with other systems within UPM namely IHRAMS, which is the Human Resource and Payroll system, SMP, which is the student information system and EIS which is the statistical reporting system. The system integrates data, which are tabulated for record purposes, complaints and to search for information.

The e-Klinik system is comprised of the following 9 sub-systems:

- PMS - Patient Management System

- PhIMS - Pharmaceutical Information Management System

- RMS - Resource Management System

- LIMS - Laboratory Information Management System

- RIMS - Radiology Information Management System

- SIMS - Statistical Information Management System

- PQMS - Patient Queuing Management System

- CMS - Calling Management System

- Medical check-up Module.

Among the benefits of the e-Klinik system is that it enables the clinic consultation and medication processes to be as paper-less as possible, from patient information, medication disbursement, setting appointments to view of stock level of drugs and online reporting. Patients no longer have to carry their medical papers from one division of the clinic to another. All the information is disseminated via a workflow within the portal. For example, instead of writing an x-ray instruction on a form and getting the patient to pass the form to the x-ray department, the radiographer can access the instruction via the e-Klinik application. All records are kept in the e-Klinik database. This ensures records are updated instantly and are kept securely. Figure 2.14 and 2.15 show the examples of user interfaces in the e-Klinik system.
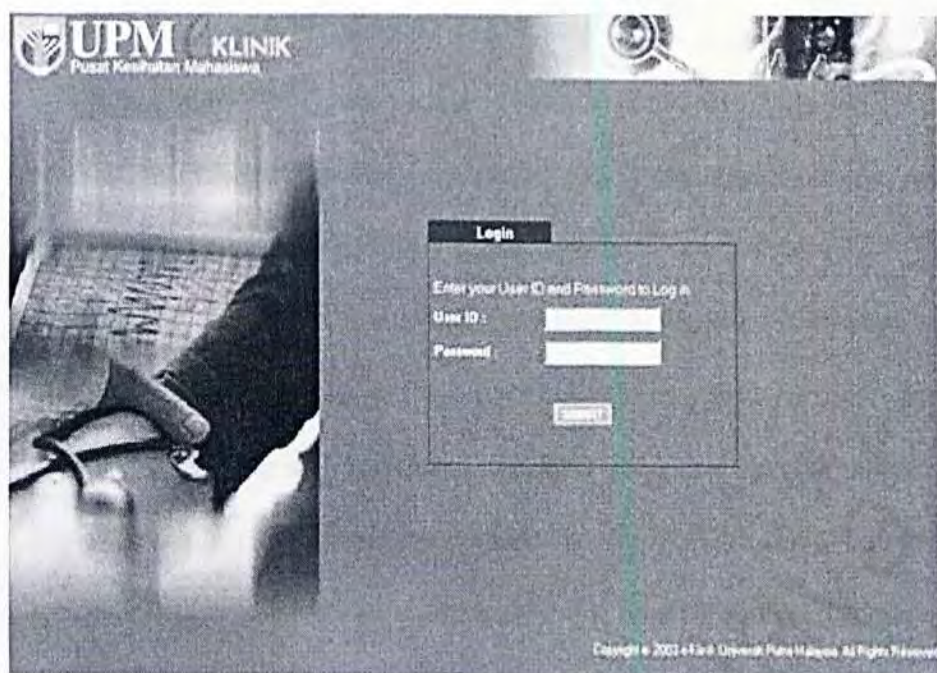
Figure 2.14: Login page for UPM e-Klinik system

Figure 2.15: A patient details page

2.16.2 Building Campus Network at UiTM

Universiti Teknologi Mara (UiTM), one of Malaysia's premier institutions of higher learning, is *building one of the largest campus networks in Asia with 10 Gigabit Ethernet solutions* from Cisco Systems.

UiTM vice chancellor Datuk Seri Prof Dr Ibrahim Abu Shah said the project was implemented as the university was in *need of an infrastructure capable of creating a world-class e-learning environment, and to cope with a fast-growing staff and student population.* In addition, UiTM *opted for a network that is reliable and scalable,* and one which *can accommodate future technology advancements.* This network supports the convergence of storage, data and multimedia at consistent speeds. As a university that prides itself on academic excellence and the development of the next generation of technology leaders for Malaysia, it is important that we keep pace with advancements around the world. Furthermore, in order to become a world-class university, UiTM need to provide world-class facilities with a highly dependable communications infrastructure.

The network, with a total capacity of 5.5 terabits per second (Tbps) – 55,000 times faster than a 100Mbps Fast Ethernet network – will *enable UiTM to deliver high-speed Internet and intranet access to its 86,000 students and 8,000 staff members at its main campus here and all 14 branch campuses nationwide.* All UiTM's branch campuses located throughout the country will use the main campus' backbone for intranet and Internet access. [9]

2.16.3 A brief case of U.S. Atlantic Command Intranet

The U.S Atlantic Command (USAC) has implemented an intranet that is the first of its kind among military organizations. The USAC is headquartered in Norfolk, Virginia and is the brain center for the U.S. military's largest joint command. In sum, it has authority over 1.2 million of the military's 1.5 million active-duty personnel, and defense responsibility for most of the U.S., the Atlantic Ocean, Europe, and the west coast of Africa.

The biggest problem with USAC operations was related to the departmentalization of information. For example, the operations department, headed by an Army officer, had difficulty sharing information with logistics, headed by Marine officer. Likewise, the strategic planning group, headed by a Naval officer, did not know the plans and information of the intelligence unit, headed by an Air Force officer. *Thus, one important goal of the intranet was to break down the information-sharing barriers.* A key aspect of this inability to share information was the security of the information. Although the USAC already had a secure network, getting to the point where divisions actually shared critical information was their biggest challenge.

For example, each day, more than 40,000 messages from around the world flow into the USAC's message-handling system. Of these messages, 250 to 300 require some sort of action and response. In the past, there are about 30 officers reviewed and sorted the same 40,000 messages each day to identify the critical messages for their divisions. In addition, they were unable to route messages to the most appropriate division because no information- forwarding capabilities existed.

Today, within the USAC intranet, messages are sorted by only two people and automatically forwarded to the appropriate division. Critical messages, such as news of a coup in a foreign country or notification of natural disaster requiring military relief assistance, can be routed to top commanders. Lower-priority messages are routed to the appropriate levels. *As a result, this intranet is changing the way information flows and is enabling the USAC to do more with less.*

2.16.4 Intranet at Postgirot Bank

Postgirot Bank is the leading bank on Swedish payment market. During 2000 they contributed to the exchange of approximately 5,000 billion SEK divided into 430 million business transactions. The customers include 425,000 companies, associations and other organizations as well as 800,000 private customers. Postgirot Bank has approximately 2,500 employees.

Postgirot Bank needed an effective intranet. The overriding ambition was to make it a practical work tool for the 2,500 employees. The former intranet made high demands on the Information Department because the information had to be published quickly and be constantly updated. The choices was between upgrading the current information system and make it more user friendly and less demanding to administrate or start all over again with something new. At last, Postgirot Bank decided to choose a solution (Roxen CMS), which was implemented on a Windows NT platform. The first contact with Roxen was made in August 1999. The contract was signed in November and the new intranet was launched in February 2000.

The intranet has had great impact and made the internal handling of information more efficient. Today, it is a vivid tool that efficiently supports the work processes. The local distribution of information has made the intranet process and business oriented. On the intranet today there is everything from templates, time schedules, project pages, sales material and various calculation programs. It is therefore of highest importance that it always accessible and working.

It has also shown that the dispersal of information and interactivity amongst the employees have increased evidently. Now the latest information is available on the intranet. Today, everyone can build their own intranet page with text, pictures and links, independently of where and who they are. All that is needed is a brief introduction of the system. This helped achieve another company goal, increasing the IT maturity amongst the employees.

The big engagement in the intranet has resulted in employees being very keen on having their information published there. There is a great demand from the employees to work with the intranet as a publisher of information. Earlier there were approximately seven publishers, but today the number is around 300. The former intranet system depended on consultants, for example, for updates, which lead to high costs. Nowadays they appreciate being themselves and not the consultants that are in charge of the system.

2.16.5 Americaneagle.com Intranet System

As Americaneagle.com expanded and opened offices across the country, the management of sales, projects, customers, and day-to-day administrative functions became more and more complicated, and the communications within headquarters as well as between the local offices and headquarters became more and more important.

To create a complete intranet system that centralizes many Americaneagle.com functions and that facilitates communication between headquarters and the local offices. The three primary goals of the site were to

- ➢ facilitate sales management,
- ➢ facilitate project management
- ➢ facilitate customer management.

2.16.5.1 Sales Management

To keep track of the sales and marketing efforts, Americaneagle.com created the Web Sales Management System (Web-SMS) and built the tools into the Intranet that enable sales representatives and sales executives to fully track the sales cycle. The Intranet now allows sales executives to automatically assign new sales leads, analyze returns on marketing investments based on leads, and track the performance of individual sales representatives. For the reps themselves, the Web-SMS is even more useful. Through the Intranet, each representative can now track interaction with each prospect, set email reminders to follow-up,

upload proposals and other documents of importance, and compare sales successes with other sales representatives. In addition, a library of proposal-related documents is readily available for review.

2.16.5.2 Project Management

Once a sale is "closed" in the Sales Management System, the Intranet automatically shifts the project to the Project Management Tool. The first feature of the system requires the administrator to assign the project to a specific manager. Once assigned, the manager can completely track the project's evolution from beginning to end, including team member hours, task assignments and automated task requests, client feedback, invoice processing, production schedules and deadlines, and the step-by-step requirements of each project. By identifying and tracking these pieces, anyone in the company can glance at the project details and immediately know the status, schedule, and needs of any given project. In addition, a library of programming and development-related documents is readily available for review.

2.16.5.3 Customer Management

Americaneagle.com has thousands of clients, so the Intranet was built to ensure that quality customer service can be provided quickly and effectively to each client. The Intranet system allows Americaneagle.com customer service representatives to track customer contact information, contract status, billing cycles, project development

background and documentation, Web site "update" history, service notes, and much more. The Customer Service Department relies on the Intranet to successfully manage and process each customer request.

The Americaneagle.com Intranet system has significantly streamlined operations across the board as the company has expanded. From the initial lead management to project development to post-development service, the Intranet enhances Americaneagle.com's ability to keep its competitive edge and to ensure the best service possible for our clients.

2.17 The Impacts of Intranet on Organizations

2.17.1 Cost Savings

One great impact of using Internet tools to distribute company information is low cost. The networked PCs are all perfectly capable intranet clients, and browsers are cheap or free. Even the server hardware, software and middleware are affordable. This is the one of most interest to executives. An implementation of intranet in a company can save money on printing, warehousing, and distributing documents. They also save money by eliminating faxes and memos. Since the intranet includes the network, some companies found cost savings through eliminating redundancy in their networks.

Besides that, intranet does not make the wasteful use of the company existing hardware resources. It is because an intranet is compatible with any computer, including Mac OS, OS/2, UNIX, VMS, Window 95/98/NT. And it will be compatible with new operating systems that do not exist today [10] Therefore, it enables cost savings in organization financial in terms of hardware and software technology.

Unlike traditional client-server software that makes organization buy, deploy, support and revision control dedicated client software for EVERY program at EVERY desktop, the intranet automatically downloads small modules on-demand to those who use it. Adding a function to a client is as easy as book marking a URL. So, client software deployment, support and revision costs can be ZERO! [10].

One other large area of cost savings relates to the cost of proprietary solutions. An intranet client is the web browser, like Netscape and Internet Explorer. At most, small plug-ins is added to handle special data types (like a TIFF image plug-in that is priced at $29 each at quantity 20)! [10].With browsers and servers cheap or free, nothing else competes on price for much functionality.

In addition, intranets use the same standards as the Internet, which has demonstrated the ability to scale to arbitrarily huge sizes. Adding parallel servers and parallel network paths is well establish, proven technology. Due to that, services scale easily as demand grows. No overkill purchases will happen.

2.17.2 Time Savings

Another often cited result was time savings. There are a wide range of Web sites with large, spectacular graphics, cool videos, neat Netscape forms, and other bells and whistles. And users probably enjoy them even more if they took seconds, rather than minutes, to download. That's one of the great advantages of an intranet: Videos and sound can load in less than a second. Employees can really push the envelope with the hottest available Web technologies without worrying about performance. When the information they need is only a mouse click away, employees don't waste time trying to hunt things and verify their accuracy. This efficiency turns into greater productivity.

Besides that, the time to develop web-applications for the intranet is reduced greatly, compared to the development time of standard client-server applications. Due to the standardization of the configuration (HTML-

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Browser as client and HTTP as network protocol), there's no need to develop different versions of the same application for different computer platforms and network configurations.

The **implementation time** of intranet applications is reduced too, because they need to be implemented at one place only, the web server, to become effective for all clients. Classic client-server solutions would require installations on all clients as well. The standards of **HTML** and **HTTP** allow deploying intranet web-application fast and easy, because they work on the principle **runs once-runs everywhere**, which is to say if the applications runs with one client, it runs with all others as well. This is of course also true for release updates and changes.

2.17.3 Improved Operational Efficiency and Effectiveness.

With well-designed Intranets, users can do things more efficiently, which allows them to use the time they save to do things more effectively. Turner Broadcasting feels that each employee who learns to use the intranet will be more effective.

The efficiently doesn't just apply to users. Intranets are a welcome relief to IT groups as well. They are easy to maintain, which requires fewer people. SGI, for instance, with over 2,000 servers, has a staff of only five to handle their intranet. (Mellanie hills, 1997)

Many companies claimed that the Web is now their platform of choice for applications development and to modernize their legacy systems. The intranet even allows them reuse software components.

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The end result of all of this for IT is that intranets help the organizations stretch their budgets farther. With the same budget, the organizations can do more things and achieve their targets.

2.17.4 Improved Employee and Organizational Productivity

When an organization has had implemented intranet system, it is inevitable will improve efficiency and productivity because intranet provides faster communication of information and a more intuitive user interface, which improves people's comprehension. Some intranet applications increase organizational productivity, for example, *Electronic Requisition System*, which it uses to manage purchase orders and the associated approval process.

A motivated and informed workforce is critical to business success. Good communication builds employee morale. Up-to-date information makes employees more productive. Intranet technology promotes the efficient use of management, marketing and personnel resources. It is a versatile and low cost communications tool that lets employees share information and ideas electronically.

Some examples on how an intranet system leads to productivity improvement are as follow:-

- Facilitate communications with fulltime, real-time, flextime, timeshare, and telecommuting employees. The organization will have online office that is open 24 hours a day!

- Provide easy access to information, LOTS of information, or just the one right piece of information -- *fast*.

- Distribute training documents, procedure manuals, software and technical updates instantly, without printing.

- Reduce paperwork by filing reports online.

- Keep product descriptions and product information up to the minute.

- Help employees share under-utilized resources, like expensive lab equipment.

- Locate supplies, materials -- ANYTHING -- quickly.

- Facilitate collaboration -- editing, building consensus, getting comments -- on projects by putting working documents online.

- Create an on-line suggestion box to increase morale and productivity.

- Let managers examine progress reports from salespeople on the road and distribute daily work assignments or strategies instantly.

- Employees can collaborate online: planning, design and development can occur in real time even though team members are separated geographically.

2.17.5 Improved Decision Making

Intranets provide timely access to people and information in order to help the organization stakeholders make better decisions. Often, when trying to get answers, people play telephone tag. It's even worse when employees and workgroups span time zones, especially on opposite sides of the globe. If employees don't have information available on them, they may make bad decisions. Even worse, they may make no decision at all because they can't get

the information they need. Things happen slowly until the information becomes available, and in this fast-paced world, not having the right information can lead to lost opportunities.

With an intranet, the answers are at the decision makers' fingertips and they can act quickly to make a decision. Decisions based on facts will inevitably be better than those made without facts.

2.17.6 Improved Communication

In a survey that has been carried out by a company, Novell, asking why organizations want to implement an Intranet, concluded that the most common reason is "improved communications" [11]. Most of the managers are looking to Intranet to enable faster, more reliable and cost-effective exchange of data within an organization.

Some companies build their Intranet specifically to improve internal communications, while others discover that improved communication was by-product of their Intranet (Mellanie Hills, 1997). There are many daily communication activities within an organization that require spending time and money to deal with the activities. Including sending document to remote sides, receiving and responding to voice mail, locating needed information and documents, scheduling conference rooms and staff for meeting. If all this document are published electronically in a standard format that are viewable by everyone in the organization, the costs of searching, replicating and distributing information would be significantly reduced. In addition, with groupware technologies (video conferencing, e-mail, Internet telephony, web-based

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discussion forums), long distance discussions can be carried on in real time with immediate feedback. Due to that, we can conclude that an Intranet provides a cost-effective and efficient way to improve communications.

2.17.7 Increases Coordination and Collaboration

An Intranet enables better coordination and collaboration of workgroups and teams. Collaboration is a medium that lies between messaging and publishing. Collaboration facilitates many-to-many communications. Collaboration allows member of a workspace to come together across geographic and departmental boundaries to solve problems and share knowledge. By allowing people open communication, collaboration makes the transfer of corporate knowledge a reality and boosts team productivity [11]. Many collaboration applications can be building using an Intranet, including groupware, workflow, group memory, calendaring and scheduling.

2.17.8 Capture and Share Knowledge and Expertise

Intranet provides organization a better way and place to capture and share information so that it is always available to anyone who needs that knowledge to perform their job. This can be done through internal web publishing by different departments or through captured knowledge from newsgroup discussion forum. Information can be shared between departments in real time. A user no longer needs to track down the right person to get the correct report or a statement, he/she just need to capture the available knowledge from the

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Intranet. Users can capture the knowledge of the experts, lesson learned, or information about key technologies or procedures. It can also be the foundation to enable communication and coordination among workgroups and project teams.

2.17.9 Provide New Business Opportunities

As companies do a better job of capturing and sharing knowledge and expertise, new business opportunities can be find out. New products and services could provide using an Intranet.

2.17.10 Securing Sensitive Information

In addition to providing the ability to share information, an Intranet can ensure only authorized personnel can access necessary information [12]. Since Intranet is not published online like a website, it ensures that only authorized personnel can access necessary information. It is secure and confidential. Knowledge can be share throughout the whole organization, in a group or to a particular person. Anyone who is not authorized will no able to get and view that sensitive information. A successful Intranet will keep track of the user once user log in to the Intranet system. Only authorize information will be display in the screen and user will be blocked to access unauthorized information.

2.17.11 Provide Access to Accurate and Up-to-date Information

Intranet provides quick and easy access to information when and where needed. Users don't even have to know where the data resides in order to be able to access it. Users can just as easily access something created by the person in the next office as by a person on the other side of the globe. Without an Intranet, users who need information have to go through to know where the information located and to know how to get access to it. Using Intranet, users just need to point and click on the internal web in order to access information needed. Users don't have to waste time going through the files or manuals looking for the same information. Access to information means that an organization can have employees who are more knowledgeable and self-reliant.

Information in an Intranet will be entered by people who can best verify its accuracy. Organization can guarantee the information is most accurate available, as long as organization keep the information on the web server current.

Furthermore, Intranet provides access to more up-to-date information, especially when employees can do their own updates. Updating information is easy because it is posted in the Intranet using Hypertext Markup Language (HTML). Because HTML is simple to learn, employer doesn't have to hire a professional to update organization information, employer can simply train the same people who would have previously updated the information on paper and distributed it. Without an Intranet, it wasn't easy to find out that if employees had the most up-to-date information.

2.17.12 Provide for Creativity and Innovation

Intranet facilitates creative processes. This can be done through discussion forum and chat services for group brainstorming. For example, a product development engineer dealing with a problem could put a description of the problem on an engineering newsgroup and ask for ideas and suggestions. By putting together several of the forthcoming suggestions, the engineer is able to solve the problem and keep the project on schedule. In another example, the engineer who monitors the newsgroup can get ideas for new features for the product being develop.

2.17.13 Provide New Business Partnerships Through Access by Suppliers and Customers

Intranet provides the opportunity to cultivate valuable business relationships with company suppliers and customers through support links with them. Organization can provide them with access directly into company databases, as Federal Express did when it opened up its internal package tracking application to its customers via the internet.

2.17.14 Improved Customers Service

Satisfied customers are the lifeline of organization business. With a well-designed Intranet, organization has immediate access to the information and resources that allow organization to better serve their customers. Inbound and outbound customer contact is improved because of accurate information that is

available in Intranet. Due to that, organization can turn customer's service into a key strategy for attracting and maintaining customers.

2.17.15 Reducing the Administrative Burden

Instead of filling forms/requests on hard copy and needing to past them from department to department for approval, an Intranet enable form to be automatically forwarded the proper standard channel for approval via e-mail or others application without wasting valuable human resources. Therefore, burden administrator will be reduced and they can focus more on performing their critical work.

2.17.16 Access to Internal and External Information

Distribution of documents, files, and data can be done through Intranet. All of this internal and external information can be accessed by users through Intranet. Using resources management, useful links or others applications, users can get others useful external knowledge beside on-the-job knowledge. Users can use search engine which is available in an Intranet to searching information needed and then access to that information. Users just need to point and click on the internal web in order to access information needed.

2.17.17 Solve the Problem of Information Overload

We are living in a society where information overload is increasingly becoming a problem. With the advent of the web and e-mail, the amount of information exploded, and this has serious consequences for the workplace.

Too much information does not cause information overload and the solution conducted is not purpose to reduce available information. Problem of information overload arise when individuals have little control over the information that comes at them. They are buried under a mountain of data. They needs to take mental energy to filter, sort, store, and retrieve all this information. Most of the information is irrelevant and needed to be filter.

2.17.18 Facilitates Organizational Change : Breaking Down Bureaucracy

The first step in organizational change is for the leader to share his or her vision with the troops. The intranet facilitates this communication by directly to everyone so that it doesn't become garbled along the way. This helps develop the shared vision and commitment necessary to propel the organization forward.

With the discussion forums provided in the Intranet system, you can champion your risk takers and make them role models for the rest of the organization. They are the one who will drive the organizational change.

2.17.19 Facilitates Organizational Bonding

One somewhat unexpected result from having an intranet is that it helps build what the folks at Rockwell call a corporate consciousness.

Intranets promote bonding of employees and bonding to the organization. People feel a lot closer and know that they're part of a team. When the organization communicates its vision, goals, and strategies, people know and understand what is happening and why, and become part of making it happen.

There is a few types of networks can be considered when develop an Intranet
system such as LAN, MAN, and WAN. A network is nothing more than two or more
computers connected together by a cable so that they can exchange information. In the
following section, we will discuss on this topic to get a clearer picture on different types
of networks.

2.18   Categories of Network

When we speak of networks, we are generally referring to three primary
categories: Local Area Networks, Metropolitan Area Networks, and Wide Area
Networks. Into which category a network fall is determined by its size, its ownership,
the distance it covers, and physical architecture.

2.18.1 Local Area Network

A local area network (LAN) is a group of computers and associated
devices that share a common communications line or wireless link and typically
share the resources of a single processor or server within a small geographic
area. Most LANs are confined to a single building or group of buildings.
However, one LAN can be connected to other LANs over any distance via
telephone lines and radio waves. A system of LANs connected in this way is
called a *wide-area network (WAN).*

Usually, the LAN server has applications and data storage that are shared
in common by multiple computer users. A local area network may serve as few
as two or three users (for example, in a home network) or many as thousands of
users.

Typically, a suite of application programs can be kept on the LAN server. Users who need an application frequently can download it once and then run it from their local hard disk. Users can order printing and other services as needed through applications run on the LAN server. A user can share files with others at the LAN server; read and write access is maintained by a LAN administrator. A LAN server may also be used as a Web server if safeguards are taken to secure internal applications and data from outside access.

Most LANs connect workstations and personal computer. Each node (individual computer) in a LANs has it own CPU with which it executes programs, nut it also is able to access data and devices anywhere on the LANs. This means that many users can share expensive devices, such as laser printers, as well as data. Users can also the LANs to communicate with each other, by sending e-mail or engaging in chat sessions.

The following characteristics differentiate one LAN from another:

➢ **Topology:** The geometric arrangement of devices on the network. For example, devices can be arranged in a ring or in a straight line.

➢ **Protocols:** The rules and encoding specifications for sending data. The protocols also determine whether the network uses a peer-to-peer or client/server architecture.

➢ **Media:** Devices can be connected by twisted-pair wire, coaxial cables, or fiber optic cables. Some networks do without connecting media altogether, communicating instead via radio waves.

LANs are capable of transmitting data at very fast rates, much faster than data can be transmitted over a telephone line; but the distances are limited, and

there is also a limit on the number of computers that can be attached to a single

LAN.

Figure 2.16 shows the Local Area Networks diagram:
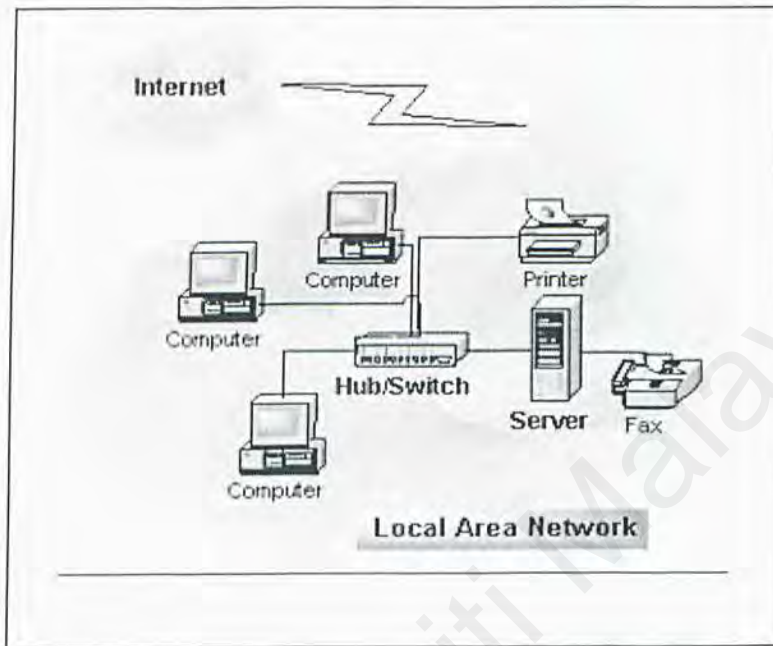
Figure 2.16: Local Area Network

2.18.2 Metropolitan Area Network

A Metropolitan Area Network (MANs) is designed to extend over an

entire city. It may be a single network such as a cable television network, ort it

may be a means o connecting a number of LANs into a larger network so that

resources may be shared LAN-to-LAN as well as device-to-device. For example,

a company can use a MAN to connect the LANs in all o its offices throughout a

city.

A MAN may be wholly owned and operated by private company, or it may

be a service provided by a public company, such as a local telephone company.

Many telephone companies provide a popular MAN service called Switched Multi-megabits data services (SMDS).

2.18.3 Wide-Area Network

Figure 2.17: Wide-Area Network

While the geographic distinctions of "local" and "wide" area networks imply a difference in the distance between network nodes that is not always the case. By definition, a Wide Area Network (WAN) is a government-regulated public network or privately owned network that crosses into the public network environment. It doesn't matter whether the area being bridged is across the country or across the street. If the geographical separation crosses over a public thoroughfare, a WAN is required to make the connection.

The WAN is typically used to connect two or more local area networks (LANs). As you know, a LAN is a privately owned communications system that is designed to allow users to access and share resources (computers, printers, servers) with other users. LANs that are interconnected by a WAN may be located in the same geographical area, such as an industrial park or campus setting, or in geographically separate areas, such as different cities or even different regions.

Computers connected to a wide-area network are often connected through public networks, such as the telephone system. They can also be connected through leased lines or satellites. Compare to LAN, a fraction of the network assets of a WAN are not owned. The largest WAN in existence is the Internet. Figure 2.18 shows the corporate LAN and WAN networks:
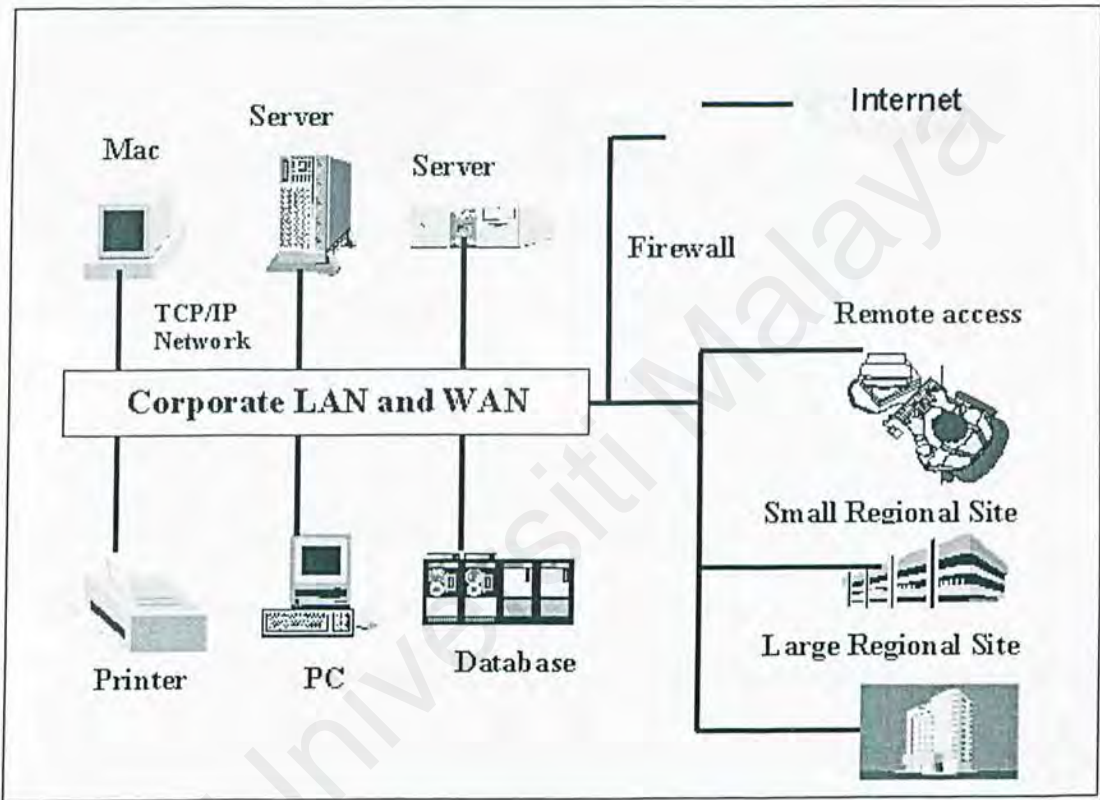
Figure 2.18: LAN and WAN Diagrams

2.18.4 How TCP/IP Work on Intranets

What distinguishes an intranet form any other kind of private network is that it is based on TCP/IP, which is the same protocols that apply to the internet. TCP/IP refers to two protocols that work together to deliver data, which are Transmission Control Protocol (TCP) and the Internet Protocol (IP). When

information is sent across an intranet, the data is broken into small packets. The packets are sent independently through a series of switches called routers. Once all the packets arrive at their destination, they are combined into their original form. The TCP breaks the data into packets and recombines them on the receiving end. The IP handles the routing of the data and make sure it gets sent to the proper destination.

After considering the categories of network, we will continue our discussion on the software architecture. There is a few different types of software architecture can be considered: mainframe architecture, client / server architecture, two-tier architecture, and three-tier architecture.

2.19 Software Architecture

2.19.1 Mainframe Architecture

In mainframe system architecture, all operation is within the central host computer. User interacts with the host through a terminal that captures keystroke and sends that info to the host. Mainframe architecture is not tied to a hardware platform. User interaction can be cloning using PCs and UNIX workstations. A limitation of mainframe architecture is that it does not easily supports graphical user interface or accesses to multiple databases from graphically dispersed sites.

2.19.2 Client / Server Architecture

Client / Server architecture is network architecture in which each computer or process on the network is either a client or a server. Figure 2.19 shows overview of the network architecture for a company.
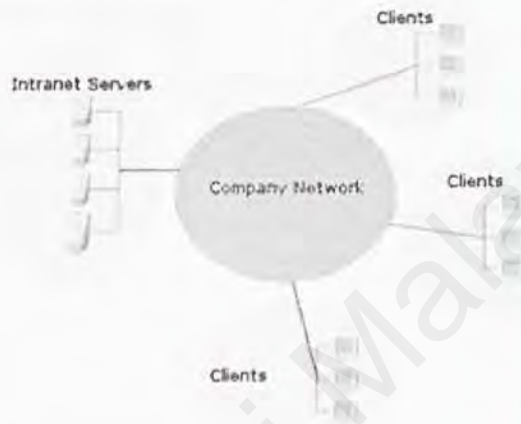
Figure 2.19: Company Network Architecture

- **Client**

  Client is a networked information requester, usually a PC or workstation that can query database and/or other information from a server. Clients rely on servers for resources, such as files, devices, and even processing power.

- **Server**

  Server is a computer, usually a high-powered workstation, a minicomputer, or a mainframe, that houses information for

manipulation by networked clients. Server is dedicated to managing disk drives (file servers), database (database servers), printers (print servers), or network traffic (network servers).

- **Client-server**

  Client-server architecture implies a cooperative processing of requests submitted by a client, or requester, to the server, which processes the requests and returns the results to the client. The client manipulates the data and presents the result to the user.

Servers are powerful computers or processes dedicates to managing disk drives (file servers), printers (print servers), or network traffic (network servers). Clients are PCs or workstations on which users run applications. Clients reply on servers for resources such as files devices and even processing power.

Another type of network architecture is knows as a peer-to-peer architecture because each node has equivalent responsibilities. Both client/server and peer-to-peer architectures are widely used, and each has unique advantages and disadvantages.

The main advantages of client/server architecture are high performance and scalability. Thousands of users can access the same database at the same time, and the database can store billions of records.

In a client/server environment, all the data are processes on the server, and only the results are returned to the local machine. This reduces the amount of

network traffic between the server and the client machine, improving network performance.

In general software architecture, most application program has three major layers. On top is the presentation layer, which provides the human/machine interaction (the user interface). The presentation handles input from the keyboard, mouse, or other device and output in the form of screen displays. In the middle is the application or business logic, the functionality that gives the application program its character. Application logic makes the difference between an order entry system and inventory control system, for example; it is often called business logic because it contains the business rules that drive a given enterprise. The bottom layer provides the generalize services needed by other layers, including such things as file services, print services, communications services, and perhaps most important, database services.

Figure 2.20 shows the one-to-one client / server architecture:-

Figure 2.20: One-to-One Client Server

Client-server solutions can be in a many-to-one design that is more than one client typically makes requests of the server.

2.19.3 Two-Tier Architecture

Two-tier architecture refers to client/server architectures in which the user interface runs on the client and the database is stored on the server. The actual application logic can run on either the client or the server. There are only the architecturally tiered data server and client.

The first tier of a client /server application is the *client tier*, or presentation tier, which runs on the client. This tier contains code that present data and interacts with the user. We can build client tier that run in a browser. These are web pages that contain controls and allow user to interact with the database.

The client request data from the database and display it. Once the data is on the client computer, application can process it and present it in many different ways. The client computer is quite capable of manipulating the data locally, and the server is not involved in the process. If the user edits the fields, the application can update the database as well. The communication between the client and server takes place through ADO, which makes it really simple to extract data from and update the database.

The second tier is the *database server*, or DBMS. This tier manipulates a very complex object, the database, and offers a simplified view database through OLE DB and ADO. Clients can make complicated request. Obviously, the DBMS can not afford to process the data before passing it to the client. The server's job is to extract the required data from the tables and furnish them to the client in the form of cursor. It simply transmits a cursor to the client and lets the

client process the information. The more powerful the client, the more it can do with the data.

Figure 2.21 shows the two-tier architecture:

First Tier:

Client

Tasks/Services

- User Interface
- Presentation services
- Application services

Second Tier:

Data Server

Tasks/Services

- Application services
- Business services
- Data services
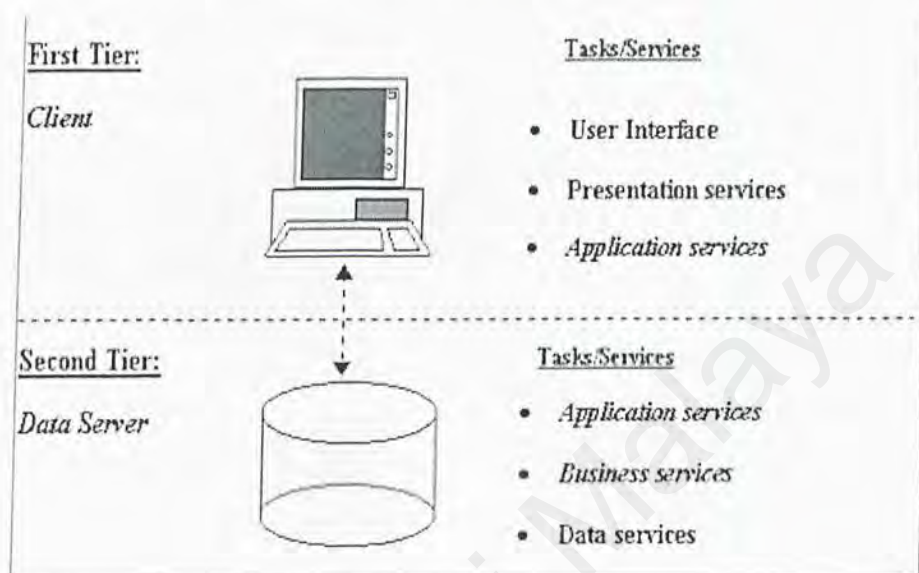
Figure 2.21: Two-Tier Architecture

2.19.4 Three-Tier Architecture

Three-tier architecture is a special type of client/server architecture consisting of three well-defined and separate processes, each running on a different platform:

The three tiers consist of:

- **Client-tier**

  Client-tier is the user interface, which runs on the user's computer.

- **Application-server-tier**

Application-server-tier is the functional modules that actually process data. This middle tier isn't present in 2-tier architecture in this explicit form. This tier protects the data from direct access by the clients.

- **Data-server-tier**

  Data-server-tier is a database management system (DBMS) that stores the data required by the middle tier.

Figure 2.22 shows the three-tier architecture:
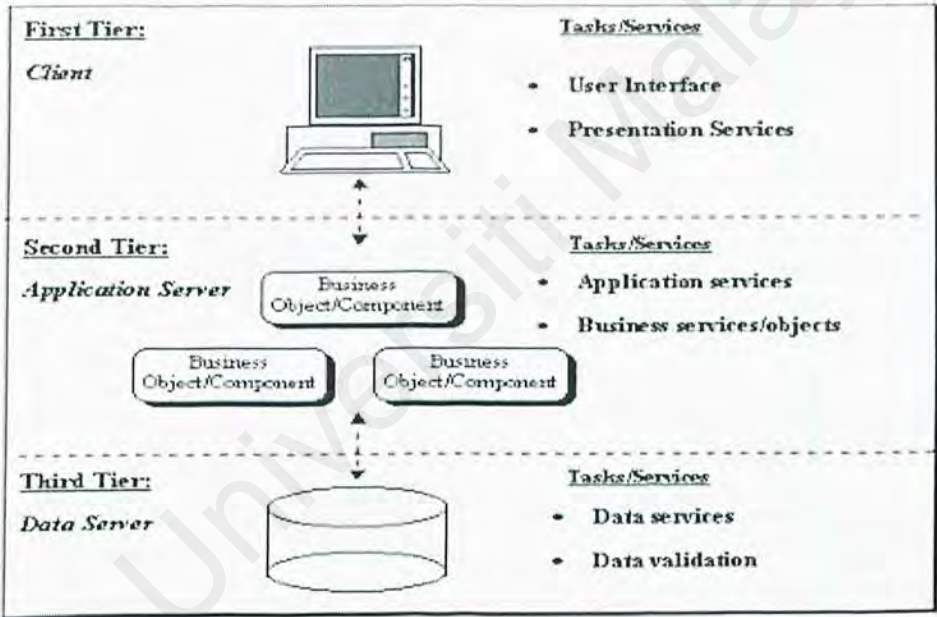
Figure 2.22: Three-Tier Architecture

2.19.5 Comparison between Two-Tier and Three-Tier Architecture

Table 2.5: Comparison between two-tier and three-tier architecture

	Two-tier Architecture	Three-tier Architecture
System Administration	More complex (More logic on the client to manage)	Fewer complexes (The application can be centrally managed on the server Application program are made visible to standard system management tools)
Security	Low (Data level security)	High (Time turned a the application layer)
Encapsulation of data	Low (Data tables are exposed)	High (The client)
Performance	Poor (Many SOL statements are sent over the network, selected data must be downloaded for analysis on the client)	Good (Only service requests and responses are sent between the client and server)
Scale	Poor (Limited management of client communication links)	Excellent (Concentrates incoming sessions, can distribute loads across multiple servers)
Application reuse	Poor	Excellent (Can reuse services and objects)
Ease of development	High	Getting better (Standard tools can be used to create the clients, and tools are emerging that you can use or develop both the client and server sides on the application)
Server-to-server infrastructure	No	Yes (Via server-side middleware)
Legacy application integration	No	Yes (Via gateway encapsulated by services or objects)
Internet support	Poor (Internet bandwidth limitations make it harder to download fat clients and exacerbate the already noted limitations)	Excellent (this client are easier to download, remote services invocations distribute the application load to the server)

Heterogeneous database support	No	Yes (Can use multiple databases within the same business transaction)
Rich communication choices	No (only synchronous, connection oriented RPC-HKE calls)	Yes (Support RPC-HKE calls, but can also support connection messaging, queued delivery, publish and subscriber and broadcast)
Hardware architecture flexibility	Limited	Excellent
Availability	Poor (Can fall over a backup server)	Excellent (Can restart the middle tier components other services)

2.19.6 Conclusion for Software Architecture

The three-tier architecture is chosen for this project because it is easier to implement and design. The three-tier design has many advantages over traditional two-tier or single-tier designs, the chief ones being:

➢ The added modularity makes it easier to modify or replace one tier without affecting the other tiers.

➢ Separating the application functions from the database functions makes it easier to implement load balancing.

In this project, the three tiers consists web browser as client-tier, web server as application-server-tier and database server as the data-server-tier. A web server can be defined as a computer program that receives HTTP requests from web browser for document. Web server will achieve and process the data from database server. Web server return both the document and the document

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type to the client so that the client knows what to do with the document or data once it is received. The most common document type transferred between web server and client is HTML.

2.20 Tools and Technologies Considerations

This section attempts to find out the tools and technologies that are used to develop an intranet system, including operating systems and databases. Since this intranet system is develop as a web application, there are several web technologies including scripting and other development tools will be discussed here to have a better understanding of their underlying principle, and the advantages it has offer over others.

2.20.1 The Web Server

2.20.1.1 Microsoft Personal Web Server (PWS)

Microsoft Personal Web Server (PWS) is a Web server that was developed for companies or development. Unlike Internet Information Server (IIS), a PWS can host only one Web site. PWS's advantage is that it can be run on an inexpensive Windows 95, Windows 98, or Windows NT Workstation operating system.

The PWS was created for two purposes. User can use it to host a very low traffic Web site (for example, to share documents on your company's intranet). Alternatively, user can use the PWS to prototype a Web site before transfer the content of the site to IIS.

It should be emphasized that the PWS isn't an appropriate Web server to use for hosting a live site on the Internet. It cannot handle very many concurrent users.

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2.20.1.2 Microsoft's Internet Information Server (IIS) 5.0

Internet Information Services 5.0 has many new features to help Web administrators to create scalable, flexible Web applications. This version, which comes as part of the Windows 2000 Server operating system, consists of three major services which are the World Wide Web (www) server, File Transfer Protocol server and the Simple Mail Transfer Protocol server.

The advantage of IIS can be explained in term of its four major features below:-

➢ IIS 5.0 comes with several industry standard security features such as the digest authentication, secure connection through SSL 3.0 and TSL 1.0, server gated cryptography with strong 128-bit encryption, IP and Internet domain restriction, Kerberos v5, certificate storage, Fortezza, and a security wizard that enables the administrator to easily configure the IIS based on its policy.

➢ Administration in IIS 5.0 has been improved with support for remote administration, terminal services, accounting and throttling processes, easy start, stop and restart IIS and lastly customizable error messages.

➢ IIS 5.0 conforms to the latest Internet standard such as HTTP 1.1, HTTP compression, Web Distributed Authoring and Versioning (WebDAV), and multiple sites one IP address feature.

➢ Programmability in IIS 5.0 has been tremendously improved with the support of ASP 3.0, application protection and ADSI 2.0.

2.20.1.3 Apache Server 1.3

The Apache http server is a powerful, flexible and HTTP/1.1 compliant web server. It is highly configurable and extensible with third-party modules which makes it very flexible. The Apache http server can be customized by writing 'modules' using the Apache module API.

It comes with full source code and unrestrictive license. It is able to run on Windows NT/9x, Netware 5.x and above, OS/2, and most versions of Unix, as well as several other operating systems makes it deployable in various existing environment.

Below are the extra features of Apache http Server:

➤ DBM databases for authentication allows you to easily set up password-protected pages with enormous numbers of authorized users, without bogging down the server.

➤ Customized responses to errors and problems allows you to set up files, or even CGI scripts, which are returned by the server in response to errors and problems, e.g. setup a script to intercept errors and perform on-the-fly diagnostics for both users and yourself.

➤ Unlimited flexible URL rewriting and aliasing may be declared in the config files. In addition, a powerful rewriting engine can be used to solve most URL manipulation problems.

➤ Virtual Hosts is a much requested feature, sometimes known as multi-homed servers. This allows the server to distinguish between requests made to different IP addresses or names (mapped to the same machine).

> You can configure Apache to generate logs in the format that you want. In addition, on most UNIX architectures, Apache can send log files to a pipe, allowing for log rotation, hit filtering, real-time splitting of multiple vhosts into separate logs, and asynchronous DNS resolving on the fly.

2.20.2 The Database Management System

Developers now have a wide variety of different places and ways to store their data. In section we will look at these sources to find out which one is suitable to be applied in our project later.

2.20.2.1 MySQL

MySQL Server was originally developed to handle large databases much faster than existing solutions and has been successfully used in highly demanding production environments for several years. Though under constant development, MySQL Server today offers a rich and useful set of functions. Its connectivity, speed, and security make MySQL Server highly suited for accessing databases on the Internet. MySQL is now a full-fledged database server with a robust feature, optimized for speed, reliability, flexible and high load support.

The noted technologies and features of MySQL are:

> **The Scalable Architecture**

The MySQL Database Software is a client/server system that consists of a multithreaded SQL server that supports different backend, several

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different client programs and libraries, administrative tools, and a wide range of programming interfaces (APIs).

MySQL Server is fully multi-threaded using kernel threads. This means it can easily use multiple CPUs if available and uses a multi-threaded library which you can link into your applications to get a smaller, faster, easier-to-manage product.

➤ **Portability**

MySQL is written in C and C++ language and has been tested for a broad range of different compilers on various platforms. APIs support for various languages such C, C++, Eiffel, Java, Perl, PHP, Python, and Tcl.

➤ **Performance**

To ensure the performance, techniques such as SQL functions implemented through a highly optimized class library, very fast B-tree disk tables with index compression, very fast thread-based memory allocation system, very fast joins using an optimized one-sweep multi-join and in-memory hash tables which are used as temporary tables are applied in MySQL.

➤ **Security**

A privilege and password systems that are very flexible and secure, and allows host-based verification. Passwords are secure because all password traffic is encrypted when you connect to a server.

> **Connectivity**

Clients may connect to the MySQL server using TCP/IP Sockets, Unix Sockets(Unix), or Named Pipes (NT). ODBC (Open-DataBase-Connectivity) support for Win32 systems.

2.20.2.2 Microsoft Access

Microsoft Access is a popular data source for developers that are new and want a quick and easy way to develop a database. Another feature of Access is that the developer can create a whole application within it with its ability to use forms and Visual Basic.

Access is a very easy tool to use to create a database, design tables and input data. The users can use a bunch of wizards or create it themselves. It provides tools to create reports and web pages that access the data and display it.

Another feature is that the users can visually create queries and run them with forms and modules, the queries generate the SQL code that they can modify or copy into their pages if they decide not to use the feature in Access.

However, Access is not designed to be a database that will be loaded with requests or run queries against thousands of rows of data. Also, Access isn't very stable, if something goes wrong, it will lead to a loss of critical data. Many other things like performance, scalability and error reporting are weak points of Access.

Although, Access does have a place, a small site that only does a few operations could use Access without any problems. But if Access it going to be used a lot, time for something bigger.

2.20.2.3 Microsoft SQL Server 2000

As the most recent major release of SQL Server, SQL Server 2000 builds upon the modern, extensible foundation of SQL Server 7.0, a critical release in Microsoft's database lineup and one in which much of the SQL Server product was both re-architected and rewritten. Microsoft SQL Server 2000 is the complete database and analysis solution for rapidly delivering the next generation of scalable Web applications.

SQL Server 2000 includes rich support for XML and HTTP; performance and availability features to partition load and ensure uptime; and advanced management and tuning functionality to automate routine tasks and lower total cost of ownership. Additionally, SQL Server 2000 takes full advantage of Windows 2000, including support for the Active Directory™ service, and up to 32 processors and 64 GB of RAM.

Besides providing the necessary enterprise "abilities" for data management and analysis, SQL Server 2000 helps deliver *agility*. Agility is a characteristic of organizations that can rapidly adapt to changing environments for competitive advantage. By going beyond simple data storage/retrieval and offering true business intelligence functionality, SQL Server 2000 allows business to understand their data and act decisively on analysis results.

It includes features and technologies that make it:

➤ **Fully Web-Enabled**

SQL Server 2000 provides extensive database programming capabilities built on Web standards. Rich XML and Internet standard support give you the ability to store and retrieve data in XML format easily with built-in stored procedures. You can also use XML updategrams to insert, update and delete data easily.

➤ **Highly Scalable and Reliable**

Scalability, everyone wants a scalable platform and SQL Server lets its users share the work load and the database across multiple systems that can be expanded and contracted as necessary. With scale up and scale out capabilities, SQL Server meets the needs of demanding ecommerce and enterprise applications.

➤ **Deliver Fastest Time-to-Market**

SQL Server has long been considered the fastest way to build, deploy and manage e-commerce, line of business, and data warehousing solutions. Research studies by independent firms have demonstrated not only that SQL Server is easier to use than its primary competitor, but also that it demonstrates significantly lower total cost of ownership.

Comparison between Microsoft SQL Server 2000 and Microsoft Access are as follow:-

Table 2.6: Comparison between Microsoft SQL Server 2000 and Microsoft Access

Microsoft SQL Server 2000	Microsoft Access
Support very large database system.	Support midrange database system.
Allow multi user update the database at one time.	Only one user can update the database at one time.
Highly security protection.	Provide basic authority protection.
Support large amount of user.	Not recommended.
Support large amount of transaction.	Not supported.
Specially designed for the client/server computing.	Provide basic support for client/server architecture, but is most recommended for personal use.
Full programmability support.	Minimum programmability support.
Integration with Microsoft Office Pack.	Fully integration with Microsoft Office Pack.
Need skills and practice, especially design to meet the intermediate and advanced developer.	User-friendly application, suitable for the beginner developer.
It is quite expensive for the registered license.	Cheaper.

2.20.3 The Implementation Language (Server Side)

2.20.3.1 Active Server Page (ASP)

An Active Server Page itself is simply a text file script with the extension **.asp** containing HTML, client- and server-side script. This special extension distinguishes an ASP page from a normal HTML file that ends with .HTML or HTM. The implementation behind the ASP page was created by Microsoft and intended as an open technology server-side framework, giving web developers the freedom to develop dynamic web sites using information accessed from the

many COM-compliant data sources available to them. (Kurt Cagle, Mike Gunderloy, Noer Jerke, A.Rushell Jones, Evangelos Petroutsos, 2001)

When a user visits a Web site and requests a normal HTML file, the Web server simply retrieves the file from the computer's hard drive or memory and sends the file to the user's browser. The browser interprets the HTML content of the file and the visitor sees the Web page.

When someone requests a normal HTML page, the Web server doesn't care about the content of the file. The Web server's role is to simply retrieve the appropriate file without processing it. All the work of interpreting the content of the file is performed by the user's web browser.

On the other hand, when someone requests an ASP page, the Web server takes a more active role. Before the file is sent to the user's Web browser, it is first processed by the Web server. The Web server interprets and executes any scripts in an ASP page before sending it to the user's browser.

ASP is not available as an Open Source in the current market. However, it is quite competitive in the market as it is easy to be developed and cater for fast changing needs of most of businesses and organizations.

2.20.3.2 Java Server Page (JSP)

Java Server Page (JSP) is a technology for controlling the content or appearance of web pages through the use of servles, small program that are specified in the web page and run on the web server o modify the web page before it is sent to the user who requested it. Sun Microsystems, the developer of Java, also refers to the JSP technology as the servlet API.

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JSP technology allows web developers and designer to rapidly develop information-rich, dynamic web pages and easily to maintain. A part of Java family, JSP technology enables rapid development of web-based applications that are platform independent. Besides that, JSP technology separates the user interface form content generation enabling designer to change the overall page without altering the underlying dynamic content.

JSP technology uses XML – like tags and scripts written in the Java programming language to encapsulate the logic that generates the content for the page. This application logic can reside in server-based resources that the page accesses with these tags and scripts. Any and all formatting (HTML or XML) tags are passed directly back to the response page. By separating the page logic from its design and display, and supporting a reusable component-based design, JSP technology make it faster and easier to build web-based applications.

The following table describes the differences between Active Server Pages and Java Server Pages.

Table 2.7: Active Server Pages and Java Server Pages Comparison

	ASP Technology	JSP Technology
Web Server	Microsoft IIS or Personal Web Server	Any web server, including Apache, Netscape, and IIS
Platforms	Microsoft Windows (Accessing other platforms requires third party ASP porting product)	Most popular platforms, including the Solaris Operating Environment, Microsoft Windows, Mac OS, Linux, and other Unix platform implementations
Reusable, cross platform components	No	JavaBeans, Enterprise JavaBeans, custom JSP tags

Security against system crashes	No	Yes
Memory leak protection	No	Yes
Scripting language	VBScript, JScript	Java
Customizable tags	No	Yes
Compatible with legacy database	Yes (using COM)	Yes (using JDBC API)
Ability to integrate with data sources	Works with any ODBC compliant database	Works with any ODBC and JDBC technology compliant database
Components	COM components	JavaBeans, Enterprise JavaBeans, or extensible JSP tags
Extensive tool support	Yes	Yes
Web page execution speed	Intermediate. Requires a lot of performance tuning and code modification to execute fast.	Slow during first time due to the compilation of a JSP file to servlets. Fast on subsequent requests.
Market competitiveness	High	High

2.20.4 The Implementation Languages (Client Side)

2.20.4.1 Hyper Text Markup Language (HTML)

HTML stands for Hyper Text Markup Language. Document format used on the World Wide Web. Web pages are built with HTML tags, or codes, embedded in the text. HTML defines the pages layout, fonts, and graphic elements as well as the hypertext links to other documents on the web. Each link contains the URL, or address, of a Web page residing on the same server or any server worldwide, hence "World Wide" Web.

A Web application is a site with multiple HTML pages and server-side scripts. HTML pages call server-side scripts and pass parameters to the scripts.

These scripts are executed on the server, just like applications would be. They process the values submitted by the client, format the result as HTML documents on the fly, and the result of the processing returns to the client as another HTML document.

2.20.4.2 VBScript

VBScript is stands for Visual Basic Script, a programming language for World Wide Web applications from Microsoft. VBScript is the default ASP scripting language. In addition, VBScript is a subset of the Visual Basic for Applications language used in Microsoft Office suite and in many other commercially available applications, which in turn is an extension to Microsoft's Visual Basic language. All of these languages share an identical set of key-worlds, properties, and functions. The biggest difference between them, besides the lack of a few methods in VBScript, is no compilation in VBScript, but compilation occurs in VB. (Kurt Cagle, Mike Gunderloy, Noer Jerke, A.Rushell Jones, Evangelos Petroutsos, 2001)

2.20.4.3 JScript

JScript is Microsoft's ECMA script-compatible version of JavaScript. Unlike the relationship between VBScript and VB, JavaScript is *not* a subset of Sun's Java language. The two languages share some common syntax, but Netscape developed JavaScript, not Sun. JScript is a powerful scripting language. Developers commonly use JScript o write client-side scripts because it's the common standard for browser scripting, and not all browsers can run VBScript.

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2.20.5 The Development Tools

2.20.5.1 Microsoft Visual Interdev

Microsoft Visual InterDev is a development for building Web sites. At its most basic level, it's a very fancy text editor that allows you to create and modify Web pages on a remote or local server. You can use Visual InterDev to write both Active Server Pages ands normal HTML pages.

Visual InterDev is tightly integrated with Microsoft SQL Server. User can use Visual InterDev to design and modify database tables and create stored procedures. Visual InterDev works with any ODBC or OLE DB compliant database. Visual InterDev makes the user much easier to manage the pages of large Web site and it also includes several debugging tools.

2.20.5.2 Macromedia Dreamweaver MX

Macromedia Dreamweaver MX is a powerful Web-Creation and management program that can use to efficiently design and build a dynamic, professional-looking websites. It is a world's best way to create professional websites and easiest way to build powerful internet applications. In addition, it is complete and integrated software for Web developers to be used to build reliable sites in less time. Advanced coding features enable user instantly create and modify HTML, XHTML, and WML tags, while integrated tools allow user to effortlessly validate, reuse, navigate and format user code. Project management, quality control and sites deployment features help user to efficiently build, deploy and manage entire websites. [13]

2.20.5.3 Microsoft FrontPage

Microsoft FrontPage is a useful tool to design and build a dynamic and professional-looking websites. It enable user to view the normal page, HTML page and preview the web site. Besides, user can create and manage tasks, view hyperlink to and from any pages, design the Web's structure for navigation and link bars, analyze the created Web and manage its contents, organize files and folders, and edit a Web pages.

2.20.5.4 Microsoft Office XP Professional

Microsoft Office is a very complete productivity suite. It contains applications such a word processing, spreadsheet, presentation, graphical editor, database management, e-mail and much more.

This integration provides ample functionalities for many general purposes while providing other advance features such as smart tags, task panes, integrated e-mail, document recovery, and send for review which makes it easier to use, increase your productivity and enabling collaboration with others.

2.20.5.5 Microsoft Internet Explorer 6.0

Microsoft Internet Explorer 6.0 is the latest version of web browser from Microsoft. This browser is tightly integrated in Microsoft Windows operating systems. Microsoft Internet Explorer is now the most widely used web browser.

The Internet Explorer 6.0 comes with many features such as simple and familiar interface, security and privacy features, content control support, connection wizard, and accessibility for less fortunate groups of users.

Also technically, Microsoft Internet Explorer 6.0 supports and conforms to various Internet standards such as XHTML, XML, DOM, CSS, SSL 3.0, TSL 1.0, FTP and many others. It is also support new features by using the latest add-ins or plug-ins such as XML parser, Java Virtual Machine, Shockwave and others.

2.20.5.6 Adobe Photoshop 7.0

Adobe Photoshop 7.0 is a professional standard graphical package that various kinds of graphical authoring and editing functionalities. It contains a lot of built in filters that enables graphic manipulation. Adobe Photoshop supports various graphic formats and animation too. Adobe Photoshop can also be used to optimize graphic for web used.

2.20.5.7 Rational Rose Enterprise 2000

Rational Rose 2000 Enterprise Edition is a very good example of integrated CASE tools as its covers various stages and functionalities needed in software development lifecycle. Rational Rose 2000 provides a wide range of flexibility, supporting multiple methodologies and the creation of custom attributes and reports. Its publishing features enabled us to communicate with the many people involved in the development of the architecture and its use throughout the organization.

Rational Rose 2000 offers several noted key features: multi-user repository for creating, storing, reviewing and sharing information about relationships, events and objects; multiple methodology support that integrates

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UML, system engineering and reverse engineering; extensibility, or ability to customize business rules to the client's needs and transparently merge custom attributes into the standard repository; Web and Office-Suite reporting; and several enterprise standard framework support, for various languages, and from high-level conceptual models to logical, object or data models.

During the system modeling and design, visual modeling is a key technology for the successful deployment of a software solution. Using products based on standards such as UML and XML, with the automation of code generation from the modeled business processes, will ensure the timely and rapid development and deployment required by businesses today. This cycle will also ensure that the solution deployed matches the true business processes.

Developers is also provided with vast numbers of built in components, data types, stereotypes and notations to be used on the fly which eases and quicken the design and modeling process. Also, Rational Rose 2000 is flexible enough to support custom or user defined components, data types or stereotypes without constraining user to only the predefined repository objects.

2.20.6 The Operating System

2.20.6.1 Microsoft Windows XP Professional

Microsoft Windows XP Professional is the new version of windows that bring user PC to life. Windows XP packs the punch user need for top performance and enjoyment! User can get all the power and dependability of Microsoft's most advanced operating system technology. And to ensure that version of Windows XP is always the very latest, automatic updates are available

at command from the Microsoft Web site. Windows XP delivers greater dependability and increased efficiency. Windows XP works harder—so user can work smarter!

Furthermore, Windows XP brings a brand-new visual style to our computer—friendly, fresh, and streamlined. User will notice cleaner lines, richer colors, smarter organization, and easier ways to get where he/she want to go and do what he/she wants to do. The simplified Start menu automatically puts user most frequently-used programs in plain view, never more than one click away. Besides, this operating system will find out everything user wants to know about Windows XP and computer. The all-new support center in Windows XP is user one-stop shop for:

- ➢ Clear how-to instructions.
- ➢ Engaging start-to-finish articles.
- ➢ Troubleshooting advice.
- ➢ Free product updates.

2.20.6.2 Microsoft Windows 2000 Server

Microsoft Windows 2000 Server is built on the NT technology that has proven to be very stable. It is designed to meet the needs for businesses of all sizes, from small, centralized organizations to the largest distributed enterprise. Windows 2000 Server integrates standards-based directory, Web applications, network, file and print services with powerful end-to-end management and reliability to provide the best foundation for integrating your business with the Internet. [13].Windows 2000 Server offers the following advantages:-

➤ Internet-ready

Windows 2000 Server will enable organizations to readily pursue Internet-based solutions and opportunities. With comprehensive Web, security and communication technologies built-in, and the scalability and performance to handle the demands of Internet traffic, Windows 2000 Server delivers a unique, Internet-enabled platform on which to take advantage of the Business Internet.

Windows 2000 Server comes with the built-in Web services of Internet Information Services 5.0 (IIS), and support for the Internet development language XML. Integrated communications services, such as Virtual Private Networking and Remote Access Services, coupled with comprehensive security options, enable you to securely connect mobile employees, branch offices, partners and customers to your network.

➤ More Reliable

Windows 2000 Server will enable organizations to minimize network interruptions to end-users. With system architecture improvements for higher server uptime, fault tolerant and redundant systems for increased availability, and online configuration and maintenance capabilities, Windows 2000 Server delivers you the confidence that your servers will be up and running, and your organization will be open for business.

High System Uptime with significant improvements to the core operating system, such as improved memory management, reduces unplanned downtime. New file protection capabilities prevent new software installations from replacing essential system files and causing failures. Server and Network Availability are increased with the use of redundant directory, networking and file services.

> **Easier to Use and Manage**

Windows 2000 Server will increase efficiencies and productivity across your organization. With improvements that make the system easier to deploy, manage and use, powerful centralized administration enabled by the Active Directory service, and a standards-based approach to interoperability with your existing systems, Windows 2000 Server will increase efficiencies of your IT staff, end users and systems.

Build and deploy servers faster with configuration wizards that set up system services, including Active Directory and DNS, and tools that deploy copies of that system image across multiple servers.

> **Broad Hardware Support**

Windows 2000 Server supports the latest advances in networking and peripheral hardware, including USB devices, high bandwidth and directory-enabled networking devices, to ensure the platform you build today takes advantage of the latest technology advances and supports your future investments.

Interoperability with client systems, including previous Windows systems, Macintosh and UNIX; server systems including Novell NetWare and UNIX; directories including Microsoft Exchange, Novell NDS, and others; and network devices and peripherals, helps ensure Windows 2000 Server will work with systems you already have in place.

Methodology

3.1 Methodology

3.2 The Phase Development Life Cycle

Chapter 3 – Methodology

This chapter includes the description about the technique and procedures that are used to gather the system requirements and will specify the justifications for the chosen methodology for the project.

3.1 Methodology

A methodology is a collection of methods, procedures, techniques, tools and paradigms for solving a class of problem. It represents a particular approach or philosophy for building system. One is not better than other; each has its advantages and disadvantages, and there may be situations when one is more appropriate than another. There are several process models such as Waterfall Model, Prototyping Model, V-Shaped Model, Spiral Model and the like, which prescribe the software development activities in a variety of contexts.

3.1.1 Overview of Different Methodology / Software Life Cycle

1) Waterfall Model

Waterfall model is well-defined development process in which one phase has to be finished before the next phase. The model is very simple to use. The model can be used if the requirements are fully understood and defined. The principal stages of the Waterfall model map onto fundamental development activities such as follow: -

1. *Requirements analysis and definition*

2. *System and software design*

3. *Implementation and unit testing*

4. *Integration and system testing*

5. *Operation and maintenance*

The waterfall model is a very alluring approach because it takes the beeline between specification and launch. Waterfall model is helpful in laying out the development processes. Its simplicity makes it easy to explain to customers who are not familiar with software development. However, there are some disadvantages of this model as listed below:

-   *There are no insights into how each activity transforms one artifact to another, such as requirements to design.*

-   *Changes during product development are inevitable, costly, time consuming and a source of disagreement between the Web agency and the client.*

-   *Usability problems aren't revealed until after product release, when changes are very costly.*

-   *Provides no guidance to developers on how to handle changes to products and activities that are likely to occur during development. This will cause the thrashing of development activities.*

-   *Failure to treat software as a problem-solving process as it is derived from hardware world, which presenting a manufacturing view of software development.*

Usually, designers use the waterfall model to develop a simple system because it is hard to change if the model is used. If customers come by and ask for changing requirements, designers will have to start from the scratch because there is no fast way to design the system with the new requirement. Also there is a big problem for testing later if there is a change in requirement. The testers do not have well-define set of test cases, so the test is easy to fail. In brief, waterfall model is used if designers have a well-defined list of user requirements.

2) V-Shaped Model

V-shaped Model is similar to waterfall model. **The difference is that each test phase matches each development phase: requirements with system testing, high-level design with integration testing, and detailed design with unit testing.**

V-shaped model is an improved version of waterfall model. V-shape model does not run into the problem that the software is impossible to be tested because system test, integration test, and unit test are planed ahead. For example, when we plan the requirement, we also plan for system testing. Therefore, when the system is built, we have a whole set of test cases for system testing. By that way, the system does not meet user requirements.

The benefit of V-shaped model is it better spells out the role of different types of testing. It also helps the system developed meet the user requirements because it involves user in testing.

The drawbacks of V-shaped model are this model may not always be cost-effective. V-shaped model also have some drawbacks as waterfall model.

Due to the intranet system that we will develop in this project is expected to enhance the former or existing intranet system, thus the proposed system has to be developed with a great deal of iteration in order to determine what the users wants and what the additional characteristic that are desired are. In this perspective, the waterfall model and V-shaped is unsuitable to be used in developing the proposed system as it doesn't provides guidance on how to handle the iteration processes or changes. Thus, the waterfall model with prototyping has been used to develop the proposed system.

3.1.2 Waterfall Model with Prototyping

3.1.2.1 The Overview

Waterfall model with prototyping consists of eight stages that are depicted as cascading from one to another (see Figure 3-2). Each development stage should be completed before the next begins. The eight stages are as follow:-

1. **Requirement Analysis**

The intranet system's services, constraints, goals and objectives are established in this stage. Understanding and determining users need by having brainstorming, eliciting and analyzing user requirements by having questionnaire session, survey or interview, collecting and specifying all the user requirements and validating requirements.

2. **System Design**

Once the requirements are defined, a system design has to be created. It establishes overall system architecture. The system functionality should be outlined from the user's perspectives by having feasibility studies or case studies on current system. The user then reviews it. This also involves determining and specifying hardware or software architecture and verifying system design.

3. Program Design

When users and customer approve the system design, the overall system design is used to generate the designs of the individual programs involved.

4. Coding

The programmer will write the programs based on the approved program design. This stage includes programming, personal planning, tool acquisition, database development, component level documentation and programming management.

5. Unit and Integration Testing

When the programs have been written, they are tested as individual pieces of code, which called unit testing. Once the pieces work as desired, the system was build by adding one piece to the next until the entire system is operational, which called integration testing.

6. System Testing

This stage involves a test of whole system to ensure the system has implemented all of the requirements, which call validation. The purpose of validation is to ensure that the system has implemented all of the requirements, so that each system function can be traced back to a

particular requirement in the specification. Besides that, verification process has to be carried out to make sure each function works correctly and as needed. Verification checks the quality of implementation.

7. Acceptance Testing

The purpose of acceptance testing is to identify as far as possible any errors and deficiencies in the system prior to its final release into production use. There are usually four major types of acceptance testing that are program testing, system testing, user testing and quality assurance testing. The following table gives the explanation of each types of acceptance testing:-

Table 3.1: Explanation of each types of acceptance testing

Type of Testing	Explanation
Program testing	Programmers who develop the individual programs in the system must test their programs for accuracy, completeness and efficiency.
System testing	Some members of the development team must take responsibility for testing the overall system to see especially that the interfaces between the various programs and subsystems work correctly.
User testing	Users must test the total system, including the system interfaces, program and procedures.
Quality assurance testing	A quality assurance group is responsible for ensuring the system complies with all standards adopted by the organization

(Ron Weber, 2000)

The following figure gives an illustration of each type of acceptance testing:-
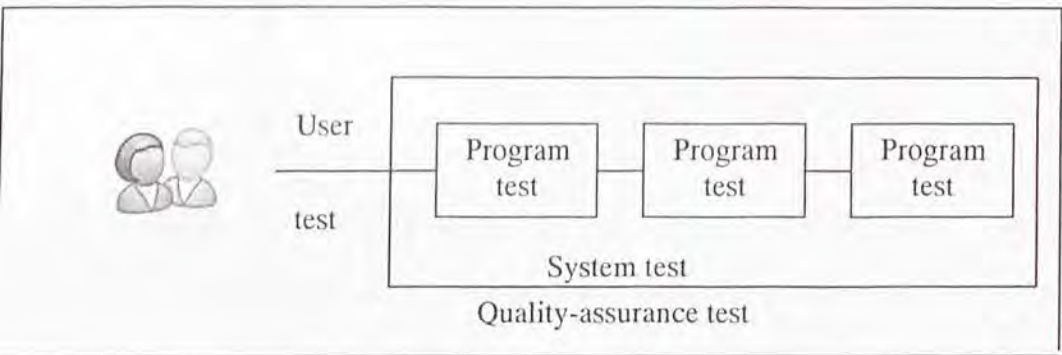
Figure 3.1: Illustration of acceptance testing phase

8. Operation and Maintenance

Normally (although not necessarily) this is the longest life cycle phase. The real-estate system is installed and put into practical use. Maintenance involves correcting errors which were not discovered in earlier stages of the life cycle, improving the implementation of system units and enhancing the system's services as new requirements are discovered.

In light of production experience with a system, three types of changes can be undertaken:

i. **Repair maintenance** – login errors discovered in the system are corrected.

ii. **Adaptive maintenance** - changes in the system (user) environment might necessitate system modification.

iii. **Perfective maintenance** – changes might be made to improve processing efficiency.

Repair maintenance and perfective are more likely to occur early in the life of a system. Adaptive maintenance is more likely to occur at later stages.

3.1.2.2 System Prototyping

Prototyping is such a sub-process to develop a prototype, a partially developed product a simple simulator of the actual system to enable the user to examine some aspect of the proposed system and decide if it is appropriate for the final product. The prototype is a working version of an information system or part of the system, but it is meant to be only a preliminary model. Once operational, the prototype will be further refined until it confirms precisely to user's requirements. For many applications, a prototype will be extended many times before a final design is accepted. Once the design has been finished, the prototype can be converted to a polished production system.

In waterfall model with prototyping, the stage of system prototyping allows all or part of the real system to be constructed quickly to understand or clarify issues. The requirements or design require repeated investigation to ensure that the developer, user and customer have a common understanding both of what is needed and what is proposed. Besides, prototyping system information is worthwhile for gathering specific information about user's information requirements. The initial reactions from the users to the prototype were sought. Then, the user suggestions about changing or cleaning up the prototyped system, possible innovations for it, and revision plans detailing

which parts of the system need to be done first or to prototype next were searched too.

A prototype of intranet system will be built regarding to the project scope and the analysis of the system before start to build the actual system.
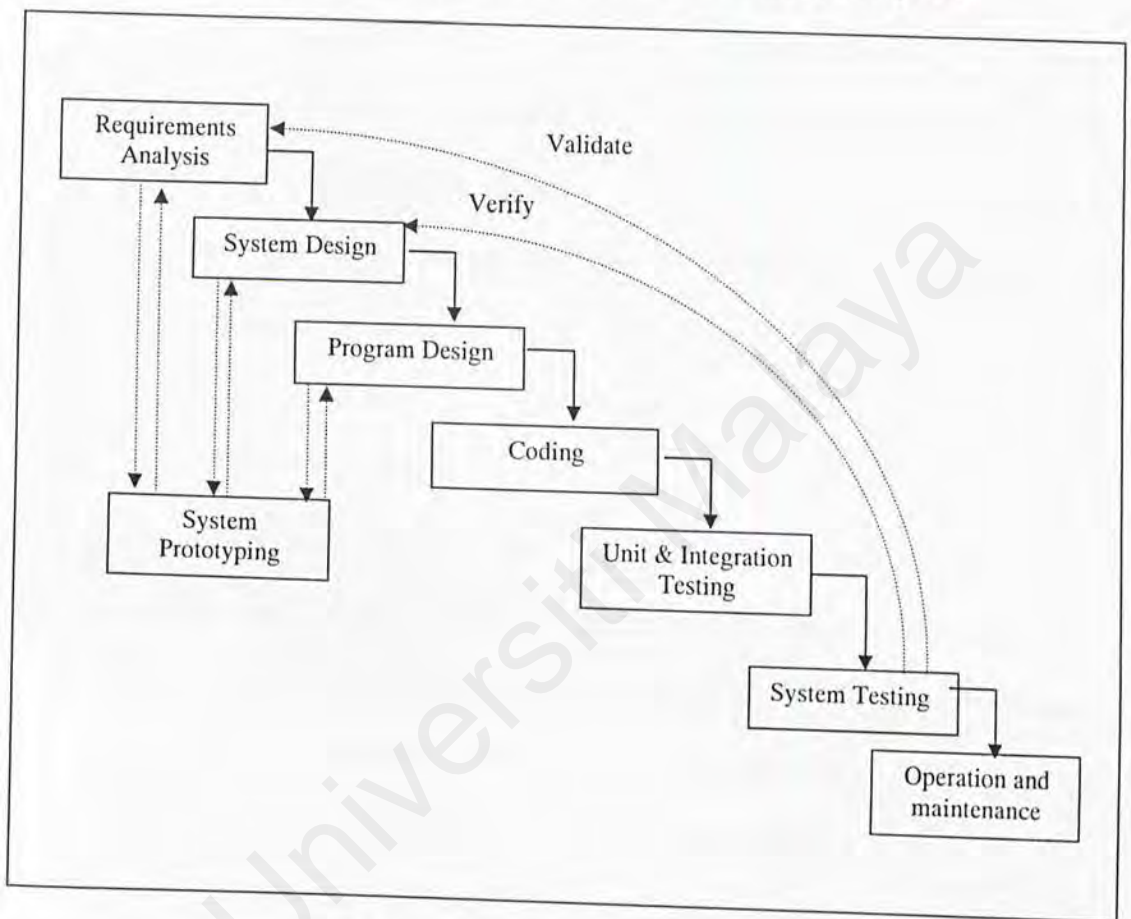
Figure 3.2: Waterfall Model with Prototyping

Figure 3.2 is waterfall model with prototyping, which represent the intranet system development processes.

Besides the main reason that we stated previously on why choose waterfall model with prototyping, there are another existing factors that

influence us to make this decision which will be discussed in the following section.

3.1.2.3 Why Waterfall Model with Prototyping?

The waterfall with prototyping approach was used because the system consists of separate process phases, which cascade from one phase to another, except the System Prototyping stage. If the process phases were uncontrolled, developer may thrash from one activity to the next and then back again, as they strive to gather knowledge about the problem and how the proposed solution addresses it. Besides, it also offer a means of making the development process more visible compare to other models.

The system consists of several phases such as requirements analysis, system design, program design, coding, unit and integration testing, system testing, and operation and maintenance. Each stage is 'signed-off' when it is defined and development goes on to the following stage. There is a cycle among the stages of requirement analysis, system design and program design. These three stages are keeping looping is the system prototype is to be changed, as it is not as ideal as what had been expected.

In brief, waterfall model with prototyping is chosen for this project (Intranet system) because:

- **Easy to use**
- **Systematic**
- **Scope of project well understand**
- **The advantages offered by prototyping technique such as:**

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a) Changes can be made early in development.

b) System developed can meet users' needs more easily.

c) It provides a common baseline and frame. Developers and users can communicate better.

d) The developer can understand the system much better.

e) Prototypes are easy to grasp because they simulate how the final product will work.

f) Users, developers and the clients will focus on content, structure and functionality, and will not be distracted by the details of graphic design

g) Prototypes make it possible to get a formal approval of the design from both programmers and the client before proceed to the development stage

h) They make it possible to start usability testing at an early stage in the development process

i) Prototypes comply with the wish to show fast results to the client

j) Prototyping legalizes experimentation and many revisions because it's inexpensive to alter.

Prototyping seems appropriate for our project because Intranet system is:

- Data-oriented applications

- Applications with emphasis on the user interface

- Applications which are highly interactive

Prototyping is very important: -

1. To ensure the system meet the performance goals or constraints

2. To ensure the system are practical and flexible.

3. To ensure the system fulfill the users' requirement.

4. To have an insight of how the module and sub-modules interact with each other.

3.2 The Phase Development Software Life Cycle

3.2.1 The Overview

The software process model or better known as the software life cycle model defines the set of activities that are found in the software development process, specifies the input and output of each activity and also defines the roles played in each of the activities. A software life cycle model specifies the relationships between project phases, including transition criteria, feedback mechanisms, milestones, baselines, reviews, and deliverables. Much of the motivation behind utilizing a life cycle model is to provide structure to avoid the problems of the "undisciplined hacker".

There are many different kinds of software process models available and each of then has it commonalities, differences, advantages and disadvantageous over the others. **Among the available software process model, we have chosen to use the Phase Development Model using both Incremental and Iteration Approaches.**

Figure 3.3 represent the Phase Development Software Process Model that is used in this project.
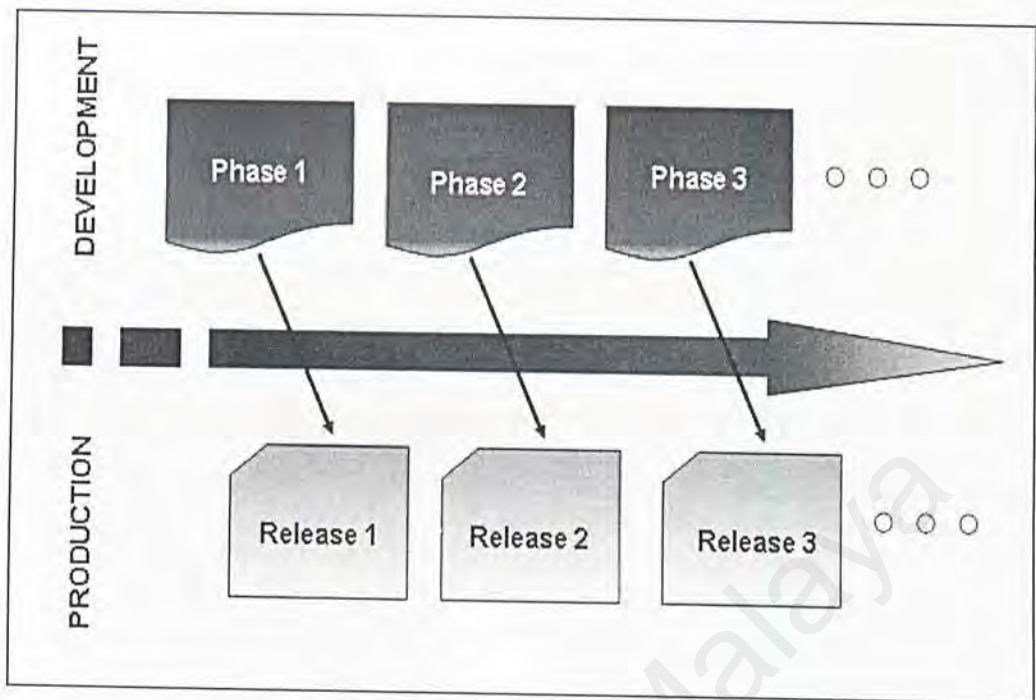
Figure 3.3: The Phased Development Software Process Model

3.2.2 Why This Approach?

There are several reasons behind on why Phase Development Model is used for this project: -

1) **Phased development is better suited for large and complex systems.** It enables developers to focus on each smaller module of the system on each release without being distracted by other functionalities of the whole complex system offers. . Each stage has its own requirement; usually it has certain features or core of the system. The incremental approach allow developers plan the stages in such a way that they can determine what functionality have to do

first, which is to say they may choose to deliver the most important functionality to the customer first. Each stage can use V-shape, prototype or waterfall model to develop the requirement for this stage. *(In our project, we use waterfall model with prototyping).* Regardless what kind of model is used in each stage, the product with certain features must be done at the end of the stage. This enables system to be developed according to user's requirements. Figure 3.2 demonstrates the incremental approaches in Phase Development Model.

1ˢᵗ Stage   2ⁿᵈ Stage   3ʳᵈ Stage
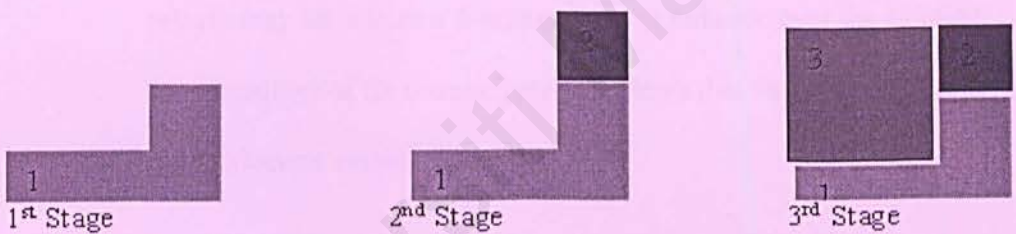
Figure 3.4: Incremental approach in Phase Development Model

2) **Phased development reduces the cycle time of software development.** The system is designed and delivered in small pieces, enabling users to have the basic functionalities while others are being developed.

3) **Training can begin on an early release.** The training process allows developers to observe and response to user's needs and working style

by making the necessary modifications and enhancements for the next release.

4) **Development and production are carried out parallel and simultaneously**. This means that customers can start using the software in production system while developers can enhance and build the next release in development system without interruption to the customer production.

5) **Frequent releases allow problems to be fixed quickly**. Each new release may include new functionalities or enhance over the existing functionalities or fix unanticipated problems that user reported from the production system.

6) **Expertise can be applied to different releases.** The team of developers can focus on different areas of expertise with different releases. For instance, the first release will focus on basic functionalities, then the next focus on enhancement and better GUI while the future releases fixes bugs and provides advance functionalities or so on.

System Analysis

Chapter 4 – System Analysis

In this chapter, we will concentrate on system analysis which including the requirements elicitation, requirement analysis, development tools consideration and justification. Meanwhile, the hardware and software requirement are also considered in order to come out with suitable and compact set of development tools and environment.

4.1 Introduction to System Analysis

System analysis is a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component part work and interact to accomplish their purpose. (Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, 2002). System analysis is an essential and important phase that is used to determine clearly all necessary requirements including functional and non-functional requirements when a new system is being built or existing systems are being modified.

Notice that emphasis is placed on business issues, not technical or implementation concerns. System analysis is driven by the business concern of system owners and system users. Hence, it addresses the DATA, PROCESS, and INTERFACE building blocks from system owners' and system users' perspectives. (Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, 2002)

Installing a system without proper planning and analyzing will lead to a great dissatisfaction and frequently causes the system fall into disuse.

In brief, the purposes of system analysis are as follow:-

- **Identity user's need.**

- **Evaluate the system concept for feasibility study.**

- **Allocate functions to hardware, software, people, database and other system elements.**

4.2 System Analysis Approaches

Fundamentally, system analysis is about problem solving. There are many approaches to system analysis; some of the more popular system analysis approaches are *structured analysis, information engineering, discovery prototyping* and *object-oriented analysis.*

System analysis approaches applied in this project is structured analysis. Structured analysis is a model-driven, process-centered technique used to either analyze an existing system, define business requirements for a new system, or both. The models are pictures that illustrate the system's component pieces: processes and their associated inputs, outputs, and files. (Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, 2002)

Structured analysis is simple in concept. A series of process models called data flow diagram (DFD) that depicts the process in a system along with their inputs, outputs and files will be constructed. Ultimately, these process models serve as blueprints for both business processes to be implemented and computer programs to be purchased or constructed.

4.3 Techniques Used To Define Requirements

Requirements Elicitation (RE) is an especially critical part of the process. Effective and appropriate techniques must be used to define and elicit users' requirements. Several techniques need to be applied in order to get a complete requirement. The following are the techniques that have been used for this purpose:-

4.3.1 Internet research

Internet is the main resource in searching materials especially when doing the literature review, some intranet system solutions in the web has been visited and analyzed. It is the fastest, easiest and most effective method in getting the latest information. Through the internet, some interesting web design and useful tools also have been referred. From there, we can get some ideas about the new features that should be integrated to existing intranet system that are using by organization in Malaysia. In brief, Internet has become a very useful and powerful weapon for the developer to seek information.

4.3.2 Library Research

UM Library serves as a valuable knowledge repository for us to gain a wide range of information about the intranet system. We went to library to search and borrow some references books related to intranet system design and the basic requirements for this system as well as the way it can be implemented successfully.

4.3.3 Trial on the Existing System

There are some intranet service providers offered a free trial on their intranet system solutions. This opens a golden opportunity for us to try on the existing intranet system itself. So, from with the experience of using the intranet system, we can then see and judge the system from the user's perspective.

4.3.4 Brainstorming

After getting all the information needed, then it is the time for brainstorming. The brainstorming session are sometimes done together or individually, supervisor and also with other friends and other lecturers. Brainstorming sessions are very much importance in the sense of formulating a better or enhance system requirements, system architecture and design, implementation techniques and solve the ambiguities that we faced.

4.3.5 Interview

In order to make our survey success, we have interview several people. Interview question has been attached (see Appendix A). This people are consists of the staffs in the organizations who use the system and those never use the Intranet system. The objective of this interview is to find out the current stage of Intranet usage in Malaysia and investigate what expectations from the user on Intranet.

There are several reasons why interviewing is chosen as one of an information gathering technique.

o Goals are important information that can be gleaned from interviewing, which is not being able to be determined through any other data-gathering method.

o Able to capture the opinions and feelings of the interviewee in order to understand the current system more deeply.

o Able to discover the key problems and solutions that the department wants to address by seeking opinions rather than facts system in future.

4.4 Functional Requirement

Functional requirements are statement of services the system should provide, how the react to particular inputs and how the system should behave in particular situation. In some cases, it also stated what the system should not do.

There are eight components recognized as the most important functional requirements for this project besides the login module: bulletin board, events calendaring, task management, project management, contact directories, discussion forums, reservation and meeting scheduler, fault reporting and knowledgebase. The distribution of development works are shown as the following diagram:-

```
                    ┌─────────────────────┐
                    │   Project team of   │
                    │   Intranet System   │
                    └─────────────────────┘
```

Chong Yi Ching (WEK 010052)	Chong Yuet Yuan (WEK 010053)
• Bulletin Board • Events Calendaring • Task Management • Project Management	• Login and logout • Knowledge base • Contact Directories • Discussion Forums • Fault Reporting System
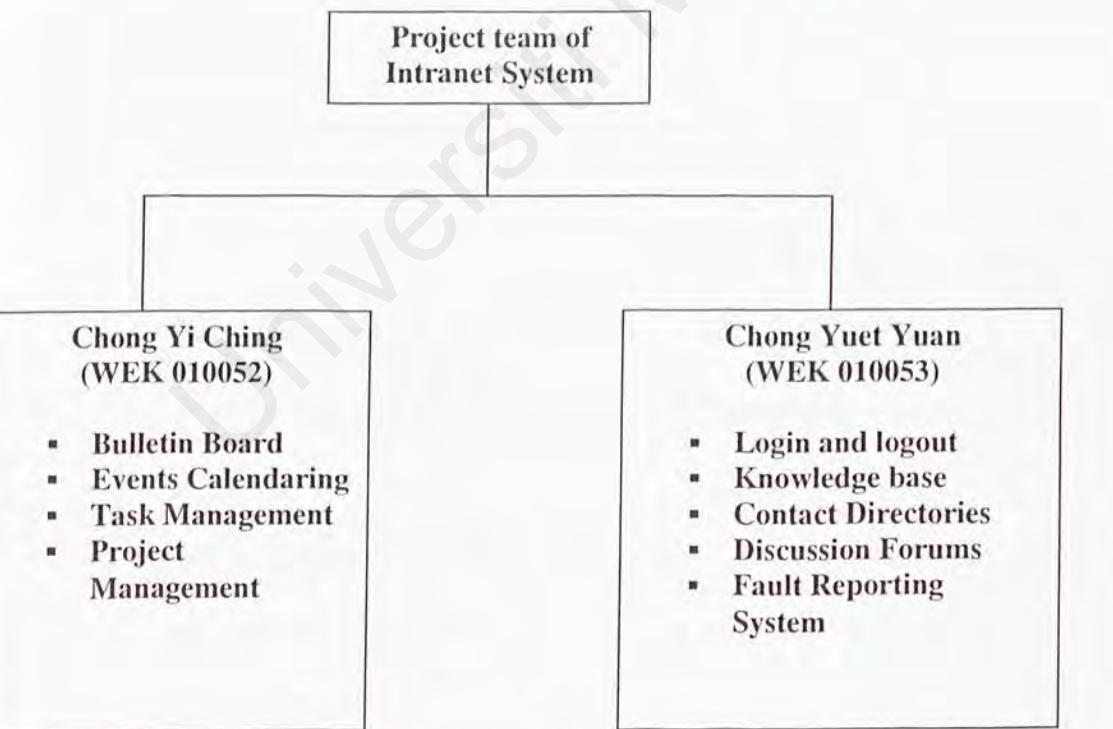
Figure 4.1: The distribution of development works

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4.4.1 Events Calendaring

The events calendaring allows users to keep track of personal appointments, group meetings and company-wide events.

4.4.1.1 Monthly View Calendaring

- This monthly view calendar should be open for viewing by all users logged into this Intranet system.
- All the related event and task shall be able to be view by user according to the date of that event and task.
- Each date in the monthly format having hyper linked titles of an event and task. User shall be able to view the task and event information after click the hyper linked.
- Monthly view should show the particular user's events and tasks in the month.

4.4.1.2 Daily view calendaring

- This application should display all the user's events in a day and display according to event time
- This application should have a button in to enable the user to add event according the day and time.

4.4.1.3 Three status of event

- Three status of event are private, show as busy, and public

- User can select whether they want that event to be viewed by any particular user, group of users, or all the users.

- For those events that have been status as **private** and didn't issue to others, the event's detail will only be viewed by that owner. In the other hand, if the event status is private, but issues to others, the event's detail will be viewed by the users in the lists only.

- For those events that have been status as **show as busy** and creator of that event issue it to others, the event's detail will be viewed by the users in the lists. Others will only see when the event is schedule but can't view the event detail.

- For those events that have been status as **public**, its detail will be viewed by all the users of the Intranet system.

4.4.1.4 Event lists

- This application should list down the entire past and upcoming event.

- By defaults, this application should display the entire event. User shall be able to filter event according to past and future event.

- User shall be able to maintain the event created by them and view all the event which is related to them

- User can select the event type and this application will display all the event fall into the selected type.

4.4.2 Task Management

Task Management application enable Intranet user to schedule and manage daily individual task as well as group of user daily task.

4.4.2.1 Two types of Task (Ad Hoc and Routine Task)

- Ad Hoc task is informal task and arranged for a particular purpose.
- Routine task is fixed and regular task that performed regularly. It is either performed everyday, every week on specific day, or specific day on specific week.

4.4.2.2 Assign New Task

- Only administrator has authorized to assign new task to user, certain group or all the users of the Intranet system. Other users are not allowed to access this section and assign new task.
- Task assign form will check all the important fields in the form. For those fields that require data entered by the user, a message box will be prompt to alert users if that important field have not enter data and users are required to enter data into that certain field. In the other hand, a default value will be assigned to those optional fields. Task assign form will be submitted as long as all the important fields have been entering data by users.

- The new task record will be inserted into database automatically once the 'Task Assign form" had been submitted successfully.

- As a result, an updated task listing will be display automatically.

4.4.2.3 Update and Delete Task

- All the users except administrator are not allowed to update and delete task records.

- Only the assignee/administrator of the task shall be able to maintain the task records and they are allowed to maintain those task records that have been assigned by them only.

4.4.2.4 Close Task

- Task that has been completely done shall be able to close and will be invisible to the users.

- The task that has been done by users and closed will not be deleting and still will be stored in the database for later use.

4.4.2.5 View Related Task Summary

- All the users of the Intranet system shall be able to access tasks summary application.

- Task summary only show all the undone task assigned to the particular user who log in to the Intranet system.

4.4.2.6 Task Report

- Administrator shall be able to view ad hoc and routine task assigned by them or others by entering a date range into the system to enable the system to search for the task according to the date range.

- The entire task either new, in process, done or cancelled will be present in the task report application according to the date range

- Task report application will display types of the task, task description, expected start date, expected start time, expected end date, routine date, person involved in the task and task status either is cancelled or done.

- Administrator can use this task report to find those tasks that has been assigned to a particular person.

4.4.3   Bulletin Board

Using the bulletin board application, the users can view the current important news and announcements which are related published at the Intranet system main page once they login successfully. Group announcements are the fast way to communicate throughout the organization. Use the news and announcements system to communicate general information to users. This application is very useful for displaying latest important news, new product release, useful file, and articles on a web site.

4.4.3.1 View News and Announcements

- All the users including the administrator shall be able to view the news and announcements. In addition, users are also allowed to access to further details page of an announcement.

4.4.3.2 Make New News and Announcements

- Only the administrator is allowed to make new news and announcements. Others will not be allowed to access this section.
- News and announcements will be seen by all the users.
- Messages that are urgent will be written in red color and display at the top of the announcements list.

4.4.3.3 Update and Delete News and Announcement

- Only the administrator shall be able to maintain news and announcement. Others will not be allowed to access this section.

- Announcements that have been deleted by users will not be deleting in database and still will be stored in the database for later use.

- Deleted announcements will be invisible to the users.

4.4.3.4 Search Announcements

- Enable users to search for announcements by entering date range.

- Users shall be able to enter start date and end date for searching purpose.

- Lists of announcement will be display after user click the search button.

4.4.4 Project Management

The Project Management application provides a simple graphical overview of a project's detail. There are three categories of projects: active projects, inactive projects and closed projects. By default, the project management main page will list out all the active projects. Only administrator, project leader and person who involved in the project/task have the authority to process (add, edit, and delete) this application. Others only have permission to view the project information.

4.4.4.1 View Project List

- All the users including administrator shall be able to view all the three categories of project's and can access to further details page, example task of the project, sub task of the task and all the details of task and sub task

4.4.4.2 Create New Project

- Only the administrator and project leader are authorized to create new project. Others will be block to access this section.

- Once a new project created, new task related to the project shall be able to make. In addition, sub task of the task is also shall be able to create for the particular project.

4.4.4.3 Update and Delete Project

- Only the administrator and project leader shall be able to maintain the selected project record.

- Others will not be allowed to access to this section

- Projects that have been deleted by users will not be deleting in database and still will be stored in the database for later use.

- Deleted projects will be invisible to the users.

- Lists of project that has been selected to be deleted will not be automatically deleted from database. The system shall confirm again with user whether user is sure want to delete the selected project. From the application, if user change user mind, user can uncheck any project they do not wish to delete.

4.4.4.4 Create Notes

- Important notes about certain task of the project shall be able to add and visible to all the users.

4.4.4.5 Assigned Project Leader and Participant

- Administrator shall be able to assign project leader and participant according to project created.

4.4.4.6 Upload Project Files

- User shall be able to upload files related to a particular project by using the upload application.

- Files that have been uploaded shall be able to view, open, save by user.

- User shall be able to upload many files if that files are related to a project

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- User shall be able to upload many files if that files are related to a project

4.5 Non Functional Requirement

A non functional requirement is a description of the features, characteristics, and attributes of the system as well as any constraints that may limit the boundaries of the proposed solution. (Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, 2002) The new Intranet System must ensures certain web application qualities like user-friendliness, correctness, functionality, reliability, flexibility, efficiency and maintainability.

The following states the non-functional requirement for the Intranet System:

4.5.1 Usability and User friendliness

User interfaces design creates an effective communication medium between a human and a computer. Therefore, it is very important to make sure that the interfaces fulfill user-friendliness so that it would not cause trouble to users. Generally, the design of all the interfaces should conform to the following:

- *Consistent, in term of screen design and error messages display*

- *Accommodation of any level of user*

- *Appropriate error handling with associated error messages*

- *High degree of understandability and void too much of memorization of events and commands for the users.*

The Intranet System utilizes the Graphical User Interface (GUI). The usage of suitable and meaningful icons will help ensure that users use the system with more confidence and avoid mistakes made by user

unintentionally. The system will also display a confirmation message for any non-trivial process such as deletion and data updating. Appropriate prompts and instruction will be shown to guide the user along the operation of the system. The instructions also guide the users while using the system.

4.5.2 Efficiency

Undeniable, efficiency is the main key for implementing the new Intranet System. Efficiency in computer technology means a process or procedure that can be called or accessed in an unlimited of times to produce similar outcomes or output at a creditable pace or speed.

Efficiency is measured base on response time performance, page generation speed and graphics generation speed.

4.5.3 Modularity and Maintainability

The system coding and design will be implemented by using a modular approach so that it can be easily enhanced in the future. The procedure, subroutine and methods in the program are written in modular. It also makes the program easier to understand in the later time. Some common procedures or functions are reusable. This will save a lot of development time and prevent the codes redundancy. Later maintenance to the system can save a lot of effort.

4.5.4 Security

The proposed system has also security measures to minimize the risk of data exposure to unauthorized users. Access to the database and administrator's page has to be controlled with proper authorization and authentication controls.

4.5.5 Correctness

A program or system must operate correctly or it provides little value to its users. Correctness is the degree to which the software performs its required function. To ensure this application quality, lots of testing and trial-and-errors will be carried out.

4.5.6 Functionality

The functionalities stressed here are the searching and retrieving capability, which is very important in any web application that deals with data retrieval from existing database. Besides, navigation and browsing features as well as application domain-related features will be taken into account.

4.5.7 Reliability and dependability

Reliability is the extent to which a program can be expected to perform its intended function with required precision. It is closely related to correct link processing, error recovery and user input validation and recovery. A system is said to have reliability if it does not produce dangerous or costly failures when it is used in a reasonable manner, that is in a manner that

instructed by the system. Appropriate messages and prompts were designed to enable user follow step by step easily in using the system. Assumptions were encountered by the system design in order to prevent user acts in an unusual pattern.

4.5.7 Robustness

The system module will be completely tested to ensure each module achieve its expectation. The modules will be integrated into system and system testing will be started after process integration. Any error that discovered during system testing will be solved immediately. This is to make sure the system is as robust as what had been expected before.

4.5.9 Expandability

The degree to which architecture, data or procedure design can be extended.

4.5.10 Respond Time

Search results must be obtained within a reasonable period of time like 30 seconds.

.6 Explanation of Hardware and Software Requirement

6.1 Chosen Platform, Web Server, Database Management System and Tools

4.6.1.1 Chosen Development Platform (Windows XP)

For the Intranet System, Windows XP Professional is chosen as the development platform. Windows XP Professional integrates the strengths of Windows 2000 Professional, such as standards-based security, manageability, and reliability, with the best business features of Windows 98 and Windows Millennium Edition, such as Plug and Play, simplified user interface, and innovative support services. This combination creates the best desktop operating system for business computers.

The main reason that we choose Windows XP as the development operating system is Windows XP Professional has offered many features and advantages that suite the needs of our project scope which we have to establish an Intranet System for a small and medium-size company. Some of them are shown as follow:-

- **Reliable**

  Windows XP Professional is built on the core software code used in Windows 2000 and Windows NT® Workstation. This code, known as the NT kernel, makes Windows XP more powerful, secure, and stable than Windows Me, Windows 98, or Windows 95. Compare to those systems used in the past, Windows XP offer a dramatic advantage: even if a program crashes, in most cases the computer will keep running. This suite our project needs because reliability is one of the non-functional requirements.

- **Easy to use**

  From its fresh, new look to its intuitive, task-based design, Windows® XP Professional makes it easier than ever to use our computers. We'll be able to get more done in less time, find items in a snap, and arrange files and folders in a way that makes sense to ourselves. Simply put, Windows XP Professional helps us to the work in a smarter way.

- **Secure**

  Security features in Windows XP Professional protect sensitive and confidential data both on our computer and while we are transmitting over a network or the Internet. With support for the latest security standards and enhanced virus protection, Windows XP also protects us from some of the more common types of Internet attacks.

  Windows XP includes the Internet Connection Firewall, which provides strong security for home or small business network. It helps to keep our system secure while we are on the Internet. This feature is important for us when we carry out our project because we need to connect to the internet to test some parts of our project functionality such as e-mail notification.

- **High Performance**

  Computers running Windows XP Professional outperform Windows 98 Second Edition, and meet the performance of Windows 2000 on commercial benchmarks. Not only will Windows XP launch applications faster, in most cases, the entire system will start up much more quickly.

When we turn on the computer running Windows XP Professional, it will be ready to work an average of 34% faster than Windows 2000 and an average of 27% faster than Windows 98 SE. Besides that, with Windows XP, programs will start an average of 25% faster than with Windows 98 SE and as fast as they did with Windows 2000. The same performance improvements that make the Windows XP–based computer start faster when we turn it on also make programs start faster when we're ready to use them.

After we start a program a few times, Windows XP learns the code and data required to launch it. It stores that information where it is easily accessible, so the system wastes no time searching for it the next time we start the program. These high performance features are useful for us when we develop the Intranet System since the main constraint of our project is times limitation.

4.6.1.2 Chosen Web Server (Internet Information Server)

IIS users developing a Web service for home or for office use. It can service only 10 simultaneous client connections, only one Web site, and it does not have all the features of the server versions. IIS replaces the Personal Web Service (PWS), which was found in earlier client versions of Windows. PWS cannot be upgraded to run with Windows XP.

IIS includes a broad range of administrative features for managing Web sites. With programmatic features like Active Server Pages (ASP), we can create and deploy scalable, flexible Web applications on the Internet or intranet. Some useful

features offered by IIS 5.1 in Window XP Professional that suit our project needs are as follow:-

- **Support for Active Server Pages (ASP)**, which ASP is the chosen programming language for our project. IIS support for ASP provides an easy-to-use alternative to Common Gateway Interface (CGI) and Internet Server Application Program Interface (ISAPI) by letting content developers embed any scripting language or server component into their HTML pages. ASP pages provide standards-based database connectivity and the ability to customize content for different browsers. ASP also provides error-handling capabilities for Web-based applications.

- **Administrators can use Simple Mail Transfer Protocol (SMTP) and Network News Transport Protocol (NNTP) Services to set up intranet mail and news services that work in conjunction with IIS.** This feature is very important to us because it will be applied in certain parts of our project such as e-mail notification function.

4.6.1.3 Chosen Database Management System (Microsoft SQL Server)

Microsoft SQL Server has been chosen as a database management technology that will be used in our project. The main reason we choose this database management is because SQL Server provides a complete data management business intelligence solution with the highest levels scalability that can scale form the smallest mobile devices to the largest data warehouses while maintaining lower cost performance. Features like self-healing; auto-optimization, online index reorganization, and built-in parallelism are designed with scalability. These features enable SQL Server to perform multiple, high speed actions on large amounts of data while keeping personnel and software costs low. Coupled with built-in business intelligence and data mining functionality, SQL Server provides the most cost-effective, high performance and complete data management system. In addition, SQL Server has a large number of applications that are built using its technologies and a growing number of partners who can built, maintain, and update SQL Server installations and the applications running on those installations. According to Tom Rizzo's article about why companies switch to SQL Server, he wrote that many IT departments worldwide in this current year are choosing SQL Server as a technology that provide more business value at lower cost. [14]. SQL Server includes a relational database, an online analytical processing (OLAP) server, built-in replication, and an extract, transform, and load (ELT) tool in Data Transformation Services (DTS).

4.6.1.4 Chosen Development Tools (Macromedia Dreamweaver MX)

Macromedia Dreamweaver MX has been chosen as one of the development tools. It is because Dreamweaver MX is superior web authoring application that is a combination of the functionality of three separate products: the visual layout tools of Dreamweaver, the rapid web application features of Dreamweaver UltraDev, and the extensive code editing support of HomeSite to provide a complete solution for developing websites. With Dreamweaver MX, designers, developers and programmers can work within one environment to easily create and manage any professional website, whether it's build with HTML, XHTML, XML, web services, ColdFusion, ASP.NET, ASP, JSP or PHP.

Many new and enhanced features include in Dreamweaver MX. One of the biggest features in Dreamweaver MX is the new workspace that is essentially broken up into a series of windows, panels, and inspectors. It features the streamlined integrated, panel-based interface and tabbed document window that allows user to easily switch back and forth between multiple documents during the design and development process. User can group together the collapsible, dockable panels and collapse or expand them as needed for a smooth and highly configurable workflow. The interface is designed to accommodate a wide range of expertise and working styles. [15]

In addition, Macromedia Dreamweaver MX also included others new and enhanced features as following: [16]

- New dynamic cross-browser validation

- Richer, more powerful CSS support

- Built-in graphics editing

- Secure FTP

- Increased support for today's technologies

- Seamless integration with external files and code

- Tighter integration with other Macromedia tools

- Improved support for the basics

- Enhanced coding tools

- Streamlined design and development environment

In the finding, Dreamweaver MX can reduce the task of switching between programs to coding tasks with the inclusion of HomeSite web application features. It is also easier to setup dynamic data sources in Dreamweaver MX using the application panel group. The file new dialog box provides quicker creation of common document types. In overall, several enhancements feature in this development tools, including new interface, enhanced template options, new page designs, HomeSite coding abilities, and table enhancements have leading us choose to use this development tools. It is a best choice for individuals who are looking for a complete environment for designing web pages, managing sites, and developing application.

4.6.2 Chosen Programming Language

Choosing the suitable programming language for the project is an important step to ensure that the development of this project can going on smoothly. After the research and studies about various programming languages available today, we decided to use ASP (Active Server Pages) as our project implementation language.

4.6.2.1 An Overview of Active Server Pages

Active Server Pages are a server-side scripting technology primary developed to work under IIS (Internet Information Server) on Windows NT Server (3rd party products exist enabling the use of ASP on other server platforms). ASP brings to web programmers server-side processing and database connectivity. Those capabilities have empowered static web pages so much that the term "web application" has been coined to describe the websites that heavily utilize those capabilities. Some examples of web application are web-based e-stores, report generators and workflow-based applications.

4.6.2.2 How ASP Work?

ASP pages are interpreted by an ASP interpreter installed on IIS/PWS. ASP pages may consist of pure HTML portion, ASP portion or most commonly, a mixture of both. The HTML portions contain only the standard HTML tags (like static web pages) while the ASP portions contain the ASP script source code.

ASP

HTML

Server

Client

URL

ASP Server Side Technology

HTML

Server

Client

URL

Conventional Static Page
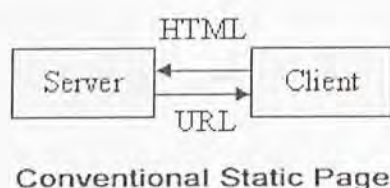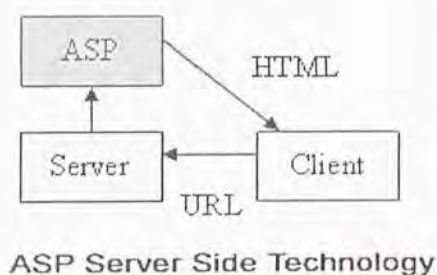
Figure 4.2: ASP Server Side Technology versus Conventional Static Page

The HTML portions will be left untouched by the interpreter. The ASP portions, on the other hand, will be processed by the interpreter to generate the resultant HTML code. The interpreter finally combines both the untouched HTML portions and the interpreter-generated HTML portions as a single HTML portion before sending it to users' browsers.

This conversion of the ASP portion into HTML code by the interpreter forms the heart of the concept of dynamic web pages. This enables the interpreter to generate different static HTML code out of the same ASP script in order to mimic a dynamic behavior. [17]

4.6.2.3 Why We Choose ASP?

In brief, we choose ASP as our project implementation language based on the following consideration:-

1) **Easy to use**

   ASP/VBScript is a relatively easy language to learn, even to programmers who have not had any prior knowledge of web development and Object-Oriented Programming. This allows us to be productive with ASP very quickly, thus it reduce our time to learn up this language.

2) **Tons of Information**

   There are currently more than 150 sites listed in Open Directory's ASP category [18]. This is more than for any other server-side development engine or language. Lots of online magazines will deliver new articles on ASP to user mailbox on a weekly or even daily basis. There's a lot of resources out there for ASP, folks. This is beneficial for our project since we can get a lot of information on how to produce the coding in a better way.

3) **Language Independence**

   ASP is a scripting engine enabling user to develop in virtually any language of his or her choice. The two languages available by default are VBScript and JScript (Microsoft's version of JavaScript); however, modules for Perl, Python and other languages already exist and there are virtually no limits for support for

other languages to be implemented. This enables the novice ASP developer to utilize his or her previous programming experience

4) Secure

Active Server Pages is a component of Internet Information Server, and thus uses Windows NT Security. ASP files can be easily restricted to just certain users through secure Windows NT authentication, basic Web authentication, or client-side certificates. For additional security, all client-to-server communications can be secured with Secure Sockets Layer (SSL). This suit our project needs since the security is an important issue in the Intranet System.

5) Extensibility

Using ASP components, programmers will be able to modularize their ASP codes into separate components according to their functions. This facilitates code reuse and extensibility of the standard ASP capabilities. For example, there's no way to send email using standard ASP functions but there are lots of components (both free and commercial) enabling us to do this, as well as choosing the methods and features that we want implemented.

6) Database

ASP provides database connectivity with many popular RDBMS (Relational Database Management System) such as Microsoft SQL Server and Oracle, as long as ODBC (Open Database Connectivity) driver for the RDBMS is available.

ASP-RDBMS interfacing facility is a crucial feature which is required to support data-driven web applications such as Intranet System.

4.7 Server and Client Requirement

4.7.1 Server Side Requirement

The following computer configuration was found to be the most suitable environment to deploy both Internet Information Server 5.0 (IIS) and Microsoft SQL server 2000. Both Microsoft SQL Server 2000 and IIS 5.0 are run on Microsoft Windows 2000 XP.

4.7.1.1 Server Hardware Requirement

The hardware specification of server computer is listed below:-

- A server with at lease Pentium 166Mhz processor
- A minimum 64 MB memory to support the workload of the server
- 10 GB of free hard disk space
- VGA or higher resolution monitor
- Network interface card (NIC)
- Other standard computer peripherals

4.7.1.2 Server Software Requirement

The following table describes the server software requirement for developing an

Intranet System: -

Table 4.1: The server software requirements for developing an Intranet System.

Software Components	Description
▪ Microsoft Window NT Server 4.0	▪ Network Operating System
▪ Microsoft Internet Information Server (IIS) 3.0 or above	▪ The web server service to interpret ASP codes.
▪ Microsoft Internet Explorer 4.0 or above, Netscape Navigator 4.0 or above	▪ The web browsers to view the output.
▪ Active Server Page (ASP)	▪ Server scripting engine
▪ SQL Server 2000	▪ The web server for database to perform SQL queries.

4.7.2 Client Side Requirement

The client hardware requirements are quite minimal as long as it has a reasonable amount of RAM and a reasonable quality dial-up connection line.

The recommended configurations are:-

4.7.2.1 Client Hardware Requirement

- Any compatible computer with recommended at least 486 processor

- A minimum of 64 MB memory

- A minimum of 1 GB of free had disk space

- Network Interface Card (NIC) and network connection with recommended bandwidth at 10 Mbps or more

- VGA or higher resolution monitor

4.7.2.2 Client Software Requirement

The client software requirement falls on the browser used by the users. It requires system that can run Microsoft Internet Explorer 4.0 or above. Any operating system can be used.

System Design

Chapter 5 – System Design

In this chapter, we will concentrate on system design which including the system architecture, system functionality design, database design and user interface design.

5.1 Introduction to System Design

System design is defined as those tasks that focus on the specification of a detailed computer-based solution. It is also called physical design. It is the first step in the development phase, in which requirements are translated into the representation of the software that is accessed before beginning the code generation. (Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, 2002)

System design phase uses the information collected earlier to accomplish the logical design of the system. It involves designing accurate data entry procedures and provides accurate input to the system being developed by using techniques of good form and screen design. Thus, whereas system analysis emphasized the business problem, system design focuses on the technical and implementation concerns of the system.

The following are three characteristics to achieve a good design and software quality:

- The design must implement all the explicit requirements contained in the analysis phase and it must accommodate all implicit requirement desired.
- The design must be readable and understandable guide for those who will generate code and those who will test and subsequently maintain the system.

- The design should provide a complete picture of the system, addressing the data, functional and behavioral domains form an implementation perspective.

Each of these characteristics is actually a goal to be achieved during the design process.

5.2 System Architecture
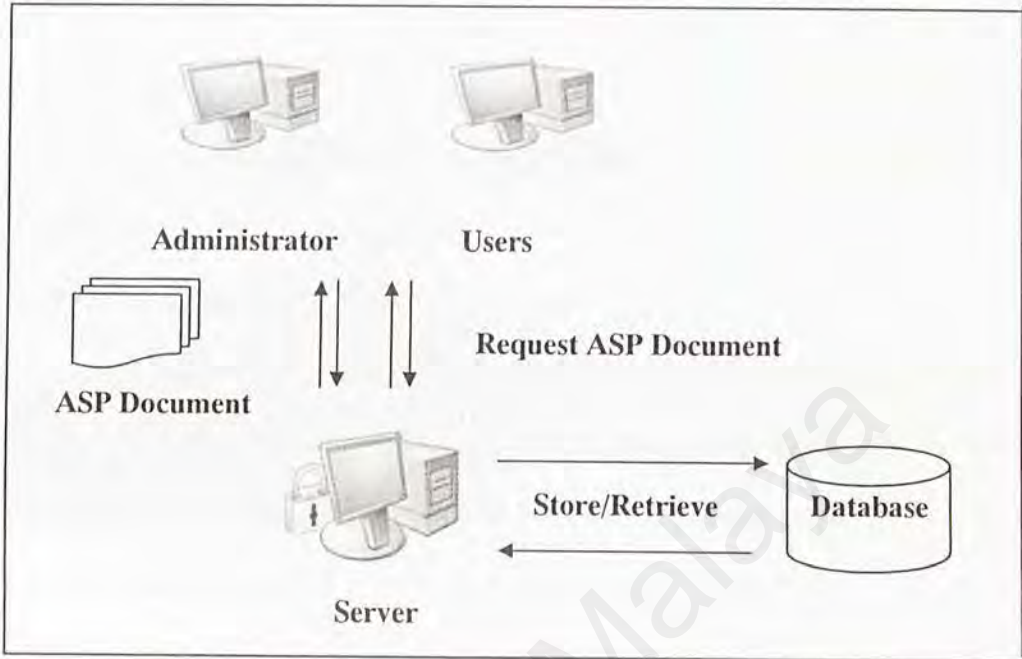
Figure 5.1: System architecture of Intranet System (single-server system)

Figure 5.1 shows the overview of Intranet System architecture. At first, users will be given a password to access the system from any PC with compatible browser. After log on the system, they have the rights to perform their activities on each module in the Intranet System. All the information needed by the user is stored in the database and it can be retrieved by the users through a server. The single server can be a desktop, Intel-based PC running one of the supported operating system such as Microsoft Windows NT or a commercially supported UNIX-like system. Data stored in the database will be updated every time whenever there is an action taken by the user on the system e.g. add, edit, update or delete a record.

5.3 System Functionality Design

There are several design methodologies for the system functionality design. For this project, (Intranet System) is designed based on the data flow oriented-design method or structured design. Structure design has its origins in earlier design concepts that stressed on modularity, top-down design and structured programming.

5.3.1 System Structure Chart

Structure chart is used to depict high-level abstraction of a specified system. The objective of structure chart is to describe the interaction between independent modules. Major functions from the initial component part of the structure chart, which can be broken into detailed sub-components.

In overview, Intranet System of this project is divided into 7 main modules; each of these modules is further divided into many sub-modules or functions. Figure 5.2 show all the modules and sub modules of Intranet System in structured chart: -
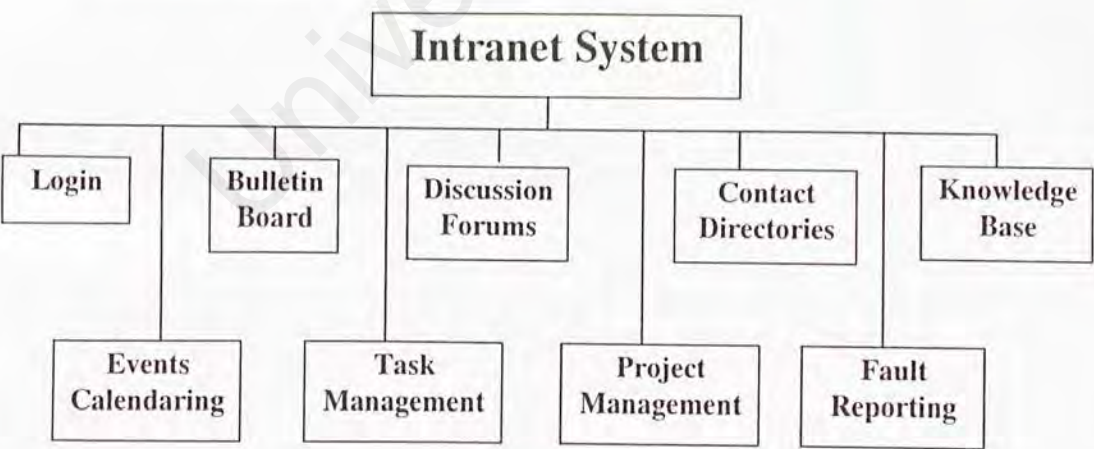
Figure 5.2: Structured chart for Intranet System
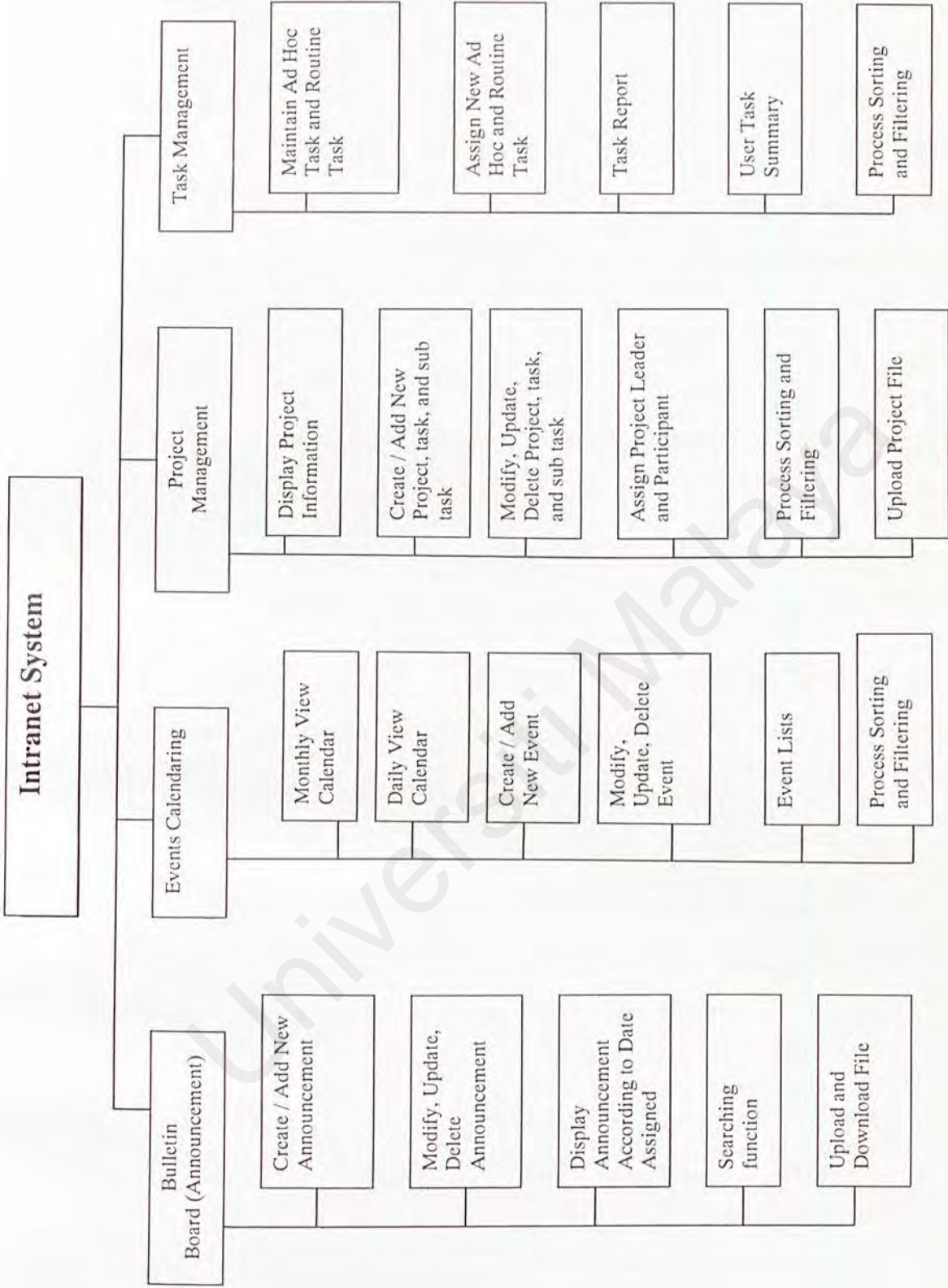
Figure 5.3: Structured chart for modules conducted by Chong Yi Ching

5.3.2 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is a method used to graphically characterize data processes and flows in Intranet System. DFD will depict the broadest possible overview of system inputs, and outputs, which correspond to data movement through the system.
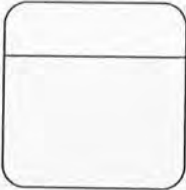
The advantages of using DFD are:

- *Further understanding of the interrelatedness of modules and sub modules of Intranet System.*

- *Analysis of a proposed system to determine if the necessary data and processes have been defined.*

DFD is easy to be understood as it has symbols that specify the physical aspects of implementation. Table 5.1 describes the four basic symbols in DFD: entity, flow of data, process and data stores such as follow:-

Table 5.1: Description of symbols used in Data Flow Diagram

Component	Description
Data ⟶	Data Flow • Represent the flow of data or information from one object to another • Arrow denotes the direction of data flow • Each data flow is labeled with the name or details of the information represented by the data flow
ID | Stored Data	Data Store • Hold data for a time within the system • Comprise two sections: 1. Identifier information

	2. Description of the data stored
	Entity • Any objects in the real world, for example person

	Process
	• Transform the input data to output data
	• Represented by rectangle shape
	• Comprise two or three sections:
	  1. Top section contains the identifier information
	  2. Center section contains a description of the process
	  3. Lower section contains the physical or computer program information

The convention, which is used to design DFD are based on the work by C.Gane and T.Sarson. The data flow is conceptualized with a top-down perspective. So, the Context Level Diagram will be drawn, followed by the Diagram 0.

5.3.2.1 Context Diagram

The context diagram shows the entire system as a single process surrounded by the external entities. The major input and output are representing as data flows. The purpose of this kind of diagram is to furnish an easy overview of the whole system that will be developing or implement. (Kendall, K.E. and Kendall, J.E, 1999)

Context diagram also help to focus on the boundary of the system to be investigated and assistance in achieving agreement while defining the scope of this project. Below is the Intranet system context diagram.
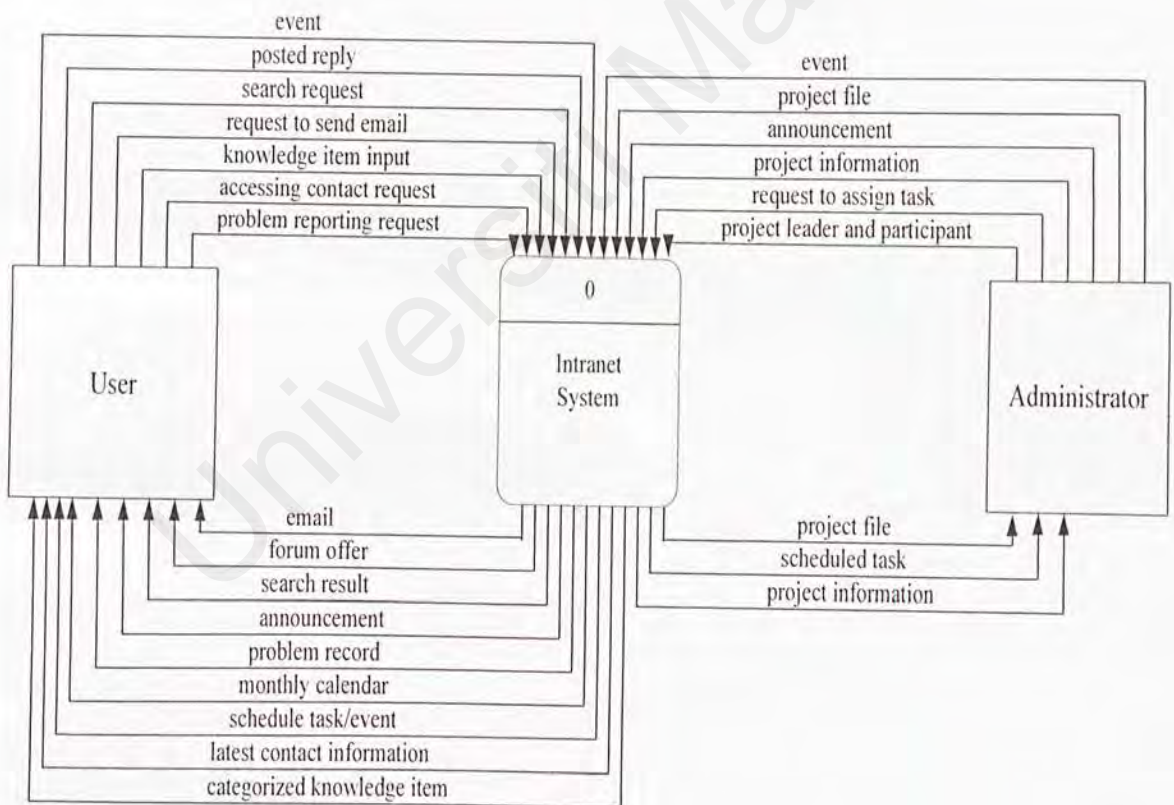
Figure 5.4: Context diagram for Intranet System

5.3.2.2 Diagram 0

Diagram 0 is an overview process of all the major modules in Intranet System that includes all the data stores, entities and process involved.
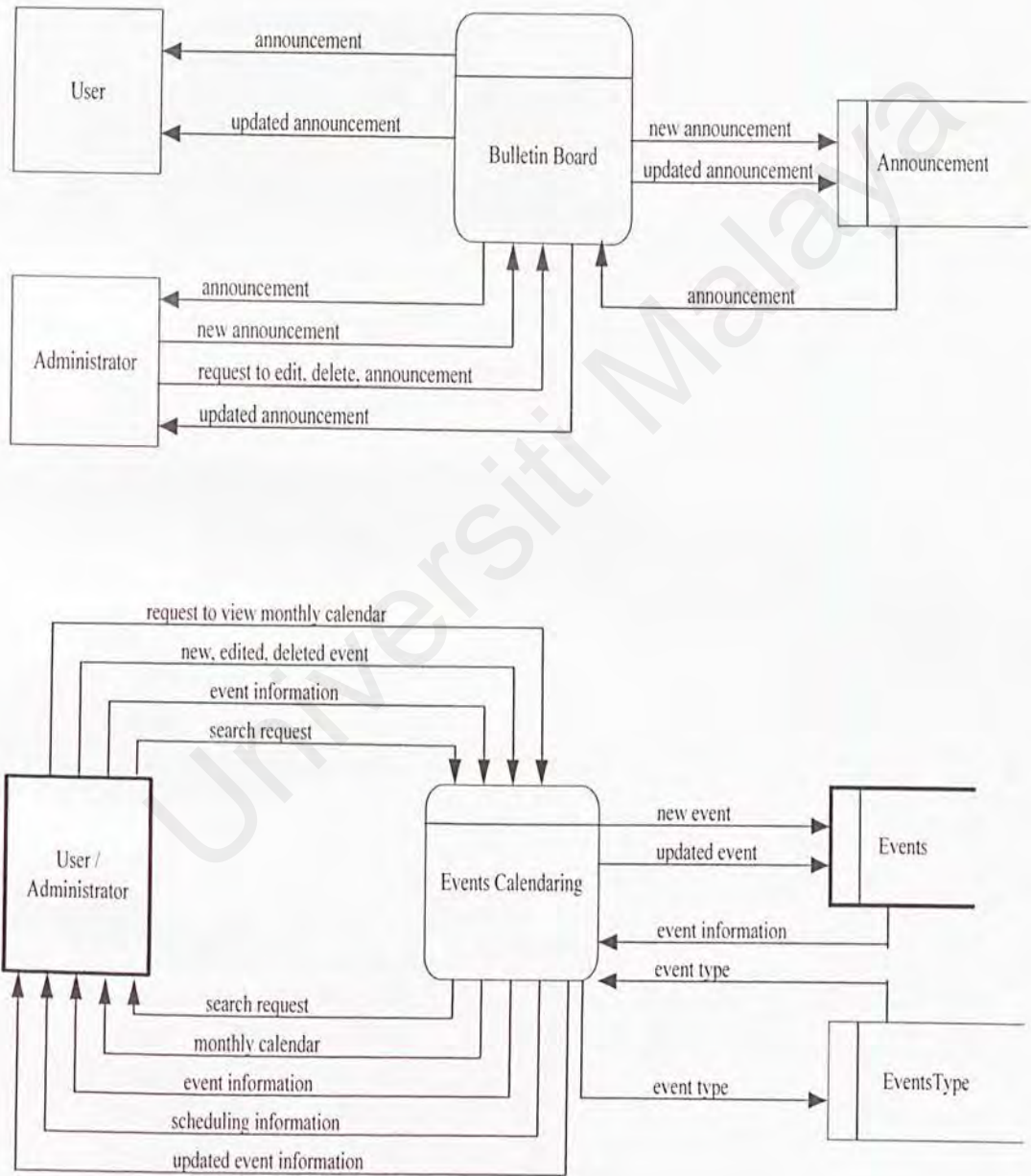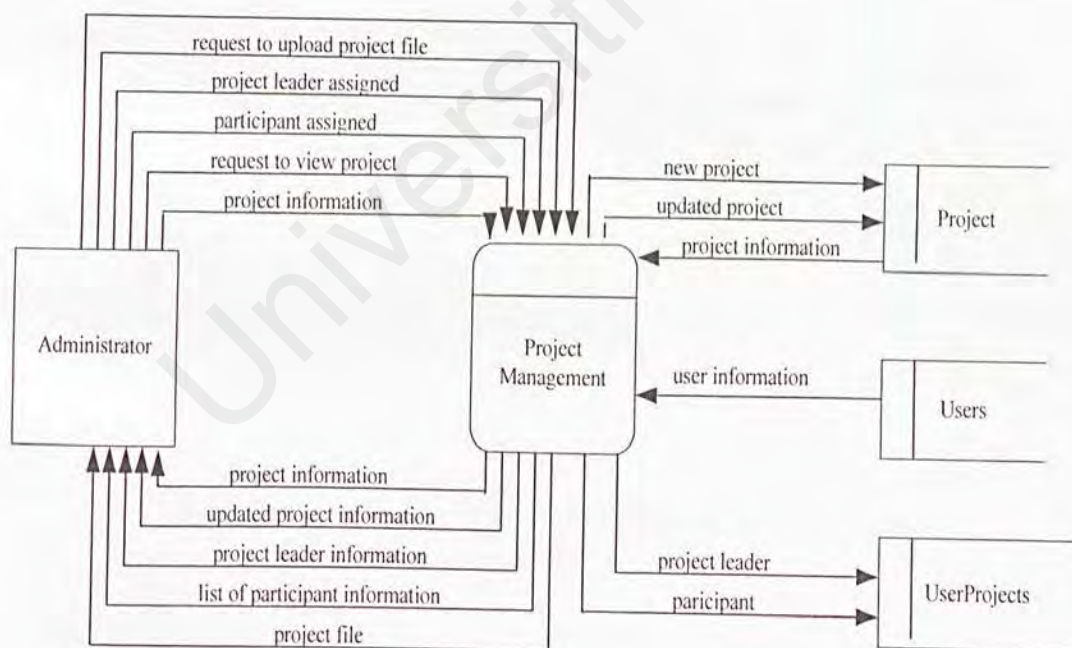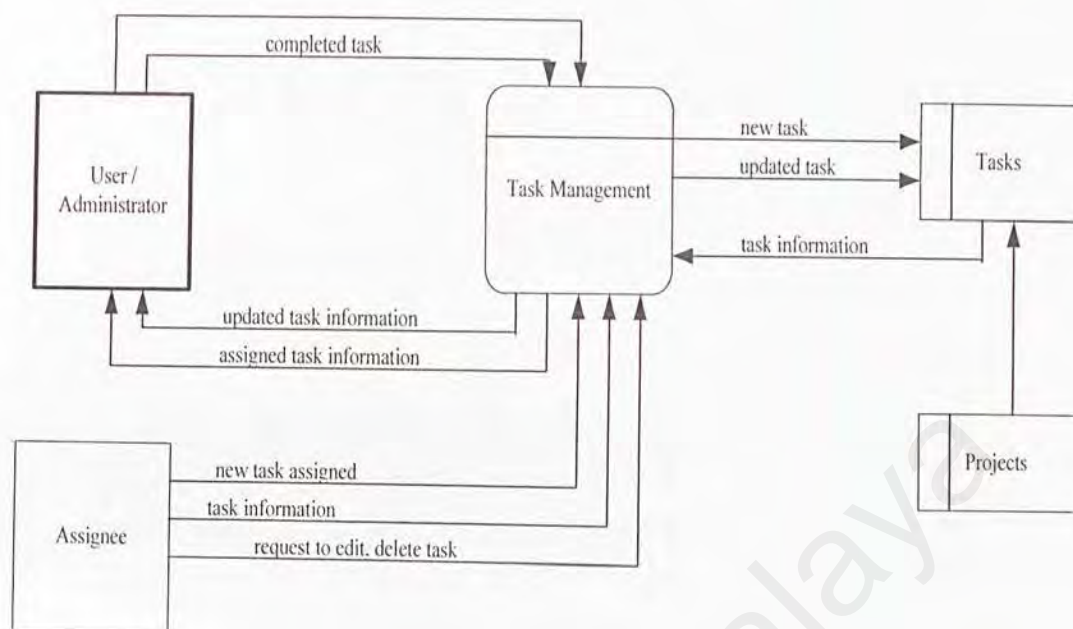
Figure 5.5: Diagram 0 of Intranet System

5.3.2.3 Data Flow Diagram for Each Module
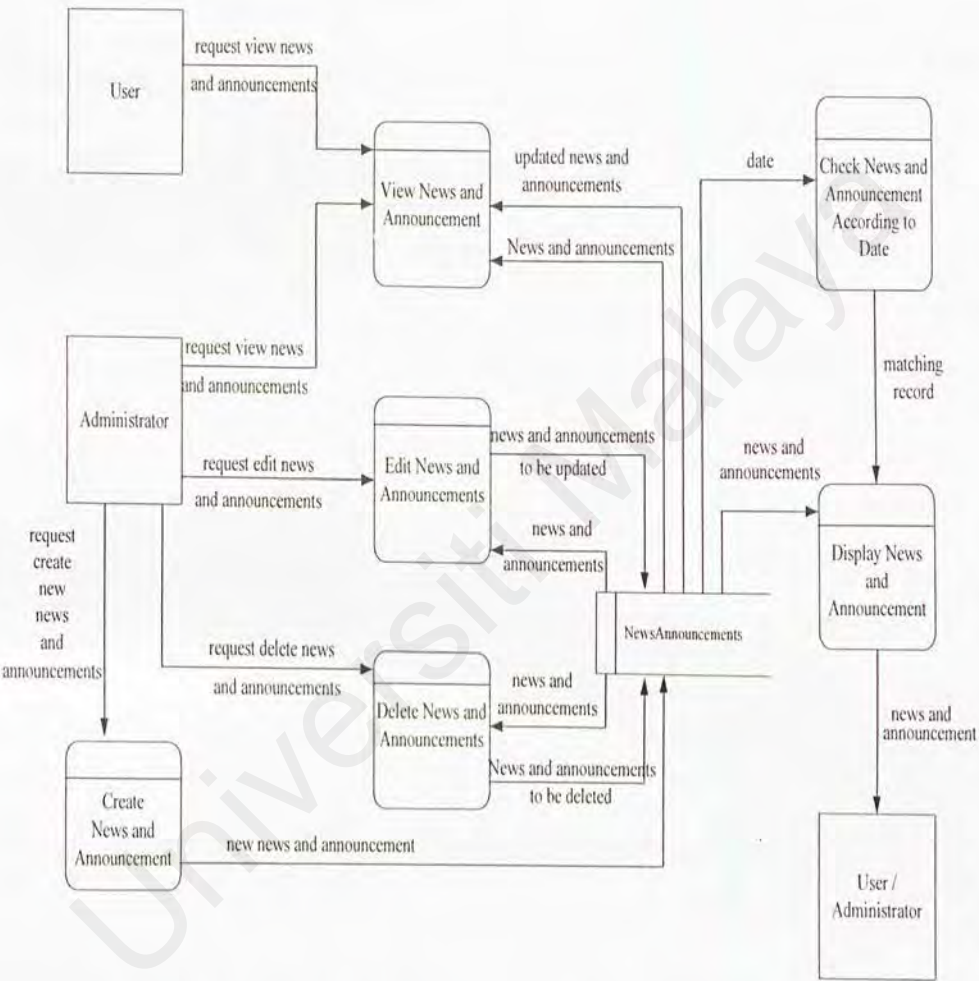
Figure 5.6: Data Flow Diagram for Bulletin Board Module
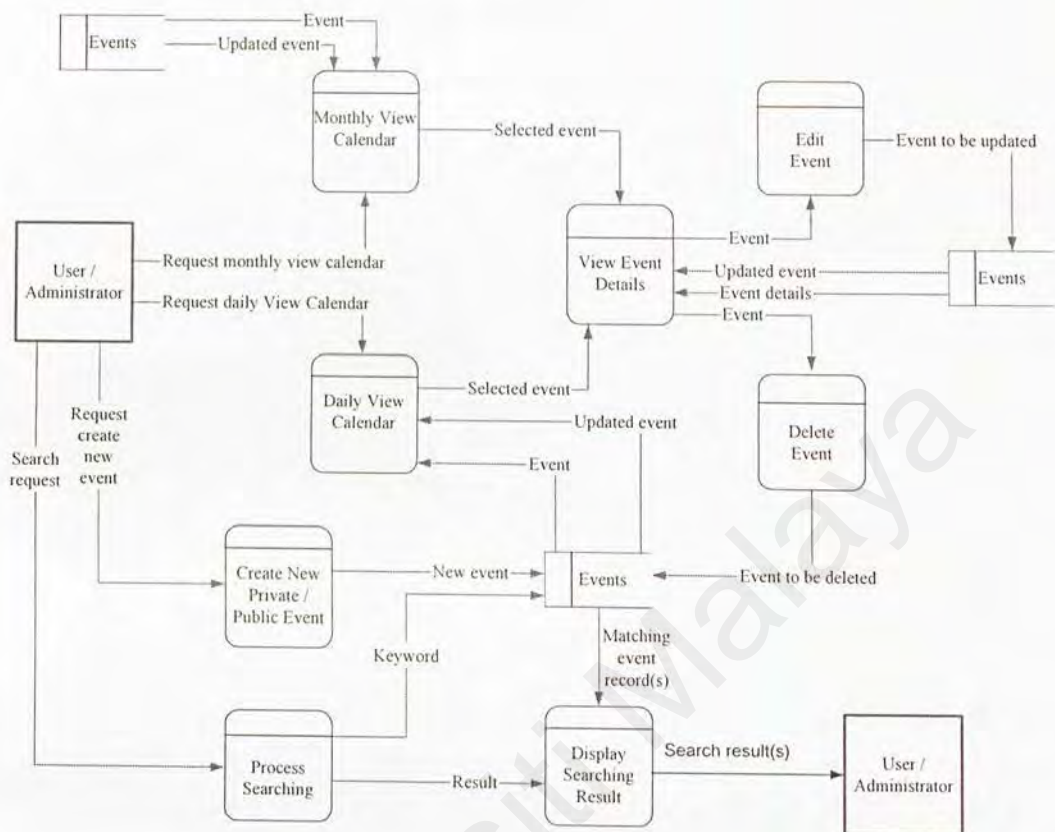
Figure 5.7: Data Flow Diagram for Events Calendaring
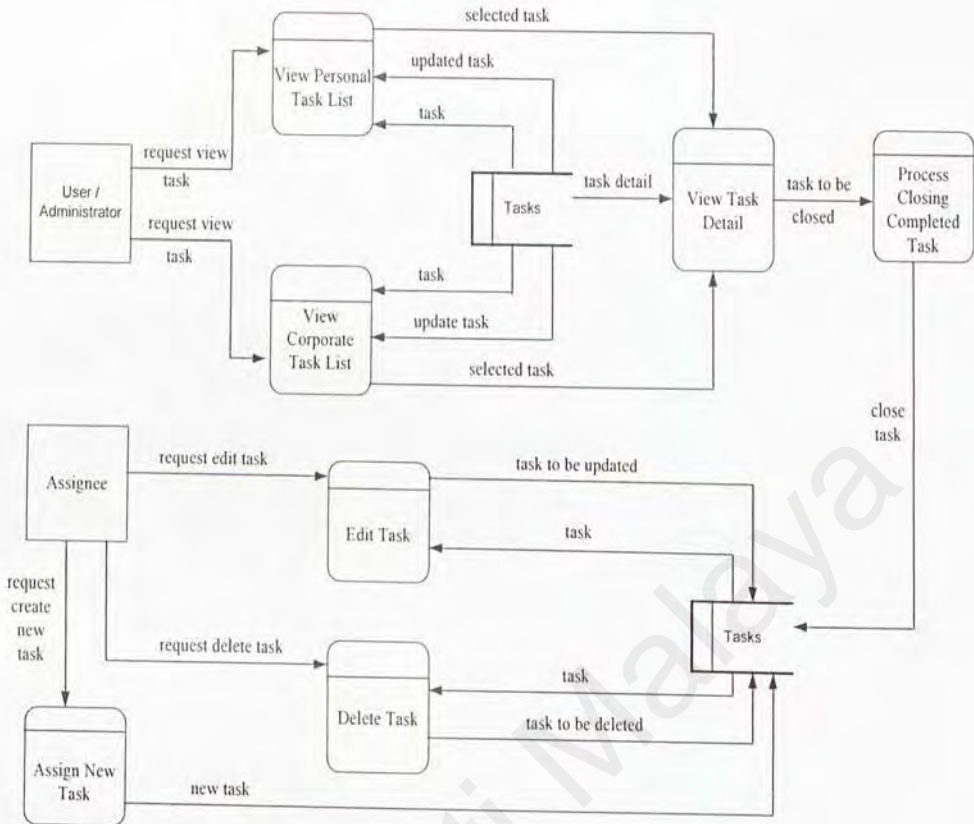
Figure 5.8: Data Flow Diagram for Task Management
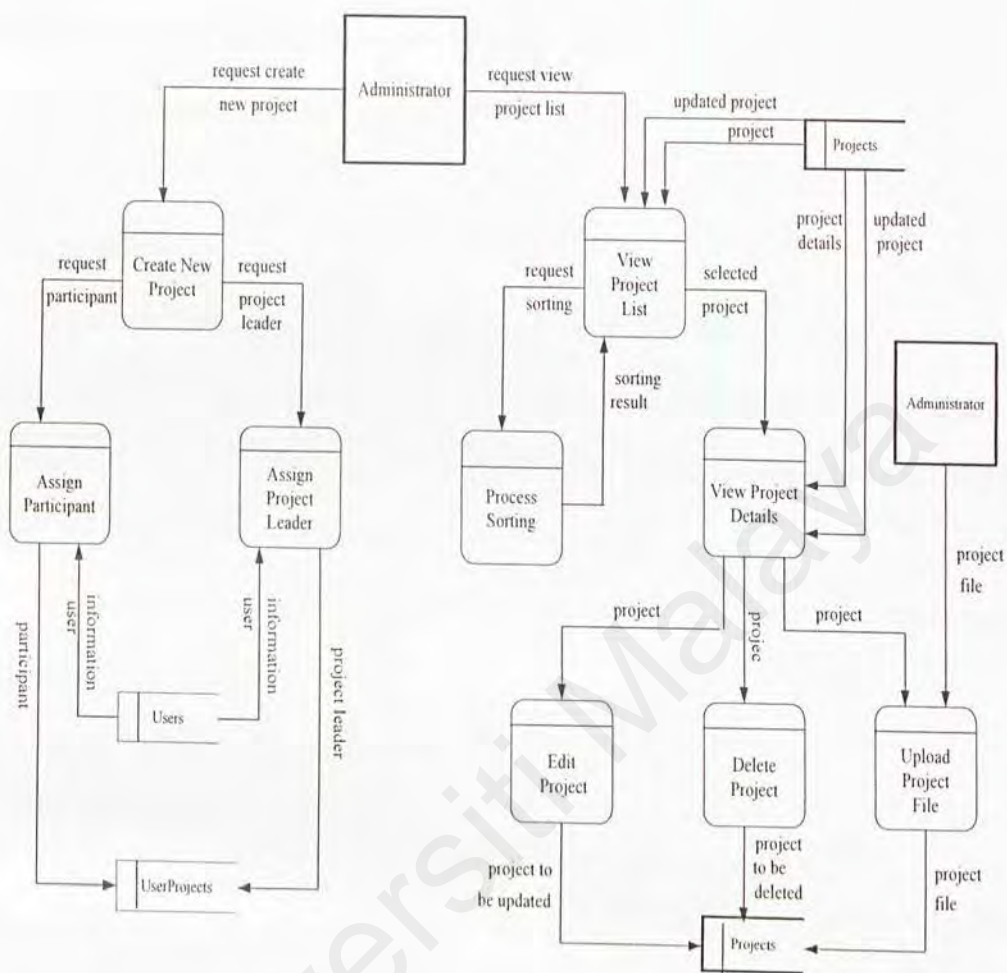
Figure 5.9: Data Flow Diagram for Project Management

5.4 Database Design

This Intranet system uses the relational database model in its database implementation. The database is constructed using the Microsoft SQL Server 2000.

5.4.1 Data Dictionary

Database Dictionary (DD) is a repository of all the elements in a system. It is a logical characteristic of current systems data stores. DD identifies process where the data are used and where immediate access to information is needed. It also serves as the basic for identifying database requirements during system design.

A Data Dictionary entry should contain specific categories of information including: (Post, G.V., 1999)

i.   Name and aliases of the data item

ii. Description of the data item

iii. Permissible range of the data item

iv. Data elements related to the entry

v.   Its allowable length in information

vi. Any other pertinent editing information

There are 10 tables used in the four modules (project management, task management, events calendaring and bulletin board) of the Intranet system, which are listed as the following:

1) Project   2) ProjectTask

3) UnderlayingTask   4) TaskStatus

5) TaskPriority   6) TaskSolution

7) TaskNotes   8) Task

9) Event   10) Announcement

The Data Dictionary table of the four modules that in charge by the writer is shown in the following sections:-

Database name: **Intranet**

1. **Module: Project Management**

i) **Project**

Table 5.2: Project table

Column Name	Data Type	Length	Description
ProjectCode	int	4	Autonumber of project code
ProjectName	nvarchar	100	Title of project
ProjectDescription	nvarchar	500	Description about project
ProjectState	char	1	State of project, either is active, inactive or closed project. A=Active, I=Inactive, C=Closed
ProjectLeader	int	4	Leader of project. Leader is chosen from administrator or project leader
ProjectMake	datetime	8	Making date and time of the project
ProjectExpStartDate	datetime	8	Expected starting date of project

Field Name	Data Type	Length	Description
ProjectExpEndDate	datetime	8	Expected starting time of project
UserID	int	4	User's identification number who create the project
FTimeStamp	datetime	8	Making/changing date and time of project
UpdStat	char	1	Update status of project either is active or cancel A=Active, C=Cancel

ii) ProjectTask

Table 5.3: ProjectTask table

Field Name	Data Type	Length	Description
TaskCode	int	4	Autonumber of task code
ProjectCode	int	4	Refer to project table
TaskSummary	nvarchar	100	Title of task
TaskDescription	nvarchar	500	Description about task
TaskTo	nvarchar	4000	List of person's id who involved in the task
TaskStatus	int	4	Refer to TaskStatus table
TaskPriority	int	4	Refer to TaskPriority table
TaskSolution	int	4	Refer to TaskSolution table
TaskMake	datetime	8	Making date and time of the task
UserID	int	4	User's identification number who create the task
FTimeStamp	datetime	8	Making/changing date and time of task

UpdStat	char	1	Update status of task, either is active or cancel A=Active, C=Cancel

iii) UnderlayingTask

Table 5.4: Underlaying Task

Field Name	Data Type	Length	Description
UTaskCode	int	4	Autonumber of underlaying task code
TaskCode	int	4	Refer to ProjectTask table
ProjectCode	int	4	Refer to Project table
UTaskSummary	nvarchar	100	Title of task
UTaskDescription	nvarchar	500	Description about task
UTaskTo	nvarchar	4000	List of person's id who involved in the task
UTaskStatus	int	4	Refer to TaskStatus table
UTaskPriority	int	4	Refer to TaskPriority table
UTaskSolution	int	4	Refer to TaskSolution table
UTaskMake	datetime	8	Making date and time of the task
UserID	int	4	User's identification number who create the task
FTimeStamp	datetime	8	Making/changing date and time of task
UpdStat	char	1	Update status of task, either is active or cancel A=Active, C=Cancel

iv) TaskStatus

Table 5.5: TaskStatus table

Field Name	Data Type	Length	Description
StatusID	char	10	Task status code
StatusDesc	char	10	Description about task status either is new, pending, in process, evaluation or closed.

v) TaskPriority

Table 5.6: TaskPriority table

Field Name	Data Type	Length	Description
PriorityID	char	10	Task priority code
PriorityDesc	char	10	Description about task status either is paused, lowest, low, normal, high or highest.

vi) TaskSolution

Table 5.7: TaskSolution table

Field Name	Data Type	Length	Description
SolutionID	char	10	Task solution code
SolutionDesc	char	10	Description about task solution either is open, fixed, failed or none

vii) TaskNotes

Table 5.8: TaskNotes table

Field Name	Data Type	Length	Description
FID	int	4	Autonumber of task notes
FNotes	nvarchar	500	Notes of the task
TaskCode	int	4	Refer to ProjectTask table
UserID	int	4	User's identification number who create the task's notes
FTimeStamp	datetime	8	Making/changing date and time of task's notes
UpdStat	char	1	Update status of task's notes, either is active or cancelled.

2. Module: Task Management

i) Task

Table 5.9: Task table

Field Name	Data Type	Length	Description
TaskCode	int	4	Autonumber of task code
TaskTitle	nvarchar	100	Title of the task
TaskDescription	nvarchar	500	Description about task
TaskRoutine	char	1	Routine task or ad hoc task y=routine task, n=ad hoc task
TaskAssignTo	nvarchar	4000	List of person's id who involved in the task

TaskAssignOn	datetime	8	Task expected start date
TaskExpTimeStart	datetime	8	Task expected start time
TaskExpDateEnd	datetime	8	Task expected end date
TaskExpManday	int	4	Expected day taking to complete the task
TaskExpHour	int	4	Expected hour taking to complete the task
TaskEveryday	char	10	Routine task is perform everyday d=everyday
TaskSpfDay	char	10	Routine task is perform every week on specific day
TaskSpfWeek	char	10	Routine task is perform on specific week
TaskDone	char	1	Task is done or undone y=done, n=undone
TaskDoneBy	int	4	User ID who finish done the task
UserID	int	4	User's identification number who create the task
FTimeStamp	datetime	8	Making/changing date and time of task
UpdStat	char	1	Update status of task's notes, either is active or cancel A=Active, C=Cancel

3. **Module: Events Calendaring**

i) **Event**

Table 5.10: Event table

Field Name	Data Type	Length	Description
EventCode	int	4	Autonumber of event code
EventTitle	char	100	Title of the event
EventLocation	char	100	Location of the event
EventDesc	char	500	Description about event
EventDate	datetime	8	Date of the event
EventTime	datetime	8	Time of the event
EventTo	char	4000	List of person's id who can view the event
EventMake	datetime	8	Making date and time of the event
EventType	char	50	Types of the event, either is holiday, personal time, vocation, birthday, meeting, appointment or others
EventSharing	char	10	Sharing of event, either is private, show as busy or public
UserID	int	4	User's identification number who create the task
FTimeStamp	datetime	8	Making/changing date and time of task
UpdStat	char	1	Update status of task's notes, either is active or cancel A=Active, C=Cancel

4. **Module: Bulletin board**

i) **Announcement**

Table 5.11: Announcement table

Field Name	Data Type	Length	Description
AnnounceCode	int	4	Autonumber of announcement code
Title	nvarchar	100	Title of the announcement
ShortDesc	nvarchar	1000	Short description of the announcement
Message	nvarchar	800	Detail description of the announcement
Urgent	char	1	Announcement is either urgent or not urgent y=urgent, n=not urgent
StartDate	datetime	8	Starting date of the announcement
ExpDate	datetime	8	Expiration date of the announcement
UserID	int	4	User's identification number who create the task
FTimeStamp	datetime	8	Making/changing date and time of task
UpdStat	char	1	Update status of task's notes, either is active or cancel A=Active, C=Cancel

Besides, the Data Dictionary table of the others modules is shown in the following sections:-

- **Users table**

The users table stores the entire privacy username and password for the system users to login to the Intranet System.

Table 5.12: Users table

Field Name	Data Type	Length	Description
*user_ID	int	4	User's identification number.
user_name	nvarchar	50	User's login username.
password	nvarchar	100	User's login password.
user_categoryID	int	4	Category of user.
user_status	char	10	Status of event, either A=Active, P=Passive
updated_pwd	nvarchar	100	Status of password, either Y = updated N = not updated
lastupdatedpwd	datetime	8	Latest date the password to be updated.

- **Security table**

This table stores the security question and answer of user.

Table 5.13: Security table

Field Name	Data Type	Length	Description
*question_ID	int	4	Identification number of question.
question	nvarchar	100	Question created by the user.
answer	nvarchar	50	Answer for the question.
user_ID	int	4	Identification number of user who create the question.

- **User_Contact table**

This table stores the general personal detail of the Intranet system's users as well as the administrator.

Table 5.14: User_Contact table

Field Name	Data Type	Length	Description
* userID	int	4	User's identification number.
username	nvarchar	30	User's name.
title	nvarchar	30	User's job position in the company.
dept	nvarchar	50	Department of the user.
work_phone	nvarchar	20	User's work phone number.

mobile_phone	nvarchar	20	User's hand phone number.
home_phone	nvarchar	20	User's home phone number.
emer_contact	nvarchar	30	Emergency contact's name.
emer_phone	nvarchar	30	Phone number of emergency contact.
address	nvarchar	200	User's current address.
email	nvarchar	30	User's e-mail address.
homepage_URL	nvarchar	50	User's homepage link
dt_hired	datetime	8	Date user had been hired.
dt_started	datetime	8	Date user starting their job.

- **External_Contact table**

This table stores the external contacts information like the general personal details of the co-worker, supplier, vendor, customer, partner and so on.

Table 5.15: External_Contact table

Field Name	Data Type	Length	Description
* ext_ID	int	4	Identification number of external contact.
ext_name	nvarchar	100	External contact's name.
company_name	nvarchar	100	Company's name of external contact.
title	nvarchar	50	Job position of external contact.
email	nvarchar	50	External contact's e-mail address.
fax	nvarchar	20	External contact's fax number.

work_phone	nvarchar	20	External contact's work phone number.
mobile_phone	nvarchar	20	External contact's hand phone number.
home_phone	nvarchar	20	External contact's home phone number.
company_address	nvarchar	150	Company address of the external contact.
home_ address	nvarchar	150	External contact's current address.
website	nvarchar	50	URL of external contact's company website.

- **Personal_Contact table**

This table stores the general details of personal contact.

Table 5.16: Personal_Contact table

Field Name	Data Type	Length	Description
*pcontact_ID	int	4	Identification number of personal contact.
pcontact_name	nvarchar	100	Personal contact's name.
company_name	nvarchar	100	Company's name of personal contact.
title	nvarchar	50	Job position of personal contact.
email	nvarchar	50	Personal contact's e-mail address.
fax	nvarchar	20	Personal contact's fax number.
work_phone	nvarchar	20	Personal contact's work phone number.

mobile_phone	nvarchar	20	Personal contact's hand phone number.
home_phone	nvarchar	20	Personal contact's home number.
home_address	nvarchar	150	Personal contact's home address.
company_address	nvarchar	150	Personal contact's company address.
website	nvarchar	50	URL of personal contact's company website.
user_ID	int	4	Identification number of user who own the personal contact.

- **User_Category table**

This table stores the description of user's category.

Table 5.17: User_Category table

Field Name	Data Type	Length	Description
*user_categoryID	int	4	Identification number of personal contact.
user_desc	nvarchar	30	Description of user's category.

- **Lookup**

This table stores the description of departments in the organization.

Table 5.18: Lookup table

Field Name	Data Type	Length	Description
*Keyword	int	4	Identification number of department.
Description	nvarchar	50	Name of department.

- **Bug table**

This table stores the details of problem had been submitted by the system user.

Table 5.19: Bug table

Field Name	Data Type	Length	Description
*Bug_ID	int	4	Identification number of issue record.
Bug_name	nvarchar	50	Subject of issue.
Bug_desc	nvarchar	300	Description of issue.
Module_ID	nvarchar	10	Identification number of module for the issue. (refer to module table)
Priority_ID	nvarchar	10	Identification number of priority for the issue. (refer to priority table)
Status_ID	nvarchar	10	Identification number of status for the issue. (refer to status table)
Date_reported	datetime	8	Date reported for new issue.
Date_expected	datetime	8	Date the issue expected to

			be solved.
Date_resolved	datetime	8	Date the issue had been really solved.
Reported_by	int	4	Identification number of user who submit the issue.
Modified_by	int	4	Identification number of user who submit the issue.
Resolution	nvarchar	300	The description of solution for the issue.

- **Modules table**

This table stores the description of module.

Table 5.20: Modules table

Field Name	Data Type	Length	Description
*Module_ID	nvarchar	10	Module's identification number.
Module_desc	nvarchar	50	Description of the module.

- **Priorities table**

This table stores the description of priority.

Table 5.21: Priorities table

Field Name	Data Type	Length	Description
*Priority_ID	nvarchar	10	Identification number of priority.
Priority_desc	nvarchar	50	Description of the priority such as highest, high, low, normal and lowest.

- **Statuses table**

This table stores the description of status.

Table 5.22: Statuses table

Field Name	Data Type	Length	Description
*Status_ID	nvarchar	10	Identification number of status.
Status_desc	nvarchar	50	Description of the status such as open, in progress, close and on hold.

- **Article table**

This table stores the details of the article.

Table 5.23: Article table

Field Name	Data Type	Length	Description
*Article_ID	int	4	Identification number of an article.
Subject	nvarchar	100	Subject of the article.
Description	nvarchar	200	Description of the article's content.
Author	nvarchar	50	Author's name of the article.
Date_entered	datetime	8	Date of the article posted by the user.
Link	nvarchar	50	URL link to the full article.
Posted_by	int	4	Identification number of user who post the article.
Comments	nvarchar	200	Comments given to the article.
Category_ID	int	4	Category of the article.

Field Name	Data Type	Length	Description
File_ID	int	4	Identification number of file that attached with the article.

- **Article_Category table**

This table stores the description of the article's category.

Table 5.24: Article_Category table

Field Name	Data Type	Length	Description
*Category_ID	int	4	Identification number of an article's category.
Category_Name	nvarchar	50	Subject of the category.
CategoryDesc	nvarchar	300	Description of the article's category.
CreatedBy	int	4	Identification number of the user that create the category.
ModifiedBy	int	4	Identification number of the user that modify the category.
Date_created	datetime	8	Date creation of the articles' category.
Date_modified	datetime	8	Date modification of the articles' category.

- **Files**

This table stores the details of the file attached with an article.

Table 5.25: Files table

Field Name	Data Type	Length	Description
*FileID	int	4	Identification number of the file.
FileName	nvarchar	50	Name of the file.
FileSize	nvarchar	50	Size of the file.
ContentType	nvarchar	50	Type of the file.
BinaryData	image	16	Variable-length binary data from 0 through 2^{31}-1 (2,147,483,647) bytes.
CategoryID	int	4	Identification number of category that the file belongs to.

- **Forum**

This table stores the details of the forum.

Table 5.26: Forum table

Field Name	Data Type	Length	Description
*ForumID	int	4	Identification number of a forum
forum_name	nvarchar	300	Subject of the forum.
forum_desc	nvarchar	600	Description of the forum.
moderator	int	4	Identification number of a user who create a forum (forum's moderator).

Date_created	datetime	8	Date creation of a new forum.
Date_modified	datetime	8	Date the forum updated by the moderator.
notes	nvarchar	200	Important information of the forum.

- **Topic**

This table stores the details of the topic(s) under a particular forum.

Table 5.27: Topic table

Field Name	Data Type	Length	Description
*TopicID	int	4	Identification number of a topic.
forum_ID	int	4	Identification number of a forum that the topic belongs to.
userID	int	4	Identification number of a user who create the topic.
topic_name	nvarchar	200	Subject of the topic.
topic_desc	nvarchar	300	Description of the topic.
Date_posted	datetime	8	Date posted of the topic.
Icon	int	4	Identification number of icon.

- **Replies**

  This table stores the details of the message replied for a topic.

  Table 5.28: Replies table

Field Name	Data Type	Length	Description
*ReplyID	int	4	Identification number of a message replied.
forum_ID	int	10	Identification number of a forum that the message replied belongs to.
topic_ID	int	10	Identification number of a topic that the message replied belongs to.
user_ID	int	10	Identification number of a user who post the reply.
message	nvarchar	300	Content of the reply.
Date_posted	datetime	8	Date posted of the reply.
Icon	int	4	Identification number of icon.

- **Icon**

  Table 5.29: Icon table

Field Name	Data Type	Length	Description
*IconID	int	4	Identification number of the icon.
Image	nvarchar	50	Name of the icon.

5.5 User Interface Design

User interface design is the specification of a dialogue or conversation between the system user and the computer. It is concerned with everything from starting the system or logging into the system to the eventual presentation of desired outputs and inputs. (Jeffrey L.Whitten , Lonnie D.Bentley, Kevin C.Dittman, 2001)

The user interface for the Intranet System is like a typical the web page. The user will not be aware of the processing done in the client side and server side. The web page created has links, which enables users to link to other pages quickly. Navigation buttons are placed in the web page to let users execute commands with ease. Besides that, the application is browser independent, thus the user will be able to use any compatible web browser to access the system.

5.5.1 Intranet System Screen Design

Screen design on Intranet System is presented in form of web document on the browser. Therefore, the form of web document containing components like text, graphic, input fields, buttons, and so on, which normally can be found on the web document. Since the Intranet is developed using ASP thus this web-based application is supported by Visual Basic that can convert SQL database into HTML dynamically, as requested by the users.

5.5.2 General Consideration When Designing User Interface of Intranet System

There are several numbers of important human engineering factors would be considered and in-corporate into the design of user interfaces for Intranet System:

- The system user should always aware of what to do next.

- Be consistent, that mean use a consistent format for menu selection and data display. Use of consistent label, standard abbreviation is also necessary.

- Messages, instructions, or information should be displayed long enough to allow the system user to read them.

- Offer meaningful feedback such as displaying appropriate error messages when users have keyed-in something wrongly.

- A user should not be allowed to proceed without correcting an error.

- Use display attributes sparingly.

- Default values for fields and answers to be entered by the user should be specified.

5.5.3 Intranet System Interface Design

In this project, we have design some user interfaces as the prototypes of Intranet System. For information, "ForeSee" is just an example of company who is implement the Intranet System.. Some of the user interfaces of the Intranet System are shown as follow:
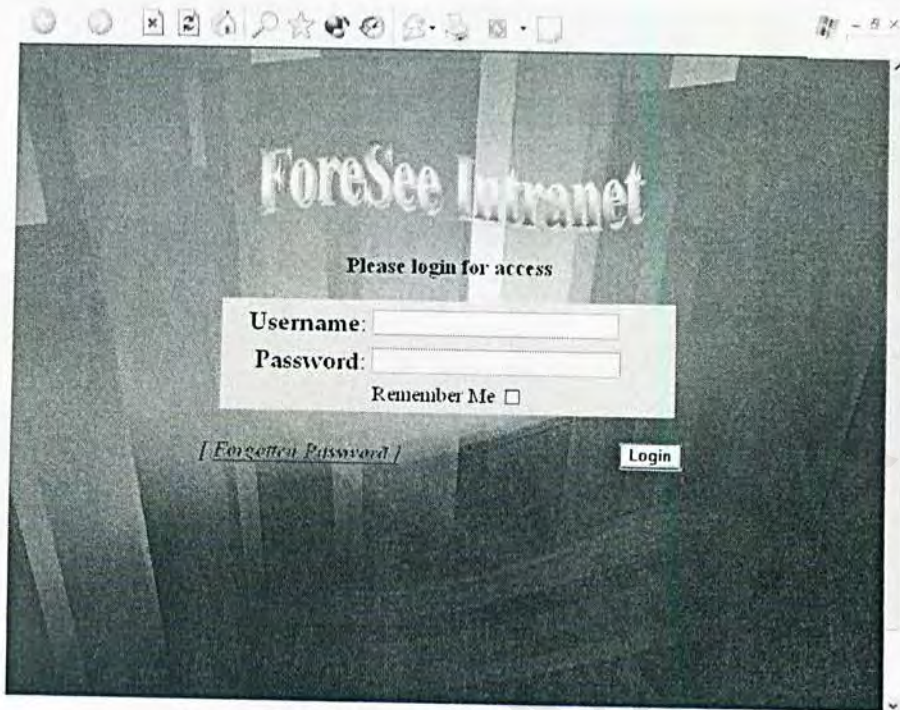
Figure 5.10: Intranet System's login page
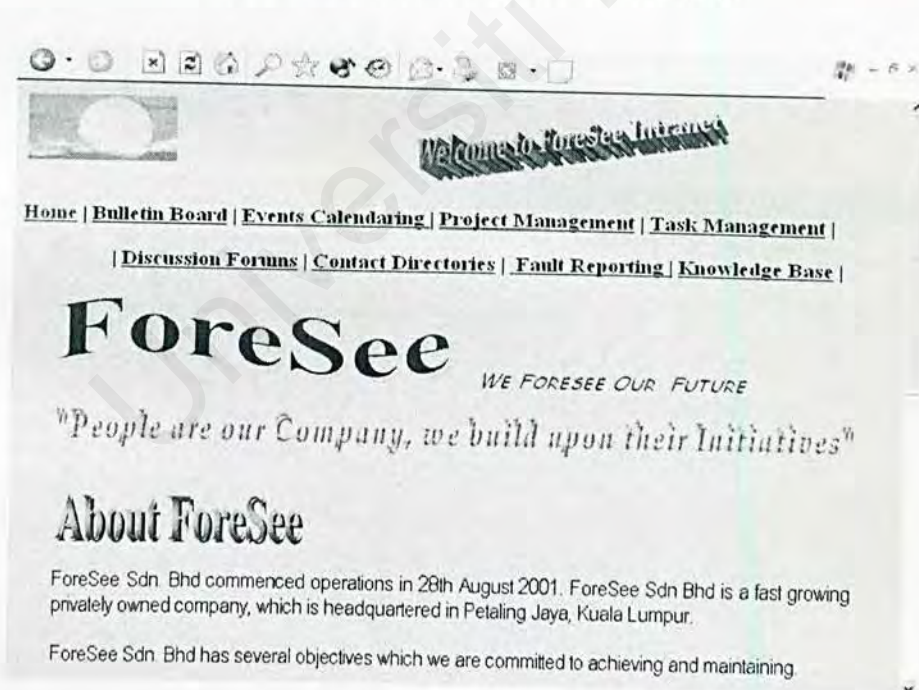
Figure 5.11: Intranet System's main page
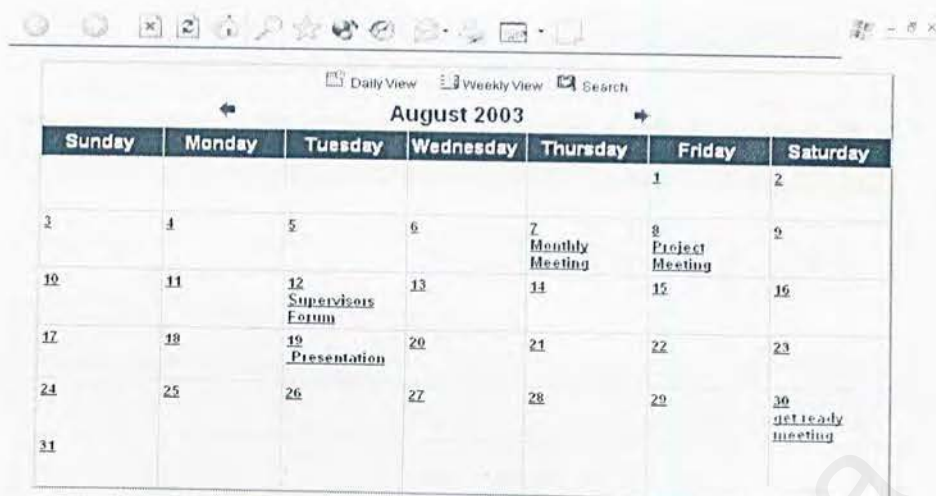
Figure 5.12: Events Calendaring
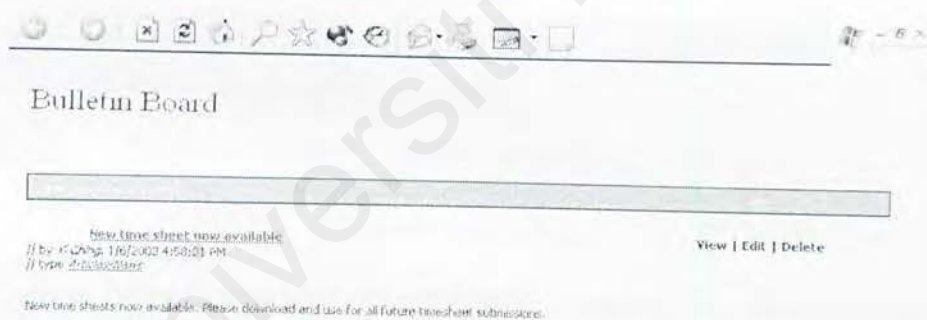
Figure 5.13: Bulletin Board
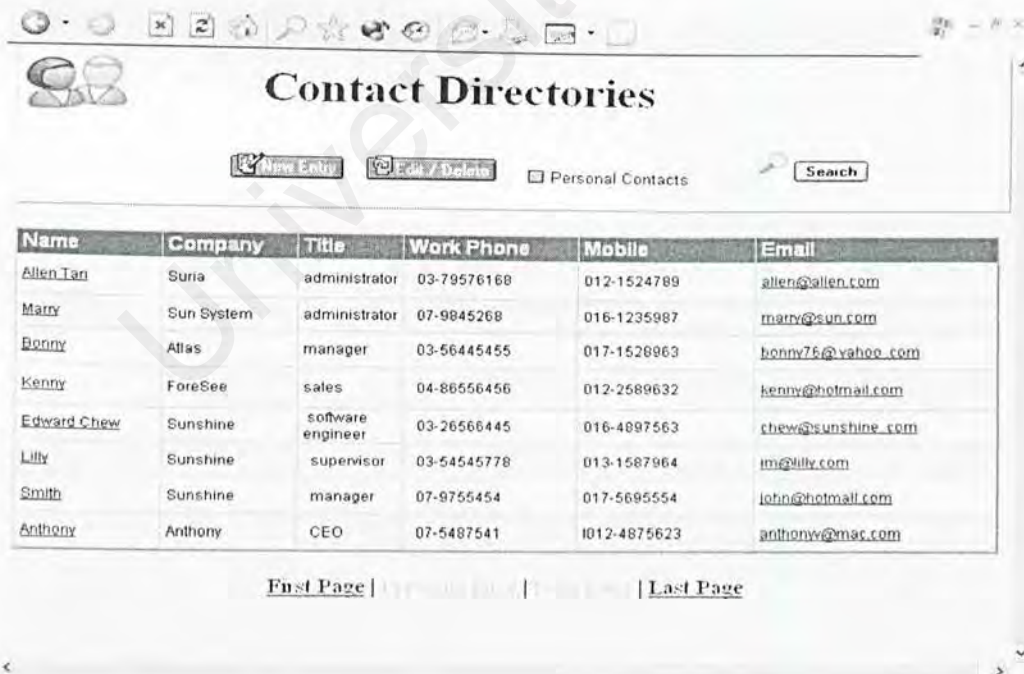
Figure 5.14: Discussion Forums

Figure 5.15: Contact Directories

System Implementation

CHAPTER 6: SYSTEM IMPLEMENTATION

6.1 Introduction

System implementation is the physical realization of the database and application design. On completion of the design phase, the implementation will be started where the database and the application have to be implemented. At this stage, the design model of the Intranet system will be transformed into a workable product. The transaction process continues when a compiler accepts the source code as input and produces machine-dependent object code as output. This output is further translated into machine code. Machine code is the actual instruction that drives micro-coded logic in the central processing unit (CPU). The implementation of a system involved system coding, debugging, installing, documenting, training users, and supporting users. Coding and debugging are the major works involved in the implementation phase.

6.2 Development Environment

Development environment play a major role in determining the speed of developing the system. The usage of dynamic suitable hardware and software will reduce the time needed to build up the entire system and simplify the work done. A part from that, it will also determine the success of the project. The overall tools used to develop the whole Intranet system are as below:

6.2.1 Hardware Configuration

The hardware configuration used to develop the system is as listed below:

- Pentium III 733MHz computer

- 128 MB SDRAM

- 40 GB hard disk

- 36x CD-Rom drive

- 1.44 MB floppy disk drive

- Other standard desktop PC components such as keyboard, mouse, monitor, standard modem for Internet connection

6.2.2 Software Configuration

List of the software/software tools used in the development of this Intranet system are show below:

Table 6.1: Software/Software Tools used in the Development of Intranet system

Software	Usage	Description
Microsoft Windows XP Professional	System requirement	Operating System (OS)
Internet Information Services 5.1	System requirement	Web server service. Map local directory to virtual directory and create local web site.
Microsoft SQL Server 2000	System requirement	Database server (build the database to store and manipulate the data)

Microsoft Internet Explorer 6.0	System development and interface design	Web browser to surf the site
Macromedia Dreamweaver 6.0	System development	Coding and debugging web pages, web pages layout design
Microsoft Visual InterDev 6.0	System Development	Debugging web pages
Adobe Photoshop 7.0	System development and interface design	Image or company's logo design and creation
Active Server Pages (ASP)	System development	Server side scripting (Program Coding)
Hyper Text Markup Language (HTML)	System development	User interface creation (Program Coding)
JavaScript	System development	Client side scripting (Program coding)
Microsoft Word	System development	Project documentation

6.3 System Development

6.3.1 System Installation

Servers and development tools installation are the very first step before development work begins. When using Microsoft's products, it is essential to know the sequence of product installation. This is to ensure smooth execution without system errors. The vital information about installation sequence is not provided in a user-friendly way to guide user.

The sequence of the installation process is shown below:

1. First, install operating system (OS) - Windows XP Professional

2. Including a web server - Internet Information Services 5.1

3. Install database management system - Microsoft SQL Server 2000

4. Install development tool - Macromedia Dreamweaver 6.0

5. Install office XP

6. Install graphical software - Adobe Photoshop 7.0

Note: step 4, 5 are interchange

6.3.2 Setting Up The Environment

A database should be build for this Intranet system. Once database has been established, a connection must be established before using data in the database. This can be accomplished with a variety of methods, including Open DataBase Connectivity (ODBC), OLE-DB and others.

6.3.2.1 Create A Database

Database is created in order to store the data required in the creation of this Intranet system, and also to store data that is entered by the end-users and captured by the Intranet system. All the tables that needed in this system are to be created in database. Relationship of the tables should be identified.

6.3.3 Database Connection

ActiveX Data Objects (ADO) is a set of objects that allows programmers to program their data access logic from languages like ASP as well as scripting languages. ADO is a high-level model than OLE-DB, which means that it simplifies the complexity of programming with OLE-DB. (Chris Ullman *et* al, 2000).

In this project, only two objects exposed by ADO are used, which is Connection object and Recordset object. These two objects are commonly used in developing Web applications.

6.3.3.1 Using Connection Object

A Connection object represents a unique connection to a data source. One of its key properties, ConnectionString is used to specify the Provider (the type of OLE-DB provider used in the connection), User ID (the user name needed to connect to the database, *sa* is the default for the administrator user name), Password (the password of user specified in the user ID field) and other information necessary for establish a connection to the database and authentication. One Connection object that is frequently used in this project is named *DataConn*.

Below is coding of global.asa file that contains declaration of connection object and ConnectionString.

```
<OBJECT RUNAT=Server SCOPE=Session ID=DataConn
PROGID="ADODB.Connection"></OBJECT>

<SCRIPT language=VBScript RUNAT="Server">
SUB Application_OnStart
END SUB

SUB Session_OnStart
    'Open ADO connection to database
    Connstring="Provider=sqloledb; Data Source=localhost; "& _
                "Initial Catalog=Intranet; uid=sa; pwd=;"

    DataConn.Open (ConnString)

END SUB

SUB Session_OnEnd
    'Close ADO connection to database
    Session("DataConn").Close
END SUB

SUB Application_OnEnd
END SUB
</SCRIPT>
```

6.3.3.2 Using Recordset Object

A Recordset object represents a cursor retrieved from a database by executing a Command. The Recordset object uses connection object for its data connection and then execute the methods and passing the SQl query statement as the parameter. Recordset object typically display read-only data in the faster possible way.

One example of coding used Recordset object (rs) and Connection object (DataConn) in Project Management Module of this project is as follow:

```
<%
Const adOpenKeySet=1
Const adLockPessimistic=2
Const adCmdText= &H0001
Set rs=server.createobject("ADODB.Recordset")
sql ="select * from Project where ProjectCode='"&ProjectCode&"' "& _
     "and UpdStat='A'"
rs.open sql, DataConn, adOpenKeySet, adLockPessimistic, adCmdText

If not rs.EOF then
    response.write rs("ProjectName")
End if
rs.Close
Set rs=Nothing
%>
```

6.3.3.3 Using ASP Built-In Objects

Seven built-in objects make up the core of Active Server Pages (ASP). The objects are Server object, Application object, Session object, Request object, Response object, ObjectContext object, and ASPError object. (Chris Ullman *et* al, 2000). Each of this objects interact with a different part of the ASP system. It is easy for programmers to include these objects within ASP scripts because there is not need to declare or initialize them. Table below show the seven built-in objects and description of each of the object. (Chris Ullman *et* al, 2000)

Table 6.2: ASP Built-In Object

Objects	Description
Server Object	Object that provide a home to a miscellaneous ragbag of properties and methods that can be used in almost every Active Server Page. This object used to set the amount of time a script can run before an error occurs, take a user-supplied string and encode it into HTML formats or proper format for a Uniform Resource Locator (URL), Convert a virtual path to a physical path on the server, create an instance of an ActiveX component, and change the course of execution by jumping to another page using the Transfer and Execute properties.
Application object	Object that provide control over the application as a whole. With this object, programmer will be notified when an application is first started or ending and store information that can be accessed by all clients accessing the application.
Session object	Object that allow programmer to be notified when a user session begins or has ended their session and it can be used to store information that can only be accessed by that particular client throughout the session.
Request object	Object that contains all the header information as well as information about the specific page request and any form information submitted by a user.
Response object	With this object, the ASP script can insert information into the

	page being sent back to the client, send instructions to the browser to create cookies on the client, send client to another page and control the various properties of the page.
ObjectContext object	Object that helps to develop application out of components. It does this by allowing handling transactions from within an ASP page.
ASPError object	Object that contains details errors generated by an ASP script. It allows more complex customized handling of error messages.

6.3.3.4 Example Database Coding

6.3.3.4.1 Add New Record

Below is the code that had been written by writer in TaskDB.asp to add a new task into table [Task].

```
<%
sql="select * from Task where TaskCode='"&TaskCode&"' and UpdStat='A' "
rs.open sql,DataConn,adOpenKeySet,adLockPessimistic,adCmdText

if rs.EOF and rs.BOF then

    rs.AddNew
    rs("TaskTitle")=trim(Request.Form("tasktitle"))
    rs("TaskDescription")=trim(Request.Form("taskdesc"))
    rs("TaskAssignTo")=trim(Request.Form("issueto"))
    rs("TaskRoutine")=Request.Form("typeoftask")
    If trim(Request.Form("typeoftask"))="y" THEN
        If trim(Request.Form("taskroutine"))="d" THEN
            rs("TaskEveryday")=Request.Form("taskroutine")
        End if
        IF trim(Request.Form("taskroutine"))="wsd" THEN
            rs("TaskSpfDay")=Request.Form("spfday")
        end if
```

```
            If trim(Request.Form("taskroutine"))="dsw" THEN
                    rs("TaskSpfWeek")=Request.Form("spfweek")
                    rs("TaskSpfDay")=Request.Form("spfday")
            END IF
        END IF

        If trim(Request.Form("typeoftask"))="n" THEN
        rs("TaskAssignOn")=cdate(Request.Form("txtReqDatestart"))
        rs("TaskExpTimeStart")=Request.Form("TaskExpTimeStart")
            If trim(Request.Form("txtReqDate"))<>"" THEN
                rs("TaskExpDateEnd")=cdate(Request.Form("txtReqDate"))
            End if
            If trim(Request.Form("emanday"))<>"" THEN
                rs("TaskExpManday")=Request.Form("emanday")
            End if
            If trim(Request.Form("ehour"))<>"" THEN
                rs("TaskExpHour")=Request.Form("ehour")
            End if
        END IF
        rs("TaskDone")="n"
        rs("UserID")=session("UserID")
        rs("FTimeStamp")=now()
        rs("UpdStat")="A"
        rs.Update
else
        response.write "<span class='rsubtitle'>Record found in database!</span>
                        <br><br>"
        response.write "<input type='button' value='<<back'
                        onclick='javascript:history.back()'>"
        response.end

end if
%>
```

6.3.3.4.2 Update Record

Here is a sample code that had been written by writer in EventDB.asp to update event in table [Event].

```
<%
sql="select * from Event where EventCode='"&EventCode&"' and UpdStat='A' "
rs.open sql,DataConn,adOpenKeySet,adLockPessimistic,adCmdText

if not rs.EOF then
        rs("EventTitle")=trim(request("ETitle"))
        rs("EventLocation")=trim(request("ELocation"))
        rs("EventDesc")=trim(request("EDesc"))
        if trim(request("EDate"))<>"" then
                rs("EventDate")=trim(request("EDate"))
        end if

        if trim(request("ETime"))<>"" then
                rs("EventTime")=trim(request("ETime"))
        else
                rs("EventTime")=null
        end if
        if trim(request("issueto"))="" then
                rs("EventTo")=session("UserID")
        else
                rs("EventTo")=trim(request("issueto"))
        end if
        rs("EventType")=trim(request("EType"))
        rs("EventSharing")=trim(request("EStatus"))
        rs("UserID")=session("UserID")
        rs("FTimeStamp")=now()
        rs("UpdStat")="A"
        rs.UpDate

else
        response.write "<span class='rsubtitle'>No record found in
                        database</span>"
        response.write "<input type='button' value='<<Back'
                        onclick='javascript:history.back()'>"
        response.end
end if
%>
```

6.3.3.4.3 Delete Record

Records that have been selected by the user to delete from the system will not be deleted from database. All the deleted record will still be stored in database for later used. Update status of deleted records will be mark as "C". Below is the code used to change the update status of the announcement to "C" in the table [Announcement].

```
<%
sql="select * from Announcement where UpdStat='A' and
    AnnounceCode='"&announcecode&"' "
'execute sql
rs.open sql,DataConn,adOpenKeySet,adLockPessimistic,adCmdText
if not rs.EOF then
    rs("UserID")=session("UserID")   'User who delete the record
    rs("UpdStat")="C"                'C means cancel
    rs("FTimeStamp")=now()           'Time the user delete the record
    rs.Update
else
    response.write "<span class='rsubtitle'>No record found in
                    database</span>"
    response.write "<input type='button' value='<<Back'
                    onclick='javascript:history.back()'>"
    response.end
    end if
%>
```

6.3.4 Programming Language Used

6.3.4.1 Hyper Text Markup Language (HTML)

This Intranet system is build with HTML tags, or codes, embedded in the text. HTML defines the page layout, fonts and graphic elements as well as the hypertext links to other documents on the system. Below are some HTML codes that used in the coding of Event Calendaring Module of this system.

```
1)  <form name="frmEvent" method="post" action="EventDB.asp"> ... </form>

2)  <select name="ETime" size="1"> <option value="12:00AM" >12:00 AM...</select>

3)  <textarea cols=70 rows=8 wrap=hard class="txtbox" name="EDesc"
    <%=OptionsStatus%>><%=PEDesc%></textarea>

4)  <input type="text" class="txtbox" name="ETitle" value="<%=PETitle%>"
    size="50" maxlength="50" <%=OptionsStatus%>>

5)  <input type="radio" name="EStatus" value="Private"
    onClick="javascript:check_sharing(this)" >

6)  <input type="hidden" name="EventCode" value="<%=EventCode%>">

7)  <input type="checkbox" name="AllDayEvent" id="AllDayEvent" value=""
    <%=ETimeStatus%>>

8)  <input type="button" value="Delete" name="Delete" onclick="DeleteEvent()">
```

1)	Creates a form and post to EventDB.asp page to do the event processing
2)	Creates a list of options to the user to select the event time
3)	Creates a text area field for user to enter multiple lines of text
4)	Creates a text field for the user to enter in event title
5)	Creates a list of options of event status and only one option can be selected
6)	Creates a hidden field that will be invisible to user
7)	Creates a list of options of event and one or more option can be selected
8)	Creates a button to call DeleteEvent() function if user pressing the button

6.3.4.2 VBScript

VBScript is the default programming language of Active Server Pages (ASP) and default language of IIS. The scripts run on the server and produce HTML code that can be viewed on any browser. The real power of VBScript is that it can access the ASP built-in objects. VBScript can be server-side scripts and client-side scripts. (Donna Crossman et al, 2001). A server-side scripting is a mix of HTML statements and VBScript statements. It specified by using the statement <%@ LANGUAGE = "VBSCRIPT"%>. The tag <% and %> delimit the VBScript statements in the HTML document. For client-side scripting, they must be delimited by the <SCRIPT LANGUAGE ="VBSCRIPT"> ... ... </SCRIPT> tags.

One Example of VBScript and ASP coding used in this Project is as follow:

```
If trim(frmProject.ExpEndDate.value)<>"" Then
        If not isdate(trim(frmProject.ExpEndDate.value)) Then
            alert "Please enter a valid date!"
            frmProject.ExpEndDate.value=""
```

```
                    frmProject.ExpEndDate.focus()
                    exit sub
            Else
                    If CDate(frmProject.ExpEndDate.value)<now()-1 Then
                            alert "Please reselect project expected end date!"
                            frmProject.ExpEndDate.value=""
                            frmProject.ExpEndDate.focus()
                            exit sub
                    End if
            End if
End if
```

Note: trim, isdate, CDate, now are the built-in functions of VBScript.

6.3.4.3 JavaScript

JavaScript is a programming language that allows scripting events, objects, and

action to create Internet applications. JavaScript is a object-based scripting language.

Below is an example taken from the ProjectMangement file name "simplecalendar.js"

```
function Browser(){
    this.dom = document.getElementById?1:0;
    this.ie4 = (document.all && !this.dom)?1:0;
    this.ns4 = (document.layers && !this.dom)?1:0;
    this.ns6 = (this.dom && !document.all)?1:0;
    this.ie5 = (this.dom && document.all)?1:0;
    this.ok = this.dom || this.ie4 || this.ns4;
    this.platform = navigator.platform;
}
var browser = new Browser();
```

6.3.4.4 Structured Query Language (SQL)

After established a connection with database, SQL is used to retrieve, add, change, and remove data from database. From the four main types of SQL's command, which are SELECT, INSERT, UPDATE, and DELETE command, only SELECT command used in the four module in charge by the writer in this project. The INSERT, UPDATE, and DELETE command are not used in the four modules and it is replaced by AddNew and Update method of the Recordset object. It is because AddNew and Update method have more advantages than the three commands. The following coding is examples of the SELECT command that join two tables together to count the total task including sub task of each project.

```
<%
Dim NoUnderlayingTask,NoTask
NoUnderlayingTask=0
NoTask=0
set rs2=server.createobject("ADODB.Recordset")
set rs3=server.createobject("ADODB.Recordset")
sql="select T.TaskCode from Project P right join ProjectTask T "& _
    "on T.ProjectCode=P.ProjectCode "& _
    "where P.ProjectCode='"&rs("ProjectCode")&"' and  T.UpdStat='A' and "& _
    "P.UpdStat='A' Group By T.TaskCode"
rs2.open sql,DataConn,adOpenKeySet,adLockPessimistic,adCmdText
do while not rs2.EOF

NoTask=NoTask+1
sql="select count(U.UTaskCode) as NoUTask from ProjectTask T , UnderlayingTask U
    "where T.TaskCode='"&rs2("TaskCode")&"' "& _
    " and U.TaskCode=T.TaskCode and T.UpdStat='A' and U.UpdStat='A'"
rs3.open sql,DataConn,adOpenKeySet,adLockPessimistic,adCmdText
NoUnderlayingTask=NoUnderlayingTask + trim(rs3("NoUTask"))
rs3.close
rs2.movenext

Loop

TotalTask=cint(NoTask) + cint(NoUnderlayingTask)
response.write Cint(TotalTask)
%>
```

6.3.4.5 Cascading Style Sheet (CSS)

Cascading style sheet have the potential of dramatically altering the appearance of the system. Using CSS, developer can gain precise control over the style of each element of the web pages. Below is an example snippet of CSS to control the color appearance of table.

```
.tabletitle
{
  BORDER-RIGHT: #bdb76b thin solid;
  PADDING-RIGHT: 2px;
  BORDER-TOP: #bdb76b thin solid;
  PADDING-LEFT: 2px;
  FONT-WEIGHT: bold;
  FONT-SIZE: 16px;
  PADDING-BOTTOM: 2px;
  BORDER-LEFT: #bdb76b thin solid;
  PADDING-TOP: 2px;
  BORDER-BOTTOM: #bdb76b thin solid;
  FONT-FAMILY: 'Times New Roman';
  BACKGROUND-COLOR: #cccc99
}
```

6.3.5 Debugging Undertaken

Debugging is necessary when a error is encountered. Usually the program is debugged from within the Visual Interdev 6.0 with its standard features like breakpoints, locals view, stack view, and other. Visual Interdev can handle JavaScript and VBScript code and can be launched on a just-in-time basis when error occurs in pages loaded into Microsoft Internet Explorer. Error message displayed by the browser every time an error occurred also provides important information during the debugging process.

6.3.5.1 Using Response.write

This technique of debugging is normally used in this project to finding out where the error is occurring. Besides, another method of the *Response* object, namely *End* can be used to stop execution before hitting a trouble spot. Both method, Response.write and Response.End are extremely valuable to debug a complex ASP pages. One example of debugging ASP script that expects some detail from a form and hyperlink is as follow:

```
<%
ProjectCode=trim(request.querystring("ProjectCode"))
TaskCode=trim(request.querystring("TaskCode"))
response.write "ProjectCode="&ProjectCode&"<br>"
response.write "TaskCode="&TaskCode&"<br>"
... ... ... ... ... ... ... ...
ListOfDECode=request("ListOfDECode")
DECodeArr=split(ListOfDECode,",")
'response.write ListOfDECode
'response.write UBound(DECodeArr)
'response.end
... ... ... ... ... .
%>
```

When run this script, it checks whether the value from the hyperlink and the previous form can be retrieved and the correctness of those values can be tell.

6.4 Program Coding

6.4.1 Coding Principles

During development of the system, several principles have been applied to ensure the quality and proper structure in the cod generated. There are three principles as listed below:

- **Readability**

  Readability is very important when it comes to the future enhancement of the system by other people. Code should be easily read and understood. To achieve this, comments can be used to explain the code. Meaningful variables and labels will also be helpful in reading the code.

- **Maintainability**

  Code should be able to read, corrected, and revised. Codes that perform functions for one module should be grouped together and should try as much as possible to achieve high cohesion and loose coupling.

- **Robustness**

  Code should be robust in terms of handling errors and responding by displaying appropriate error message. Programmers should try to avoid system failure. This web base Intranet system is developed using the event driven approach which means that codes are executed with respond to provocation of certain events such as mouse click.

6.4.2 Coding Methodology

Intranet system is developed using top-down approach. This approach starts by looking at the large picture of the system and then exploding it to smaller functions or subsystem. Each individual functions will form the basic where the coding initiates. Higher level functions will be coded first before the lower level functions. This method ensure that the core functions/modules of the system be developed and tested first. Deploying

6.4.3 Coding Style

Good coding practice is needed to avoid and detect errors easily.

6.4.3.1 Using Comment Lines

Comment is any useful information added in coding to describe the coding. Use the single quotation mark to add a comment can help a reader to more understand it. Comments should a place even in clearly structured and well-written code. The comments can break the code into phases that represent major activities (Pfleeger, 2001).

The following example snippet of code shows how comment lines have been used in writing the source code:

```
'Get today date and background color
SUB getTodayDate()
      Dim todaydate
      todayDate = month(now())&"/"&Day(now())&"/"&Year(Now())
      If dateSelect = todayDate then
            Strbgcolor = "gold"
      Else
            Strbgcolor ="#e0f7ff"
      End if
END SUB
```

6.4.3.2 Formatting And Indenting Code

Formatting and indenting code will help a reader to understand the goal of the code and how the goal is reached. Furthermore, when debugging, developer just need to glance at the code to spot, for example, code at the end of the structure that was still indented by several characters. Developer will know immediately that if something had been left out. In this project, common convention for each loop structure and conditional structure is to indent the code with a tab or several spaces. Indentation and spacing of statements can reflect the basic control structure (Pfleeger, 2001). One example snippet of code used in this system is look like this:

```
If trim(Request.Form("typeoftask"))="y" Then

    If trim(Request.Form("taskroutine"))="d" Then
        rs("TaskEveryday")=Request.Form("taskroutine")
        rs("TaskSpfDay")=NULL
        rs("TaskSpfWeek")=NULL
    End if
    If trim(Request.Form("taskroutine"))="wsd" Then
        rs("TaskSpfDay")=Request.Form("spfday")
        rs("TaskEveryday")=NULL
        rs("TaskSpfWeek")=NULL
    End if
    If trim(Request.Form("taskroutine"))="dsw" Then
        rs("TaskSpfWeek")=Request.Form("spfweek")
        rs("TaskSpfDay")=Request.Form("spfday")
        rs("TaskEveryday")=NULL
    End If

End If
```

The format shown above is clearer than the format shown below:

```
If trim(Request.Form("typeoftask"))="y" Then
If trim(Request.Form("taskroutine"))="d" Then
rs("TaskEveryday")=Request.Form("taskroutine")
rs("TaskSpfDay")=NULL
rs("TaskSpfWeek")=NULL
End if
If trim(Request.Form("taskroutine"))="wsd" Then
rs("TaskSpfDay")=Request.Form("spfday")
rs("TaskEveryday")=NULL
rs("TaskSpfWeek")=NULL
End if
If trim(Request.Form("taskroutine"))="dsw" Then
rs("TaskSpfWeek")=Request.Form("spfweek")
rs("TaskSpfDay")=Request.Form("spfday")
rs("TaskEveryday")=NULL
End If
End If
```

6.4.3.3 Convert Variants Into The Requisite Subtypes

To avoid type mismatches, value that expecting from the end user is converting into the subtype needed for any calculations or manipulation. But, before converting, the type of data the convert is check. Function that normally used to check the type of data in this project is IsNull, Is Numeric, IsDate, and IsEmpty. Besides, function that normally used to do converting in this project is CDate, and CInt.

6.4.3.4 Include File

File can easily to include by using a server-side INCLUDE directive. Using include file are like using procedures. It is very useful when certain code is repeated. It allows procedures to be available to many ASP files. Using the include file will ease the messy work of correcting all ASP page when a change is needed. Here is an example to declare an include file in ASP page.

```
<!--#include file="Main.asp"-->
```

System

Testing

CHAPTER 7: SYSTEM TESTING

7.1 Objective

System testing is a significant and critical phase that ensures the developed system fulfills the user's requirement and assures the quality of the delivered system. In addition, it is performed to make sure that the program is executed correctly and ensures the system reliability. Testing will be done throughout system development.

There are three main objectives of system testing listed as follow:

- To discover faults early in the development cycle and developer can made corrections to the faults.

- To test whether the modifications are correct and make sure the modifications will not affect others parts of the program. The purpose is to make sure no new faults are introduced to the program.

- To make sure that design of both the system and its components fulfill the requirements specified.

7.2 Testing Strategy

Testing strategy consists of unit, integration, and system testing. It is important to have full test coverage where each function is tested to ensure that it works according to the specifications and confine all the functional requirements indicated.

7.2.1 Unit Testing

In this stage, testing will be concentrated on the individual components of the system for testing. Testing of each individual component is done independently without other system components, to verify that they operate correctly. For example, this component might perform task like checking valid input value.

During development phase, thousands lines of codes are written and debugged. Simply testing just by writing expressions in a debugger is not sufficient for testing. Test cases must be written in order to demonstrate that the program works.

Three category types of unit testing were applied for this Intranet system's unit level testing: Ad hoc, white box, and black box testing.

7.2.1.1 Ad Hoc Testing

Ad Hoc or ad lib testing means simply play with the functioning unit, trying whatever comes to their mind, in attempt to make it fail. This type of testing was a fast and efficient way of debugging code errors during the early development stage. The disadvantage of Ad Hoc testing is it usually finds many errors and never be sure what was or was not to be tested.

7.2.1.2 White Box Testing

The main purpose of white box testing is to check for missing function. It focuses mainly on the idea of coverage. Thus, it involved in analyzes the structure of the code and use knowledge about the structure of a component to derive test data. The advantage of white box testing is that an analysis of the code can be used to find out how

many test cases are needed to guarantee a given level of test coverage. The code coverage that was tested under this phase including basic path tests, path testing, data flow testing, and loop testing.

For example, the loop testing that was done is For ... Next, For Each ... Next, Do While ... Loop, and While ... Wend. One example of Do While ... Next coding for the Intranet system is as follow:

```
<%
Const adOpenKeySet=1
Const adLockPessimistic=2
Const adCmdText= &H0001
Set rs2=server.createobject("ADODB.Recordset")
sql2="select * from UnderlayingTask where TaskCode="'&DECodeArr(i)&"' and
    "ProjectCode="'&ProjectCode&"' and UpdStat='A' "
rs2.open sql2, DataConn, adOpenKeySet, adLockPessimistic, adCmdText
Do while not rs2.EOF
        rs2 ("UserID") =session("UserID")
        rs2 ("UpdStat") ="C"
        rs2 ("FTimeStamp") =now()
        rs2.Update
        rs2.movenext
Loop
rs2.close
%>
```

In addition, the data flow testing that was done is If ... Then .... Else statements. On example of coding is as follow:

```
<%
Show=request.querystring("Show")
```

```
        If Show="Active Projects" then
            sql="select * from Project where ProjectState='A' and UpdStat='A' "& _
                "Order By "&SortByThe&" "&Flag
        elseif Show="Inactive Projects" then
            sql="select * from Project where ProjectState='I' and UpdStat='A' "& _
                "Order By "&SortByThe&" "&Flag
        elseif Show="Closed Projects" then
            sql="select * from Project where ProjectState='C' and UpdStat='A' "& _
                "Order By "&SortByThe&" "&Flag
End if
%>
```

7.2.1.2 Black Box Testing

Black box testing consists of assuming that the logic structure of the code is unknown; testing is done by feeding input into the black box and notes what output is produced.

This approach is used for the unit testing of the web pages and buttons on the pages as those modules involved the correctness of displaying output.

Two types of unit testing: White box and black testing used by writer to test the Intranet system. Writer selects these two methods because it is more suitable to find faults in the system.

7.2.2 Integration Testing

After all the individual components of Intranet system are working correctly, they are merging into a large working system. Integration test puts all the components together to segregate faults as the combined components are tested together. The purpose is to measure the correctness of each components behavior once they are combined together. Integration testing is also known as module testing.

Four approaches can be performing in the integration testing as listed below:

- Bottom-Up Integration
- Top-Down Integration
- Big-Bang Integration
- Sandwich Integration

7.2.2.1 Bottom-Up Integration

This is a popular approach used for merging the components together to test it in a large system. In this method, each component at the lowest level of the system hierarchy is tested individually first. Then, the next component that called the previous component will be tested. This process is follow repeatedly until all components are included in the testing.

7.2.2.2 Top-Down Integration

This approach is the reverse of the bottom-up integration testing approach. In this method, the top level module that with controlling functions is tested first by itself.

Then, all component called by the tested component are combined and tested as a large system. This process is reapplied until all components are integrated.

7.2.2.3 Big-Bang Integration

In this method, all the components are tested individually and combined together to test as a large system. The purpose is to check whether system is functions it is planned. But, this approach a not encourage to be used by developer because when all the components are combined together to test, it is very difficult to find the cause of the failure if the system not work properly.

7.2.2.4 Sandwich Integration

This approach is the combination of bottom-up and to-down testing. When using this method, the system is viewed as three layers, like a sandwich. The three layers are target layer at the middle, the level above the target, and the level below the target. Integration testing can begin early in the testing process. Sandwich integration combines the advantages of to-down integration approach with the bottom-up approach. The disadvantage is sandwich integration does not test the individual component thoroughly before system integration.

The approach had been taken to system integration testing of Intranet system was bottom-up integration. Writer selects this approach because this approach is the best approach to test the intranet system.

7.2.3 System Testing

System Testing is the last testing procedure. It is performed to uncover its limitations, measure it capabilities and ensure that the entire system meets the user requirements. Developers will join the users to perform this stage of testing where the system is checked against the user's requirements specification.

System modification will be implemented if there is a need to change or do not met the users' requirements specifications. If the users are satisfied with the system's characteristics, the system is ready to be deployed for use. The testing result will show whether or not the entire system specifications and objectives are achieved.

There are four steps in testing a system as listed below:

- Function Testing
- Performance Testing
- Acceptance Testing
- Installation Testing

7.2.3.1 Function Testing

Function testing check that the integrated system performs its functions as specified in the user's requirements specification. Test cases can be used as a guide to the function testing.

7.2.3.2 Performance Testing

After have confirm that the functions work as specified, the performance testing can be start. The performance is measure against the performance objectives set in the

nonfunctional requirements of the system. Performance testing checks the run-time performance in the context of integrated system. It involves executing the functional behavior of the application and evaluates the processing and response time.

7.2.3.3 Acceptance Testing

The main purpose of acceptance testing is to make sure that the system build meets customer's understanding of the requirements, which may be different from the developer. This testing will be done only after the system is complete and deliver to customer.

7.2.3.4 Installation Testing

Installation testing is the final stage for the system testing. Before the installation testing start, the whole system should be delivered to customer and install the system at customer site. The installation testing performs testing on the integration of the system that have been developed and the hardware on the customer site.

7.3 Test Cases

The test cases describe how each test is to be conducted and input/output details. It exercises a system with the purpose of causing failures and detecting faults. Test cases that have been performed during system testing for the four modules (Bulletin Board, Project Management, Task Management, and Event Calendaring) of the Intranet system which in charge by writer are listed as follow.

7.3.1 Bulletin Board Module

Table 7.1: Test case for creation of new announcement

Test Case 1 - To test the creation of new announcement	
Activities Tested	Expected Result
Click on [Add] announcement link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Announcement.asp' page. If not, 'Block.asp' page will be display
Key in nothing and click on [Add] button	Error message will be prompted
Did not key in all the require field	Error message will be prompted
Key in an invalid start date (ex: character)	Error message will be prompted
Key in an outdated start date	Outdated announcement. Error message will be prompted
Key in a field with more than the maximum characters allowed	Error message will be prompted

Key in all the require fields correctly and click Add button	No error message and announcement add successfully in the database
Key a valid date or select date from the drop down calendar	No error message and page can be continue processing
Set the new announcement date as today date, set the expiration date, and key in all the require fields correctly and click [Add] button	No error message and announcement add successfully. The new created announcement will be publishing automatically in the Intranet system and it will be continuing published as long as it hasn't expired.
Set the announcement as urgent and key in all the require fields correctly and click [Add] button	No error message and announcement add successfully. Announcement detail will be stored in database as enter by the user Announcement will be written in red at the top of the announcement lists.

Table 7.2: Test case for modification of existing announcement

Test Case 2 - To test the modification of existing announcement	
Activities Tested	Expected Result
Click on [Edit] announcement link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Announcement.asp' page. If not, 'Block.asp' page will be display

View the current detail information of the announcement, then modified the fields and click the [Update] button	User will be notified of any errors. If no error, the record will be update in the database.

Table 7.3: Test case for removing of existing announcement

Test Case 3 - To test the removing of existing announcement	
Activities Tested	Expected Result
Click on [Delete] announcement link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Announcement.asp' page. If not, 'Block.asp' page will be display
View the current detail information of the announcement, then click the [Delete] button	The record's update status will be changed to "C" and the record will be invisible to user.
View the current detail information of the announcement, then click the [Cancel] button	Back to the Intranet main page

Table 7.4: Test case for upload and download file processing

Test Case 4 - To test the upload and download file processing	
Activities Tested	Expected Result
Click on [Attach File] link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed

	to 'Upload.asp' page. If not, 'Block.asp' page will be display
Select the file that user wish to upload by click on the [browse..] button	A file dialog box will be shown for user to choose file to be uploaded.
After the file are selected, click on the [Upload] button	The file will be save into database and information of the file will be shown in 'AnnouncementMain.asp' page
Select the file user would like to download	A dialog box will ask user to choose a location for saving it as a local file
Select the location which the file will be stored locally	The downloading is started

Table 7.5: Test case for search function of announcement

Test Case 5 – To test the search function of announcement	
Activities Tested	Expected Result
Click on [Search] lick	Redirect to 'SearchAnnouncement.asp' page
Key in nothing and click on [Search] button	Error message will be prompted
Key in valid start and end date, and then click [Search] button	Search result will be display

7.3.2 Project Management Module

Table 7.6: Test case for project management main page

Test Case 1 – To test the project management main page (ProjectMain.asp)	
Activities Tested	Expected Result
Click on [Active Projects], [Inactive Projects] or [Closed Projects] link	List of project according to the project's status is display
Select the number of records which will be shown in a page	Total record per page is display accordingly and the number of page current, total page, and total record are correct
Click on [Add Project] link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Project.asp' page. If not, 'Block.asp' page will be display
Click on [Edit] or [Delete] link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Project.asp' page. If not, 'Block.asp' page will be display
Select a project and click on the project's name	Redirect to 'ProjectTask.asp' and list of tasks and files related to the project are display.
Did not select project and click on click [Delete Selected] button	Error message will be prompted

Select a list of project and click [Delete Selected] button	Redirect to 'DeleteProjectLists.asp'

Table 7.7: Test case for creation of new project

Test Case 2 - To test the creation of new project	
Activities Tested	Expected Result
Key in nothing and click on [Create Project] button	Error message will be prompted
Did not key in all the require field	Error message will be prompted
Key in an invalid date (ex: character)	Error message will be prompted
Key in description with more than 600 characters allowed	Error message will be prompted
key in all the require fields correctly and click [Create Project] button	No error message and project created successfully. project detail will be stored in database as enter by the user

Table 7.8: Test case for modification of existing project

Test Case 3 - To test the modification of existing project	
Activities Tested	Expected Result
View the current detail information of the project, then modified the fields and click the [Update] button	User will be notified of any errors. If no error, the record will be updated. Then, will be redirected to 'ProjectMain.asp'

Table 7.9: Test case for removing of existing project

Test Case 4 - To test the removing of existing project	
Activities Tested	Expected Result
View the current detail information of the project, then click the [Delete] button	The record's update status will be changed to "C" and the record will be invisible to user. Then, will be redirected to 'ProjectMain.asp'

Table 7.10: Test case for project's task main page

Test Case 5 - To test the project's task main page (ProjectTask.asp)	
Activities Tested	Expected Result
Click on [View New], [View Pending], [View In Process], [View For Evaluation], [View Close] or [View All] button	List of related task according to the task's status is display
Click on [My Tasks] button	List of task that is in charge by the particular user is display.
Click on [New Task] button	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Task.asp' page. If not, 'Block.asp' page will be display
Select the number of records which will be shown in a page	Total record per page is display accordingly and the number of page

	current, total page, and total record are correct
Did not select any task and click on click [Delete Selected] button	Error message will be prompted
Select a list of task and click [Delete Selected] button	Redirect to 'DeleteTaskLists.asp'
Select a task and click on the task's name	Redirect to 'ProjectTaskDetail.asp' and list of sub tasks and notes related to the task are display.
Click on [Attach File] link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Upload.asp' page. If not, 'Block.asp' page will be display
Select the file to download	A dialog box will ask user whether user want to save file , open file or cancel

Table 7.11: Test case for project's task detail page

Test Case 6 – To test the project's task detail page (ProjectTaskDetail.asp)	
Activities Tested	Expected Result
Click on [Edit] button	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Task.asp' page. If not, 'Block.asp' page will be display

Click on [Set as fixed and closed] button	The task's status will be set as closed and task's solution will be set as fixed.
Click on [Add Underlaying Task] button	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Task.asp' page. If not, 'Block.asp' page will be display
Click on [Add Notes] button or edit notes icon	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'TaskNotes.asp' page. If not, 'Block.asp' page will be display
Did not select any task or notes and click on [Deleted Selected] button	Error message will be prompted

Table 7.12: Test case for creation of new task/sub task

Test Case 7 – To test the creation of new task/sub task	
Activities Tested	Expected Result
Key in nothing and click on [Add] button	Error message will be prompted
Did not key in all the require field	Error message will be prompted
Key in description with more than 560 characters allowed	Error message will be prompted
key in all the require fields correctly and click [Add] button	No error message and task created successfully. Task detail will be stored in database as enter by the user

Did not set the task status, priority, and solution	All these three field will be set to default value

Table 7.13: Test case for modification of existing task/sub task

Test Case 8 - To test the modification of existing task/sub task	
Activities Tested	Expected Result
View the current detail information of the task/sub task, then modified the fields and click the [Update] button	User will be notified of any errors. If no error, the record will be updated.

Table 7.14: Test case for removing of existing task/sub task

Test Case 9 - To test the removing of existing task/sub task	
Activities Tested	Expected Result
View the current detail information of the task/sub task, then click the [Delete] button	The record's update status will be changed to "C" and the record will be invisible to user.

Table 7.15: Test case for upload and download file processing

Test Case 10 – To test the upload and download file processing	
Activities Tested	Expected Result
Click on [Attach File] link	'VerifyUser.asp' page is processing. If user is administrator, then will be directed to 'Upload.asp' page. If not, 'Block.asp'

	page will be display
Select the file that user wish to upload by click on the [browse..] button	A file dialog box will be shown for user to choose file to be uploaded.
After the file are selected, click on the [Upload] button	The file will be save into database and information of the file will be shown in 'ProjectTask.asp' page
Select the file user would like to download	A dialog box will ask user to choose a location for saving it as a local file
Select the location which the file will be stored locally	The downloading is started

7.3.3 Task Management Module

Table 7.16: Test case for 'maintain ad hoc' task main page

Test Case 1 - To test the 'maintain ad hoc' task main page (Note: only administrators are authorized to access this section)	
Activities Tested	Expected Result
Click on [Maintain Ad Hoc] link	Redirect to 'MaintainTask.asp' page and the page will only display the information about ad hoc tasks that assigned by that particular administrator. Task that assigned by others will be invisible.
Click on [Summary] link	Redirect to 'TaskDetail.asp' page and the page will display ad hoc task summary

Did not select old task and click on [Proceed] button	Error message will be prompted
Select an old task and click on [Proceed] button	Redirect to 'TaskProcess.asp' page and the page will display all the information about the selected task and administrator can either edit or delete the task
Click on [Assign New Task] button	Redirect to 'Adhoc.asp' page

Table 7.17: Test case for 'maintain routine' task main page

Test Case 2 - To test the 'maintain routine' task main page (Note: only administrators are authorized to access this section)	
Activities Tested	Expected Result
Click on [Maintain routine] link	Redirect to 'MaintainTask.asp' page and the page will only display the information about ad hoc tasks that assigned by that particular administrator. Task that assigned by others will be invisible.
Click on [Summary] link	Redirect to 'TaskDetail.asp' page and the page will display routine task summary
Did not select old task and click on [Proceed] button	Error message will be prompted
Select an old task and click on [Proceed] button	Redirect to 'TaskProcess.asp' page and the page will display all the information

	about the selected task and administrator can either edit or delete the task
Click on [Assign New Task] button	Redirect to 'Routine.asp' page

Table 7.18: Test case for 'your task' main page

Test Case 3 - To test the 'your task' main page	
Activities Tested	Expected Result
Click on [Your task] link	Redirect to 'YourTask.asp' page and the page will only display the summary of ad hoc and routine task that have not been done by that particular user.
If user have done the task, select the task and click on [Done] button	Redirect to 'taskdoneDB.asp' page and the task will be set as done an invisible in 'YourTask.asp' page

Table 7.19: Test case for 'task report' page

Test Case 4 - To test the 'task report' page (Note: only administrators are authorized to access this section)	
Activities Tested	Expected Result
Click on [Task Report] link	Redirect to 'TaskReport.asp' page
Did not enter date range	Error message will be prompted
Enter a date range, check the [For individual usage] check box, and then click	Redirect to 'TaskReportDB.asp' page. The page will display those task assigned

the [Proceed] button	by that particular administrator within the date range
Enter a date range, uncheck the [For individual usage] check box, and then click the [Proceed] button	Redirect to 'TaskReportDB.asp' page. The page will display all the task assigned within the date range
In the 'TaskReportDB.asp' page, select [All], [Ad hoc], or [Routine] link	If [All] link is selected, all the ad hoc and routine task will be display. If [Ad hoc] lick is selected, only ad hoc task is display. If [Routine] link is selected, only routine task is display.
In the 'TaskReportDB.asp' page, select an appiontee	The page will display all the task assigned to the appointee.
In the 'TaskReportDB.asp' page, select the number of records which will be shown in a page	Total record per page is display accordingly and the number of page current, total page, and total record are correct

7.3.4   Event Calendaring Module

Table 7.20: Test case for monthly view calendaring page

Test Case 1 - To test the monthly view calendaring page	
Activities Tested	Expected Result
Click on [monthly view] link	Redirect to 'Calendar.asp' page. By default, the page will display current

	month information which is all the task and event related to the particular user. Furthermore, the current date's background will be set to gold color.
Click on the task title link	Redirect to 'ViewTask.asp' page. The page will display all the information of the selected task.
Click on the date	Redirect to 'DailyView.asp' page.
Click on the event title link	Redirect to 'Event.asp' page
Click on month's name link	Refresh the same page and display the chosen month's information

Table 7.21: Test case for daily view calendaring page

Test Case 2 - To test the daily view calendaring page	
Activities Tested	Expected Result
Click on [daily view] link	Redirect to 'DailyView.asp' page. By default, the page will display current daily information which is all the event(s) assigned to the particular user only.
Click on [Add] link	Redirect to 'Event.asp' page.
Click on [Back] lick	Redirect to 'Calendar.asp' page

Table 7.22: Test case for creation of new event

Test Case 3 - To test the creation of new event	
Activities Tested	Expected Result
Key in nothing and click on [Add] button	Error message will be prompted
Did not key in all the require field	Error message will be prompted
Key in an invalid event date (ex: character)	Error message will be prompted
Key in an outdated event date	Outdated event. Error message will be prompted
Key in event description with more than the 560 characters allowed	Error message will be prompted
Key in all the require fields correctly and click Add button	No error message and announcement add successfully in the database
Key select future event date from the drop down calendar	No error message and page can be continue processing
Set the new event date as current date, and key in all the require fields correctly and click [Add] button	No error message and event add successfully. The new created event will be display automatically in the monthly view calendar page according to the event date.
Did not select event time	Event time will be set to 'all day event'
Enter 'issue to' field, set the sharing as *private*, key in all the require fields	No error message and event add successfully. This new created event will

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correctly and click [Add] button	be seen by the users in the 'issue to' field only.
Enter 'issue to' field, set the sharing as *show as busy*, key in all the require fields correctly and click [Add] button	No error message and event add successfully. This new created event will be seen by the users in the 'issue to' field only. Other user can only view when the event schedule but no details.
Set the sharing as *Private*, key in all the require fields correctly and click [Add] button	No error message and event add successfully. This new created event will be seen by all the Intranet users.

7.4 Conclusion

Testing on the whole system had been done successfully. Every system that is build should perform testing to make sure the functionality has run correctly and meets the user's requirement.

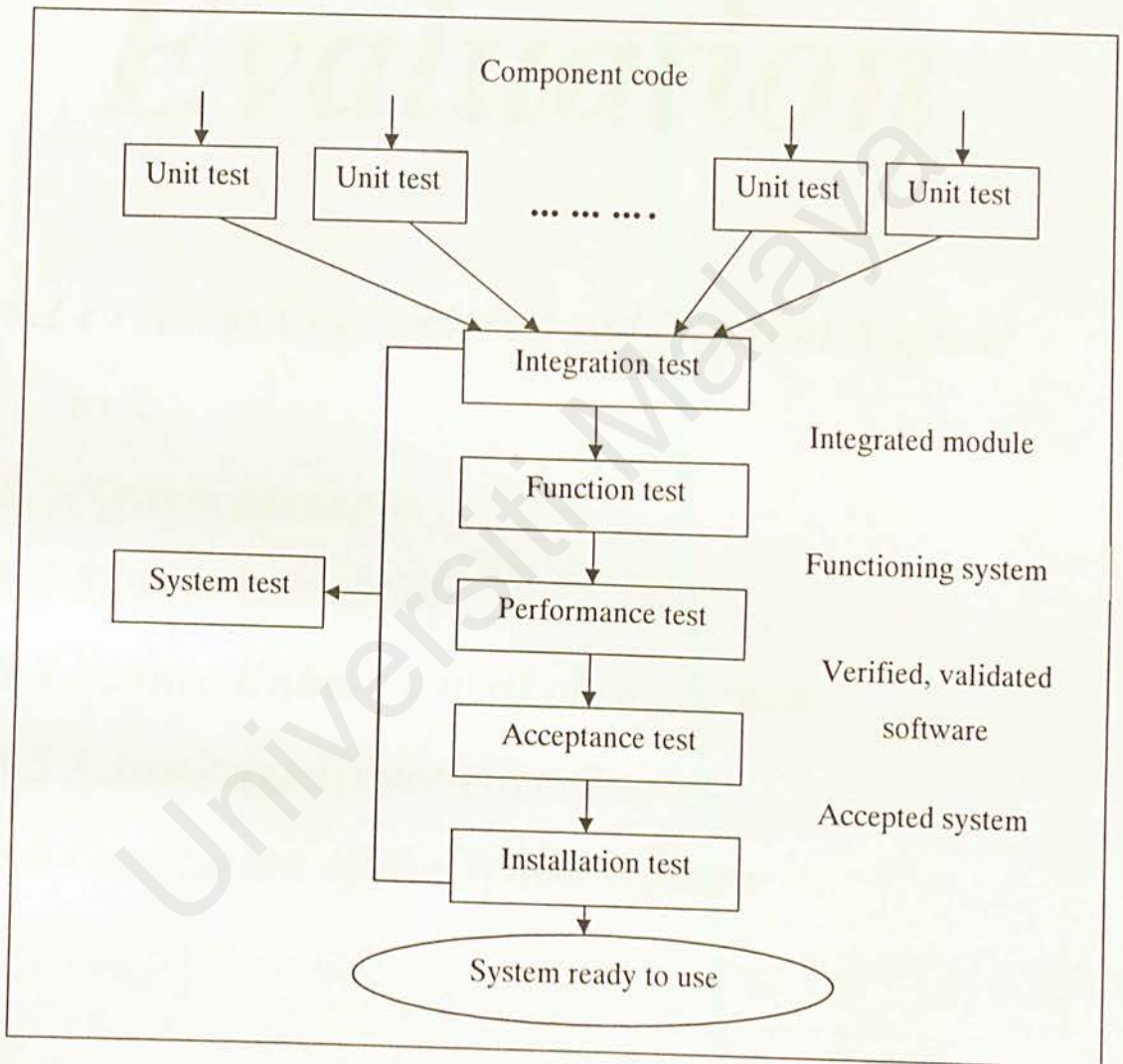The testing steps for the whole system are shown as below.

Figure 7.1 Testing Steps

System

Evaluation

CHAPTER 8: SYSTEM EVALUATION

At all phase of the system development, evaluation is a process that occurs continuously. System evaluation will cover the problems encountered during the development process from the beginning till the end of the project, the solution to the problems encounter, system strength, limitation of the system being develop, and the future enhancement for the system. System evaluation is depended to user environment, attitudes, information priorities, and several other concerns.

Topics that will be cover are listed as follow.

- Problem encountered and the solution applied to it

- System strength

- System limitation

- Future enhancement of the system

- Conclusion of the whole system

8.1 Problem Encountered And The Solutions Applied To It

In every project, the problems always occur during system development and it has been no exception in this project. Throughout this project, many problems have kept unfolding one after another as development work progressed due to many reasons.

The following are some of the major problems encountered from the beginning through the end of system development process.

- **Difficulty In Determining Scope Of The System**

At the beginning phase (analysis phase), since there was no prior experience in developing system, it was doubtful to determine to which extent the scope of the system (features and functions) should be defined so that it can be completed within the given time frame. Most of the existing Intranet systems used by companies in either Malaysia or international are private. Those companies do not disclose their internal information about the Intranet system as it is developed for internal usage only.

Solution: Discussion was held with project supervisor and project member to outline the scope of the project. Further reading on Intranet handbooks and research on the commercial Intranet system online also helped to define the features and functions that should be provided in this project.

- **Difficulty In Choosing A Programming Language And Tools**

Nowadays, there are many programming language and tools available in the market that can be used to develop a web application. Choosing a suitable tool was a critical process as all tools have their own strengths and weaknesses. The major considerations of the tool are functionality and usability of the required tools.

Solution: Installation and setting up of the available tools have been carried up to compare the strengths and weakness. In addition, seeking advices from project supervisor and course mate are also carries out. In this way, the suitable tools that can support all of the requirements for this application can be chosen. ASP (Active Server Page) and JavaScript have been chosen to develop this Intranet system.

- **Time Constraint**

During design phase, due to the inexperience and insufficient knowledge of designing a system, there was not enough time to study, learn and produce the best solution of design in Semester 1. Moreover, insufficient time cause many features and modules couldn't be added in this system.

Solution: Study as many approaches used by senior and existing Intranet system. Furthermore, the best method to solve the second problem is implementing all the critical system features and modules before other features and modules can be added.

- **Problems On Installation**

During implementation phase, there were a lot of problems on installing and configuring Windows XP, IIS, SQL server 2000, and other tools before starting coding.

Solution: A few times of formatting and reinstallation the needed software and tools were done and it successfully installed finally. From this I learn to know that, it is essential to know the sequence of products installations. This is to ensure smooth execution without system errors.

- **Inexperience In Using Programming Language**

Since there was lack of experience and knowledge in ASP, JavaScript, SQL, and HTML, an uncertainty on how to organize the structure and codes of the combination of different language was encountered during coding process. Furthermore, time is needed to learn all the web base programming language and should learn it within a short span of time.

Solution: Lots of studies were done through referring to the reference books and surfing the Internet for the related materials. Besides, discussion with course mate and senior who have used the same programming language were carried out. A more efficient method was going through trials and errors during the coding process. Try to solve the coding bugs will let the developer more understand the programming language used. Therefore, more practice on trials and errors has been done.

- **Unanticipated Appearances Of Web Pages In Different Web Browsers**

  The appearance of web pages is different on Internet Explorer 6 and Netscape Navigator and Communicator during the testing phase, such as different positioning of graphics, text, and tables on these web browsers. The main cause of these problems couldn't be detected.

8.2 System Strength

Although this intranet system does not have powerful features to some extent, but still has some strength of its own if compared to some existing Intranet system in Malaysia. System strength for this Intranet system is listed as follow.

- **Simple And User-friendly Interface**

  This Intranet system is featured with an attractive graphical user interface concept. Lots of interesting and colorful buttons are used in the design of the web page. It can be evaluated as a simple and easy use application. The interface of the system is consistent where a systematic web page design is used. Most of the operation can be done by point and click operations. Furthermore, the learning curve for of this Intranet system will be shortened because it provides graphical based and direct interface for the user to have the control of the system flow and deal with it by using buttons, select list and hyperlinks and then the training costs will be reduced. In directly, it can save time and money.

- **Provide Cost Effective System**

  This Intranet system is paperless environment. It can save the cost for generating many paper base documents. All the transaction's records will store in server. The record will not be loss as long as the server is running properly. Companies using this Intranet system can avoid from suffer loss or

damage of important documents. If the document transfer fails to transfer, user can always try again since the cost will be same. This will reduce the cost of regenerate the document if the document/data is lost. Besides, transferring on-line documents through the Intranet system takes only short period of time. Cost of transportation will be reducing as document can be transfer online.

- **Reliable System With Effective Error Handling**

This is a reliable system as it can cater almost all the possible error encountered. All the inputs from the users are validated and verified. Whenever the users attempt to perform illegal actions, the system will display error message with HTML to the users and informing the users about the type of error. For instance, if the users enter in invalid date in the start date of an event, an error message will be display and users are required to enter a valid date.

- **System Security**

Users will be redirected to the login page if they left the browser inactive after 20 minutes. Users will be required to login again in order to prevent unauthorized users from accessing the Intranet system and then misuse the privilege. Although some users know the actual URL of the Intranet system,

they are still prohibited from accessing the Intranet system before logging in
to the system.

- **Easy To Access**

  The Intranet system is developed in web base application. This has provided
  wide accessibility to users because it can easy to access as long as there is a
  web browser on the computer and network connection. Users can access this
  system from any corner of the world and any time they like since browsers
  are normally available in most of the platform.

- **Filtering Content**

  The result of some of the function could be filtered according to the
  preference of user. This will reduce the information overload.

8.3 System Limitation

Due to the experience, skills poorness, and time constraints, this system contains some inaccuracies and omissions. It does not support all the function that is provided by a commercial Intranet system. System limitation for the Intranet system is listed as below.

- **Performance Dependents On Network**

  The overall performance of this Intranet system is depends heavily on the user's network connection or transmission line. Heavy traffic jam on network will eventually lengthen the loading time of the web page. Another important factor affect the system performance is the speed of user's modem. Low speed modem will eventually discourage the user in using this Intranet system.

- **Not Support Multiple Language**

  The current developing system is only limited to one language (English) only. This is due to the time limitation. But it still can be enhance to support more languages to adapt to different environment will use different languages.

- **Not Provide Help Module**

  Help module is not implemented in this system due to the time constraint.

8.4 Future Enhancement Of The System

System development has no boundaries as new requirements and better implementation methods continue to arise and evolve. Enhancement should be made to improve the system limitations. Here are some future enhancement's suggestions that can extend the usability of the current developed Intranet system.

- **Security Issues**

   Due to this system is an Intranet system for small and medium-sized company, it should keep all the important confidential information in highly confidential place. Currently, the Intranet system security level is still under average level. Therefore, there are some suggestions to enhance the security of the Intranet system as showed below.

   1. Installing a firewall in order to prevent any unauthorized user to access to the Intranet system.

   2. Use encryption to protect other user to view the important data when the data is transforming through the Intranet network.

   3. Use digital signature to provide method to associate the message with the sender. It can use to verify to sender identification

   4. Enhance the database security control

   5. Improve security of web server

- **Interactive Help Module**

  Currently, the Intranet system does not provide any help function. A help module shall be integrated into the system in future. This help module should be content sensitive so that the user can navigates the page easily and user will get want information they want.

8.5 Knowledge Experience Gained

From the planning phase until the testing phase of this project, many experiences have been gained by the writer. These experiences are listed as follow:

- Opportunity to learn and master web-based application development scripting such as ASP, VBScript, JavaScript, and HTML.

- Learn many knowledge of Intranet while doing system literature review and research. This knowledge include definition of Intranet, the purpose of organization to create Intranet, Intranet security, Intranet return on investment (ROI), Impact of Intranet on organization and so on.

- Learn the concept of network and software architecture. Most of the knowledge was gained while doing system literature review and research.

- Learn the database design and development. These include the SQL statement, ODBC, OLE DB, and others.

- Opportunity to master the development software such as Macromedia Dreamweaver MX and Microsoft SQL Server 2000.

8.6 Conclusion Of The Whole System

Although development of the whole system is not an easy task because various objectives has been targeted and many technologies was have been involved, but it still can be considered as an effort to achieve the goals. Overall, this project has fulfilled the requirement to deliver the system in time and achieved most of the objectives and requirements as determine during analysis phase.

Throughout this project, a lot of valuable knowledge and experience has learned and gained. These include knowledge in programming, database, web application development, Intranet environment, Intranet technologies, software engineering concept, and web server (IIS) control. Study and practically do the program in HTML, JavaScript, VBScript, and ASP prove to be a valuable experience and knowledge. It is also a good way to test developer creativity to solve problems. Good software engineering principle must also apply because programming techniques are important in developing a project. Theories and knowledge gained from the previous course such as database, system analysis and design method, software engineering, and others can be applied into this project. Therefore, this project has provided a good chance to experience using the approach and techniques that learn from the course.

Although it is not a really complex system, the successful development of the Intranet system is the first step towards more comprehensive and innovative system development in future. Invaluable experience and knowledge gained from the development of this Intranet system definitely provide the useful foundation in writer future endeavors.

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