SPOT IT

INTERNAL INTRANET WEBSITE

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Declaration

I declare that this final year project is my own work and has not been submitted in any form for another degree or diploma at any other University or Institute of tertiary education. Information derived from the published and unpublished work of others has been acknowledged in the text.

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ABSTRACT

When we look at the sheer volume of information stored by corporations today, including reams of printed information like computer documentation, procedures, specifications, and reference documents, we quickly see the argument for taking information online. Users no longer have time to wade through a shelf full of manuals to find some obscure tidbit of information, and companies can no longer justify the cost of printing all this information without any guarantee that users are actually reading it. Then there is the problem of keeping all that printed information up-to-date.

Many companies are already using *intranets* to deliver information to internal users. The term *intranet* refers to the fact that the Web (or other Internet applications) are being run completely *on the inside* of a private network, often without a direct connection to the Internet. There are a number of information resources and transactions that are potential candidates for an intranet.

Considering the rapid growth of intranets, a study was conducted on the impact of intranets in Malaysian organizations. Since feedback is slow, this study was limited to sending out questionnaires only. The analysis was not done as the author was given the freedom to concentrate on the development of the system proposed(this will be discussed later).

The author has taken the opportunity to introduce intranet and the recent issues involving intranets in this first part of the thesis First of all, the author starts off with a discussion on the questions that were posed in the questionnaire that were sent to Malaysian organizations to get response on the impact intranet has on them. Following which, the author continues to tackle subjects like definition of intranets, history of intranets, issues to consider when building an intranet, key intranet questions to be asked before deciding to build an intranet, intranet myths, intranet reference model and finally to the core of the research in hand, what materials on the internet have say about intranet

benefits and challenges. These materials were very valuable in the process of designing the questionnaire. At the same time, studies on the impact of intranets on foreign organizations and also the use of intranet in the state of Sabah were also conducted and the outcomes of these findings are also explained in the literature review section of this thesis.

In addition to the research topic in hand, an internal web site within an intranet for a mock organization, West Indies Oil Refiners, called SPOT I.T is also proposed to be developed, the third and fourth chapter of this thesis will discuss in detail on the proposed development of this web site . SPOT I.T is in tune to the intranet concept; it is intended to serve I.T services to all employees of the organization. Even though it is I.T department based, all employees from any department can equally benefit from the content it has to offer. I.T services has been chosen as the theme of this website due to the fact, apart from human resource, information technology has always been the concern of all in the organization, this is even more true with the implementation of intranets.

SPOT I.T will provide forms such as complaint and request forms for users to fill in I.T based complaints and services, apart from this, they can also check what their status of complaint/request is. They will also be able to find I.T agreements, project details, information on personnel policies and benefits, lists of I.T related links and tools, information on I.T training and seminars, frequently asked questions, I.T department chart, interesting places to visit and also a calendar which lets users know what interesting events are happening everyday.

SPOT I.T is developed using the evolutionary prototype model. A few existing intranet websites were studied to get ideas on functional, non-functional requirements and design concepts. The author had to research through materials to find suitable development software for SPOT I.T. The findings of these materials are presented in chapter three, system analysis and requirement. In the fourth chapter, system design, the

author discusses the design of the system. SPOT I.T architecture is divided into administrator module and user module. The functional design of the system will be presented using data flow diagrams and structure charts. Following this the design of databases will be discussed through presentations of entity relationship diagram and samples of table designs. The main source of research for the design of SPOT I.T was the research findings in literature review. Certain examples of existing intranet related sites were used as foundations to determine the requirements and design of the system. In the fifth chapter, the author will discuss briefly on how the system requirements were transformed to implementation. This discussion will be mainly on the coding and the database connection. The hardware and software required for the implementation will also be stated. The sixth chapter will include the stages of testing that was conducted to ensure the system is not only error free but also meet the requirement. Finally the seventh chapter will conclude with the evaluation of the system. The system strengths and weaknesses will be studied, at the same time future enhancements that can be made to the system will also be analyzed. The author will also share knowledge, which was gained, and the difficulties faced throughout the project.

The most important aim of this whole project is the intention to prove that intranet based applications definitely can make a difference in an organization.

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PROJECT INTRODUCTION

1.1 Introduction

Lines of communication and access to information resources are business – critical issues, as they inevitably impact a company's productivity. I.T solutions to problems of communications and access to information resources have traditionally been achieved by applying computer dependent platforms such as client-server solutions, based on various conditions. These included site-specific solutions, organizational structure based on a reporting hierarchy and functionality focused on a department, unit or a workgroup. Unfortunately the transfer of information via these platforms is limited, either horizontally or vertically, lacking the capability to readily share information resources beyond imposed boundaries.

The intranet overcomes these disadvantages. As a computing platform it is independent and allows for a network centric configuration. Fresh as well as legacy data become accessible via the intranet with minimal effort and this valuable information can be distributed to others, where boundaries previously prevented their access. There is no doubt however that computing dependent systems will continue to exist and complement the intranet since each one fulfills a particular need. A role remains for traditional data management.

The openness of intranet technology not only simplifies the computing infrastructure, but also enables a company's social infrastructure. Direct communication can be encouraged between individuals at diverse sites and from different departments. By and large companies welcome this as it reduces cost and improves information sharing among employees.

Additionally this technology allows people to express their ideas in ways that have not been easy to do with traditional systems. The multimedia concept including the graphical use of graphics video, and audio, does much to enhance traditional textual materials, thus giving an idea or expression much more impact.

As much as its usefulness, intranets can also have its disadvantages. The downside of its openness relates to security issues, which are causing many companies

great difficulty. Three aspects of security need to be controlled. One is preventing access by public internet users to its intranet, in particular protecting the intranet from malicious hackers of various kinds. Second is preventing access by employees to subnetworks (intranet within an intranet), which they have no access to enter, and which may contain secure information that they have no right or need to know. Thirdly preventing employee from accessing the public Internet when this does not comply with company policy e.g. unauthorized use of Email, access to websites with questionable content. The accessing of pornographic websites remains one of the most common forms of internet abuse in the workplace, followed by playing games on public servers and other activities not in organizations best interests.

Intranets can also be difficult to implement for various reasons, firstly established companies have already made extensive investments in computing platforms and therefore feel compelled to maintain them rather than integrating intranet technology. Secondly there might be resistance from the employees as they are not open to new technologies and prefer not to change the style of doing work. Thirdly, for companies which have made large investments in traditional computing will focus their resources on traditional technologies as the costs of implementing an intranet might be high depending on their existing infrastructure.

The benefits of intranet technology are easily demonstrated in the ease of implementation-a feature many organizations have taken advantage of. Staff other than programmers now has the ability to present and maintain their information at a relatively low cost.

Many positive attributes have been found in successful applications, where many facets of information have been rendered. This includes forms, policies and procedures, publications, project management status, back end legacy databases, training,. Improved communications and internal responsiveness are the result. Actual competitive advantage is more difficult to measure, being highly dependent on how well the technology is implemented. Without this technology it seems likely that an organization will lose ground against competitors.

It is anticipated that the future will bring rapid changes to the concept of intranet technology and this will dramatically impact organizations. This is due in part to the current economic climate and the need for companies to strive for continued growth. Intranet technology will offer companies the opportunity to combine functional areas for their organization for increased productivity and reduce the number of procedural steps in many business processes, thus providing increased responsiveness to overall business. environment..

Considering the many ups and downs of intranet technology, this project is aimed at identifying the impact of intranet in Malaysian organizations. Research method adopted is through the distribution of questionnaires to Malaysian business companies by post. Since time is limited, and the feedback is slow, only a brief discussion on the questions prepared will be done in chapter 2. At the same time, Internet surfing was done to get more information on how foreign business organizations have been effected by the use of intranet technology, since organizations take uniform form no matter foreign or local. This method was used as intranet technology is still a new term in Malaysian organizations and not much information can be collected from the internet using the local context.

The other half of this project is to design and implement an internal website SPOT I.T situated in the intranet of a mock organization West Indies Oil Refiners, an oil refining company. This site is implemented to highlight some of the positive features of intranet technology. The development of this website will play a role in showing how fresh, updated information can be quickly disseminated throughout the organization, breaking boundaries of departments. Other positive aspects are also stressed; these aspects will be highlighted in the system objective section.

Given the rapid changes currently taking place in both intranet and internet technology, it should be recognized that the ideas and applications currently in vogue, are only the beginning. Future ingenuity will certainly bring about even more useful and effective applications for intranet.

It is hoped these two areas of project will help to convince the needs of intranet technology in organizations especially Malaysian organizations.

1.2 Objectives

The two main objectives of the project are:

1. Identify the impact of Intranet in Malaysian Organizations:

The sub-objectives include:

- Identify how popular intranets are in Malaysian organizations.
- Identify whether Malaysian organizations have succeeded in capturing the positive elements promised by the intranet technology.
- Identify the drawbacks intranet technology has posed on Malaysian organizations.
- Identify factors which influenced the decision not to implement intranet
- Identify whether Malaysian organizations have a long-term commitment towards improving the intranet.
- Identify the future of intranets in Malaysian organizational environment.

2. Design and implement SPOT I.T (an internal I.T website located within an intranet) to highlight some of the positive features of intranet technology

The sub-objectives include:

- Create a secure, professional and successful internal web.
- Facilitate friendly and interactive user interface equipped with sufficient error detection and friendly confirmation messages.
- Ensure fast transmission of news and information
- Provide an effective information storage center
- Increase communication and channeling of information among organization employees.
- Reduce usage of paper
- Achieve electronic media publishing- saves time, money and paper.
- Reduce cost of other kinds of communication- telephone, fax, since complaints and requests of services can be made on-line
- Availability of updated information to the whole organization
- Better control of redundant or out-dated information through single-point storage and access.
- Increase data integrity-single point storage

1.3 Scope

SPOT I.T is divided into two main modules, user module and administrator module. The modules will be described briefly below:

1.3.1 User Module

User module will be divided into 5 main modules. Each module will consist of sub modules.

- Agreement & Forms Module

  This module will consist three sub-modules. The first sub-module is the agreement sub module, this is where employees of I.T department can use a search engine and look for a match of keyword with the agreement description of the agreement they are looking for. Secondly there is the complaint sub module this sub module presents the user with a complaint form. Complaints relevant to the I.T department such as printer not working, software corrupted, pc crash can be filled in to this form. Users can also check the status of their complaint by remembering the id of their complaint. The third sub module will be the request sub module. It works just like the complaint sub module but the difference will be, users fill in requests instead of complaints, these requests can be in the form of loan of I.T related items such as laptops or requesting assistance during presentations. Requests will be more of an obligation compared to complaints which is their duty. Requests can be turned down but not complaints

- Links & Tools Module

  This module lists all links to other I.T related web pages and links to tools such as software and driver downloads. The descriptions of the links are given and a search engine to search for keywords, which match description, can also be conducted.

- Information Module

  Information Module will contain three main sub modules. The first sub module will be on employee benefits & policies, a list of employee benefits and policies and links to their description will be listed out on this page. The second sub module will be on the latest news on what I.T training, seminars are going on and the ones which will be held in the future. Links to more information on these trainings and seminars will also be provided. The third sub-module will be on I.T

projects. This sub module lists all I.T projects that have taken place, is going on and under proposal. Project name, project status and project description and links to projects are listed. A search engine to match keywords with description is also provided.

- Frequently Asked Question Module

  This module will provide link to 4 sub modules: Windows NT, Microsoft Outlook, Microsoft Office, Unix. These modules will explain in length on frequently asked questions, by having these pages, users can solve their problems on their own and not rely on I.T staff, therefore creating more employee independence and decreasing I.T personnel burden.

- Miscellaneous Module

  There will be three sub-modules in this module. The first sub module is I.T Department Chart; it will show the structure of the I.T department and information on its employees. To add up spice to this website, a sub module on interesting places to visit will also be added. This sub module will contain description on popular tourist attraction spots. Another sub module will be a calendar, where important events including public holidays are noted on each day of the calendar.

1.3.2 Administrator module

Administrator modules will be same as user modules with extra modules to add, edit and update database. Administrator will also be responsible in adding status and comments to request and complaints made by users. In addition to this, administrators will also have a module to log in to the system and change password. Administrator is responsible in keeping all information current and up to date.

1.4 Research Plans And Methods

- Research will primarily be based upon Internet materials and books. Internet materials will be able to provide current information on the development of intranets. Current issues and trends of intranets will be researched to find out the impact of intranets.
- Since intranets are secured sites, the author intends to surf the Internet for relevant sites that will be similar to intranet environment. At the same time industrial training reports will be made as guides to study on intranet based applications.
- Books will be studied to get more knowledge on web page development basing on the intranet concept.
- Questionnaires will be designed and sent to local organizations to get their feedback on the impact of intranets in their organization.
- Study on development tools for SPOT I.T and development methodologies will be made.
- Identify requirements of system and determine software/hardware requirements.
- Design the system basing on studies on existing systems.

1.5 System Limitations

There are a few limitations to the SPOT I.T system design, these limitations are stated as below:

- Intranet content covers a large scope. SPOT I.T covers only a very small scope of the content.
- SPOT I.T doesn't have a mailing system. Every time a user wants to check his/her complaint/request status, they have to open the SPOT I.T website to find out.
- SPOT I.T is only able to inform the admin as to what requests or complaints are made. Admin then has to direct other I.T personnel to attend to the job at hand. It doesn't automatically inform the personnel responsible.

- Since Windows NT works hand in hand with Internet Explorer 4.0 or above for security features , it is assumed the standard browser for the organization is Internet Explorer 4.0 or above.

1.6 Project Planning and Scheduling

Project Planning and Scheduling involves determining the order in which project activities will be performed, setting the start and end (finish) times for each activity. There are a variety of techniques available for depicting and documenting project plans. One of the most popular techniques is to employ Gantt charts. A Gantt chart is a bar chart that shows each task activity, as a horizontal bar whose length is proportional to its time of completion

Steps for constructing Gantt chart.

- Identify each activity to be completed
- Determine time estimates and calculate the expected completion time for each activity

Project Schedule

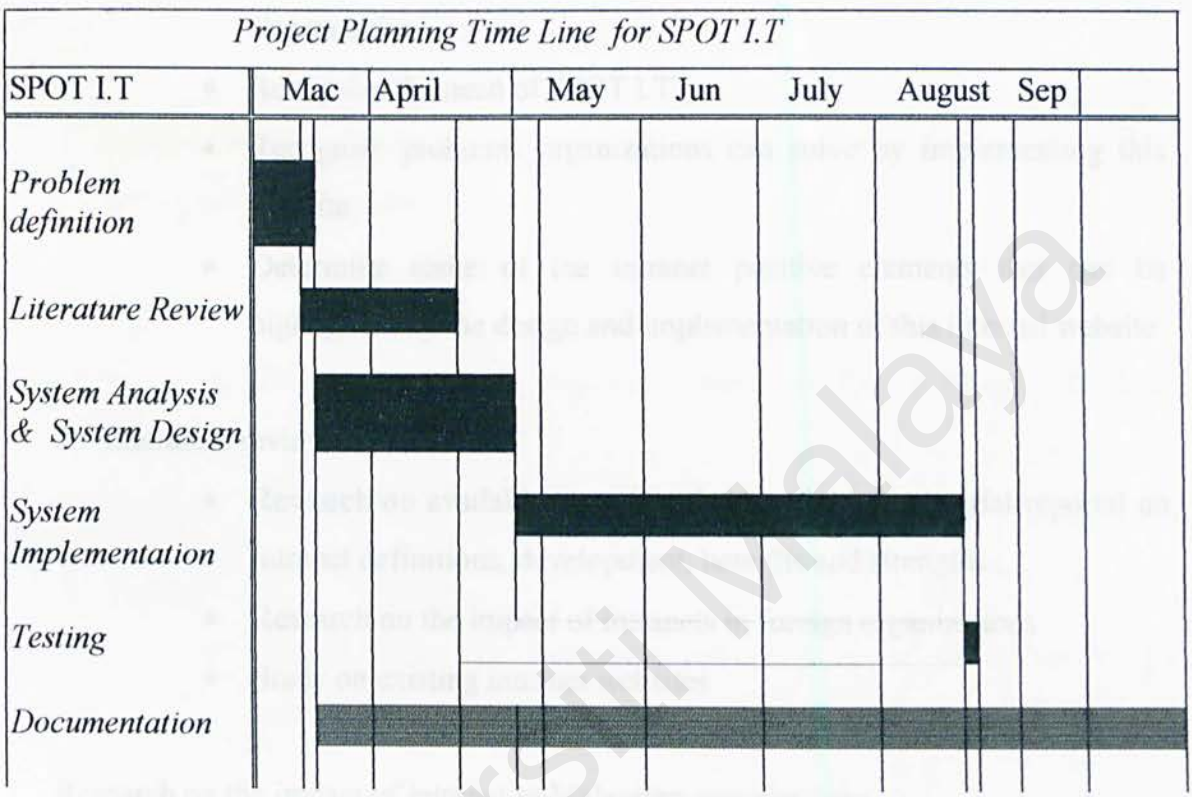


Table 1 PROJECT SCHEDULE

Activities

1. Problem definition,
    - Determine steps to research on the impact of intranets in Malaysian Organizations.
    - Recognize the need of SPOT I.T
    - Recognize problems organizations can solve by implementing this website.
    - Determine some of the intranet positive elements that can be highlighted by the design and implementation of this internal website
2. Literature review
    - Research on available materials (books, thesis, industrial reports) on intranet definitions, development, benefits and strengths .
    - Research on the impact of intranets in foreign organizations
    - Study on existing intranet websites

Research on the impact of intranet in Malaysian organizations

- Collect information on intranet and the impact of intranet through surfing the internet
- Prepare, revise and finalise questions for the questionnaire
- Find addresses of the respondent companies

3. System Analysis & Requirement
    - Determine development methodology
    - Determine functional and non-functional requirements
    - Analysis on the developing tools

System Design

- Include system architecture design, data flow diagram, entity relationship diagram, structure of the system, user interface design and database design.

4. System Implementation

   Development of System

   - Design the system using the structure charts, flowchart and pseudo codes.
   - Translate all the algorithm into specific program language instructions
   - Testing and debug the system to eliminate all errors

5. Testing

   - System testing by individual and users to ensure system works correctly and meet requirements

6. Documentation

   - All project information is compiled and recorded.

1.7 Expected Outcome

The first outcome of this project will be an analysis of impact of intranets in Malaysian organizations. We will be able to know whether intranets have made any significant difference in these organizations or is there a long way to go before they reap the real rewards promised.

The second outcome of the project will be an internal website called SPOT I.T which will provide I.T departmental service not only to the I.T department but all employees accessing the organization's intranet. It will be an information storage

and service provider spot, most importantly it will demonstrate some of the common intranet benefits such as cost saving, increased communication, electronic updating and publishing and increased speed.

1.8 Project Layout

Project layout gives an overview of the major phases involved in this project development. There are four major chapters, given as below:

Chapter 1: Project Introduction

This chapter gives an overview of the whole project. It contains project introduction, project objectives, project scope, project research plans and methods, project limitations, project planning and scheduling and the expected outcome of the project.

Chapter 2:Literature Review

This chapter contains the compilation of all materials read and surfed on the intranet, which is in line with the current project. Since the major subject of the project in hand is intranet, all relevant information on intranet can be found here, besides that a brief discussion on the questionnaire is also given. Case studies on companies using intranets and the benefits and challenges they face is also provided. In addition to this, three existing intranet sites are also studied.

Chapter 3: System Analysis

This chapter covers the methodology used to develop the system and also functional and non-functional requirements of the system. Analysis of the development tools is also included.

Chapter 4: System Design

This chapter revolves on the design of the system. System processes involve data flow diagrams and structure charts. This chapter concerns on system architecture, functional design, database design and also the user interface design.

Chapter 5: System Implementation

This chapter will touch on how the system implemented. The aspects discussed include:

1. software and hardware used
2. database connection
3. coding

Chapter 6: System Testing

Testing was done not only after the implementation but also throughout the implementation to ensure system is error free and meets the specified requirements. This chapter explains the different stages of testing done.

Chapter 7: System Evaluation & Conclusion

Here, system evaluation was done to identify strengths and weaknesses of the system. At the same time future enhancements that can make the system more functional and robust is briefly discussed. Knowledge gained throughout the project and the difficulties faced are also included.

LITERATURE REVIEW

2.0 Introduction

Literature Review is important, as it is a study of materials and sources that will help to strengthen the foundation of the project. The author starts off by knowing very little of the project in hand. It is only through research on electronic and printed materials, and visitation to current intranet websites, the author is able have a better understanding and awareness. Literature review generally helps to

- Identify user needs
- Evaluate the system concept for feasibility
- Create a system definition
- Identify strengths and limitations of development tools.

Since the first part of the project is research in nature, finding out the impact of intranets in Malaysian organizations, the Internet was a very important and ideal source of information in identifying the latest growth, trends, benefits and challenges of intranets in organizations. There are many websites, which discusses broadly on intranet concerns. This was very helpful to the author, as the information gained here was used as basis to create context relevant questions for the questionnaire. At the same time this information was also very useful for the requirement determination and design of SPOT I.T, the second part of this project.

Many books were read to help gain knowledge on designing and developing the SPOT I.T website. Information was gathered on better software engineering, intranet site development and the development tools needed for SPOT I.T. These findings will be stated in chapter 3, system analysis and requirements specification, where an in-depth discussion on the system proposed will be held. Reading and understanding these materials were important to the author as it increased familiarity and awareness on terms, technicalities and context of the system. Many seniors and friends were approached to give a better description as to how websites were built. Since they have done it previously, they had better ideas on what was going on practically. Materials can sometimes be frighteningly long and confusing and after reading many materials only

very little of what is learned is retained. Nevertheless, reading these materials increased knowledge. With knowledge came confidence.

2.1 Fact finding techniques

There are many fact-finding techniques, which can be used. These techniques include:

- Interviews
- Observations
- Questionnaires
- Research

The author used the questionnaire and research techniques for the project in hand. Approach for these techniques will be discussed more elaborately in the following sessions.

2.1.1 Questionnaire

A questionnaire is a document containing a set of standard questions that can be sent to many individuals for the purpose of collecting information about the system [1]. In this case the questionnaire was used to collect data for the research in hand.

Questionnaire techniques has the following advantages:

- This is the best technique to collect data from a large group of people.
- The responses from different individuals can be tabulated and analyzed quickly.
- Respondents are given the freedom when to fill in and return the questions,

The technique has the following disadvantages

- The number of reply is not guaranteed
- Usually takes a long time to get the reply
- Some individuals might think that the questionnaire is tedious to fill in and therefore may not return.
- The questionnaire are inflexible and the information gathered might not reflect the real situation
- Good questionnaires are difficult to prepare.

2.1.1.1 Analysis of Questionnaire

Due to time constraint, the feedback from respondents has not been received. The addresses were collected from the Kuala Lumpur Stock Exchange Market [2]. This website was chosen as the resource for the addresses for four main reasons:

- The companies listed are big, therefore their need for intranet is greater, since the research is based on the impact of intranet in Malaysian organizations, the possibility of these companies having intranets are higher, therefore they will make ideal respondents
- Since these companies are highly reputable, the chances of getting feedback from them are predicted to be high.
- This site is a main source of "Malaysian" organizations.

Since people in large organizations are always busy, the author did not want to put off respondents by designing questions that needed them to write long comments. Answering questions were made as simple as possible, all that the respondents have to do is to tick the appropriate boxes and for some questions, spaces were provided to write extra comments. The language used was simple but professional. The questions and choices of answer were also made simple with the purpose of not burdening the respondents. The questions were prepared; it was passed to Mr.Mustaffa Kamal and Mr.Omar Zakaria for feedback. There was a need for certain revisions. Revisions were made and the final set of questions was produced. A brief discussion on the questions designed will follow on the next page.

2.1.1.2 Questionnaire Discussion

A copy of the questionnaire is attached in appendix.

Name of Organization :
Number of Employees :
Organization Product/Service :
Number of Computers :

The details above were asked as the author wanted to keep track of the characteristics of companies, which used and did not use intranet as well as the advantages and

disadvantages they faced. One of the benefits of questionnaire, is the identity of the respondents will not be known and this will encourage respondents to provide real facts [1]. In this case the author chose to ask respondents their organization name as it was important to keep track who is doing what in the Malaysian scene and this information will later be beneficial for further research and case studies.

1. Does your organization use intranet?

This question was asked to find out how many percent of respondents use intranet in their organizations and how many don't. This will give us an overview as to how popular intranets are in Malaysia. At the same time this question will divide the respondents into two categories. One category will continue with this form where they will be able to identify the impact of intranet in the organization and the next category will answer questions in form 2. Respondents from the later category will provide an overall picture as to why they didn't implement intranet. These respondents are equally important, as they probably have chosen not to implement intranet due to predicted negative impacts.

2. How has your organization benefited from the intranet?

This question gets right down to main objective of the research in hand: benefits that have resulted from the implementation of intranet. The choices are given below.

Enhanced knowledge sharing

One of the known strong points of intranet is knowledge sharing, intranet encourages information flow among employees. Information known to one employee can be transmitted to the whole organization in a matter of seconds via the intranet.

Improved data/document communication

Data or document don't need to be sent in paper forms, from one department to one department or from one person to another, they can always be electronically sent (e-mail) or published in the web, and the process of updating requires little time and employees are more aware of updates. This is different if data or documents traveled around the organization in printed forms. It takes ages to be distributed and at the same time revisions of data uses up a lot resource such as paper, toner and printer. Sometimes different employees have different copies of revised documents or data and this creates unnecessary confusion and loss of data integrity.

Better resource utilization

Resource utilization is increased due to intranets. Resources may be in the form of machineries, files, documents, software, and printers. Since organizations are large, these resources maybe hard to keep track of. By intranet usage, information on resources can be put on the web and everyone in the company will know what resource can be found where. Costs can be reduced as resource is fully utilized and unnecessary purchases will not arise.

Increased internal communication

Employees and departments can always communicate with one another through the intranet. Boundaries in the organization are removed, employees in the Engineering department can always access the human resource website to know what employees

benefit they are entitled to and employees don't have to go through tedious process of filling leave application forms and submitting it to their employers as they can always do it online. These are only very few examples of the many applications available.

Improved network security

Intranets run on private networks. There are firewalls, which protect intranets from outsiders. Firewalls allow employees to look out but prevent outsiders from looking in therefore the security is assured. There is no need for employees to access the Internet, as most information they need is already available on the intranet.

Increased organization speed

Electronically published data, increased resource utilization, better communication and collaboration. These are only some of the intranet factors that will ensure processes in the organization are always on the move on a large scale and at a very fast rate, increasing organization speed.

Principal training vehicle

Training can always be given on the intranet website, it might be a step-by-step guide in text form, or a videoconference at a website. The advantages of training through the intranet : Employees can always do it at their own pace in their own free time. They don't have to travel far or leave their duties to attend training. This will help to reduce cost and increase productivity of the organization.

New business opportunities

Intranets encourage collaboration among departments and branch offices located in different parts of the country or even different parts of the world. Business opportunities that cannot be handled by one branch office can be passed to another branch office which has the capability to perform therefore it is opening lines for new business opportunities, at the same time intranets can be also a source of information on competitors. Updates on competitor product and pricing can help organizations to be more productive and competitive. Another plus point of intranets is the increased speed of organization will result better quality products. Better quality products increases company image among consumers and clients. This will indeed invite new business opportunities.

Better collaboration among users

Virtual conferences, e-mail, discussion boards, all these elements increase communication. Communication encourages employees to work together; therefore it will play an important part in increasing collaboration and cooperation among employees. Departmental boundaries, hierarchal boundaries, geographical boundaries and social boundaries can be overcome and collaboration among employees from different backgrounds will be achieved. What more can be desired than this?

Standard client reduced maintenance and training

Intranets using web technologies are platform independent. All that is needed is a browser on the client's platform. This browser can also be a standard browser for the whole of the company. Since browsers are standard, there is no need to be given different kinds of training for different employees of different platforms This reduces cost of training and at the same time browsers don't need much maintenance unless there is a move to upgrade it to a higher version, even this can be done by employees with proper instructions through the web.

Minimal software investment

Intranets uses web technology therefore it doesn't need extensive software.

But not all companies have turned to intranet 100%, they still use platform dependent traditional computing, therefore they will not be able to see a rapid decrease in software investment.

Reduction in paperwork

As mentioned earlier, electronic publishing and updating, on-line processing of forms, plans, documents, files. All theses can reduce a considerable amount of paperwork There is no need to fill in forms, type and retype, as all this can be done automatically online which can be less tedious. Cost of paper can be reduced if not eliminated and at the same time, time taken to finish tasks is considerably reduced.

Integration of business processes

Intranets create a boundary-less organization. Departments don't form their own zones, intranets make it possible for integration of business processes all over the organization. An order made by the I.T department can be sent to the procurement department for purchase and at the same time the bill is sent to the finance department for payment. All these activities are done on-line, this is a basic example of business process integration, there are many other high-tech integration which are practiced by bigger organizations.

Support employee empowerment

Employees at lower level can be distributed with power. In business processes, quick decision making is vital .A branch officer in a remote area may need to make an important decision, all he needs to do is to mail his manager at the central management to get immediate approval. This is made possible by intranet. At the same time the branch officer might need some important information in order to make the decision. All he needs to do is, go through the resources of the intranet and get the vital data, which will support and justify his decision-making. Things can get difficult without an intranet. Files have to be located and gone through manually, this takes time and results in risk of losing business opportunities.

Support multiple data types(e.g. text , multimedia)

Manual files can only be in text form, but intranets in web forms can support images, audio, graphic video. This helps to express ideas in a more meaningful way and working will become more exciting for employees.

Integration with legacy systems

Intranet can be integrated with legacy systems; data from legacy systems can be accessed via intranet therefore there is no need for organizations to worry about functions of legacy systems being abandoned and rebuilding it into the intranet.

Standard access interface regardless source

The browser on the clients provides standard interface for all employees no matter the source of the data. Therefore, different employees will not be seeing different screens on their computers and create confusion.

Better competitive edge

Better speed, better decision making, better access to information and better communication will definitely increase competitive edge, the ability to compete with competitors and capture the consumer market.

3. How many percent of information employees need to do their job can be found on the organization's intranet?

This question is asked to justify whether organizations have really captured the essence of intranet, which is to make all data and information available electronically, and create a paperless organization. By knowing the percentage of information

placed on the intranet, a general idea on how much reliance the organization places on the intranet can be identified.

4. **Was there a positive return on investment (ROI) from the intranet?**

   This question is asked to know whether investments on intranet technology have really brought returns to the organization. Returns will take form as cost savings, increased productivity and increased competitive edge. If the return on investment is positive the benefits of intranet is achieved, if not, expenditure on technological cost has not been recovered and the true intranet benefit has not been gained.

5. **Did intranet help to improve the profit margin of organization's product/ service ?**

   This question is relevant to the question above; return on investments can also be in the form of increased profit margin on the product. If productivity increases, costs are saved and competitive edge increases then definitely the profit margin on the product will increase as the cost to produce will decrease and the number of products sold will increase.

6. **How much cost savings/reduction was the organization able to achieve with the implementation of intranet?**

   Cost savings can be savings in the form of:

   - paper, printing materials
   - manpower - intranets reduce time of tasks, moreover business processes are computerized therefore less employees are needed

- software - less need for investment on highly specialized software.
- Infrastructure - infrastructure cost for web based intranets are very minimum compared to infrastructures used for traditional platform based computing
- Transportation - the need to travel is less since intranets can bring the world together using the Internet technology
- Communication - fax, telephone costs can be reduced since communication is on-line.

7. As far as employee performance is concerned, did intranet help to:
The choices are given below

- **Shift power to lower levels**
- **Improve employees work productivity**
- **Improve employees relationship**
- **Improve decision making**
- **Have better clarification of employee role and response**

This question was asked to identify the impact of intranet on the employees. Comments were not given for each choice of answer, as it is only a repetition of what has been discussed in the above questions. Therefore a general overview is given. Better communication between employees, more empowerment of low level employees with the removal of geographical, departmental and social boundaries and better collaboration among employees thanks to the intranet, will result increase in productivity, improve relationship, improve decision making, shift power to lower level employees, and offer a better clarification of employee roles and response.

8. What are the intranet challenges faced in your organization?

This question was asked to identify the disadvantages and challenges faced by Malaysian organizations in dealing with intranets: The choices are discussed below

High cost
(infrastructure, maintenance, administration, upgrades and training)

Initial cost of setting up intranet might be low but as it grows costs will also grow. For some companies modifying their existing infrastructure to accommodate intranet will also be high, for example, the process of legacy systems made to work with intranets can be costly. Costs also will be in the form of maintenance, administration such as support staff, upgrades and training for intranet users.

Not all staffs have access to computers

The importance of intranet is the ability to connect all staffs, but some organizations don't provide computers for all staffs, so some staffs will be left out in the information distribution process. There are also cases of mobile employees who have no access to computers and they are not important enough to be provided with notebooks.

Network congestion

Increased users on the intranet will cause network congestion, the server has to accommodate many client requests and at the same time if the network bandwidth is not adequate then accessing information will be tediously slow and this will put off employees. Instead of increasing organizational speed it will only reduce it.

Low intranet usage

Intranet projects don't take off as expected as people don't remember or don't know. Initially the interest will be strong to explore but if intranet content is not updated or made interesting than on the long run employees don't really have the interest to log in to the intranet. This causes low usage. New introduction of intranet projects will be never known and the purpose of intranet will be defeated.

Employees waste time as some intranet applications are linked to leisure activities or non-essential tasks

In the process of making intranets more interesting certain leisure sites are created, these sites can sometimes be disadvantageous as employees prefer to spend more time at these sites rather than concentrating the task at hand, this causes lack of productivity and time wastage.

Intranet cuts across hierarchal boundaries and management lines-sometimes causes power conflict

Access to information is important in determining power. Since access to information is available to all, managers or departments who/which were originally responsible for certain aspects of information will feel their positions shaken and this leads to organizational conflict .

Increasing number of users and publishers

As users and publishers increase, they need to be managed such as setting up accounts and access rights. An administrator should also be in charge of monitoring the many contents in the intranet so that it doesn't go beyond company policies.

9. Is there a long-term commitment to intranet and its technologies?

This question is asked to find out whether the organization is really determined in improving their intranet and make full use of its benefits in the future or are they just taking it for granted.

The following questions are posed on organizations that didn't implement intranets.

10. Why didn't the organization choose to implement intranet?

By knowing reasons as to why organizations didn't choose to implement intranet, it is possible to identify impacts predicted beforehand.

Intranet can be very costly and ROI (return on investment) is not guaranteed

As mentioned earlier, existing infrastructure sometimes needs to be modified to accommodate intranet. This maybe in the form of upgrading network lines or connecting computers in remote areas to the network. Legacy systems have to be made to work with the intranet. Technology investment will be high but return is not guaranteed..

No support / sponsorship from senior management

Senior managers are really not convinced that intranet can be productive. They feel the cost of implementing intranet is high and the return on investment is still questionable Since they already have traditional computing systems, implementing intranet in the already existing infrastructure can be cost consuming, therefore they would prefer to continue investing their resources on existing systems.

Employees are resisting change

Employees feel the implementation of intranet will change the way they work. Some of them are afraid of technology and are more comfortable doing their work manually.

There are also managers who don't want to risk losing their powers, as the organization structure will gradually change with access of information on all levels.

No clear line of business benefit

Some organizations don't require the benefits of intranets. Distribution of information or increased communication is not critical to organization success.

Lack of financial capacity

Organizations can't afford to modify their existing infrastructure to accommodate intranet. They might have foreseen the expenditure of managing intranets on the long run and decided it is not within their affordability.

11. Are there plans to implement intranet in the future?

This question is asked to find out how many organizations are actually planning to make intranets part of their computer technology in the future. Do they have a positive outlook on the intranet?

12. Does your organization feel it has lost its competitive edge as a result of not implementing intranet?

This question will enlighten us with whether organizations view intranets as a method of increasing competitiveness. Have they lost to competitors due to the factor of not reaping intranet benefits?

2.1.2 Research

Research was done basing on books, Internet and industrial report. Materials were found on intranet definitions, trends, myths, benefits and challenges and the overall impact. In addition to this, reviews were also made on intranet sites. Case studies on organizations that have implemented intranets were also done to find out what individual organizations have reaped from intranets.

Development tools for SPOT I.T. were also studied in detail, comparisons and justifications are included in chapter 3, system analysis and requirement specification

2.2 Introduction to Intranet[28]

An intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and also use leased lines in the wide area network. Typically, an intranet includes connections through one or more gateway computers to the outside Internet. The main purpose of an intranet is to share company information and computing resources among employees. An intranet can also be used to facilitate working in groups and for teleconferences.

Intranet utilizes the infrastructure and protocols of the big nets of communication, like the Internet, to satisfy the needs of a group, company or an enterprise in improving it's internal communication. It uses the services and standards traditionally associated with Internet, for example WWW in browsing, publishing and processing of information pertaining for example to finance, services, human recourses or marketing etc.

Where the *Internet* connects people and organizations and information sources by using common protocols to link computers on a public and open-to-all basis, an *Intra*net uses the same common protocols for internal company or group purposes. Instead of adopting a common proprietary standard for its communications, information storage and

presentation etc, the company (or any group of people or companies) decides to use Internet standards and methods.

An intranet uses TCP/IP, Hypertext Transfer Control , and other Internet protocols and in general looks like a private version of the Internet. Transmission Control Protocol/ Internet Protocol (TCP/IP) is the basic communication language or protocol of the Internet.

TCP/IP is a two-layer program. The higher layer, Transmission Control Protocol, manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer that reassembles the packets into the original message. The lower layer, Internet Protocol, handles the address part of each packet so that it gets to the right destination. Each gateway computer on the network checks this address to see where to forward the message. Even though some packets from the same message are routed differently than others, they'll be reassembled at the destination. TCP/IP uses the client server model of communication in which a computer user (a client) requests and is provided a service (such as sending a Web page) by another computer (a server) in the network. TCP/IP communication is primarily point-to-point, meaning each communication is from one point (or host computer) in the network to another point or host computer. TCP/IP and the higher-level applications that use it are collectively said to be "stateless" because each client request is considered a new request unrelated to any previous one (unlike ordinary phone conversations that require a dedicated connection for the call duration). Being stateless frees network paths so that everyone can use them continuously. (Note that the TCP layer itself is not stateless as far as any one message is concerned. Its connection remains in place until all packets in a message have been received.)

Many Internet users are familiar with the even higher layer application protocols that use TCP/IP to get to the Internet. These include the World Wide Web's Hypertext Transfer Protocol (HTTP), the File Transfer Protocol (FTP), Telnet (Telnet) allows logon to

remote computers, and the Simple Mail Transfer Protocol (SMTP). These and other protocols are often packaged together with TCP/IP as a "suite."

Companies can send private messages through the public network, using the public network with special encryption and other security safeguards to connect one part of their intranet to another.

Typically, larger enterprises allow users within their intranet to access the public Internet through firewall servers that have the ability to screen messages in both directions so that company security is maintained. A firewall is a set of related programs, located at a network gateway server protects the resources of a private network from users from other networks Basically, a firewall, working closely with a router program, examines each network packet to determine whether to forward it toward its destination. A firewall also includes or works with a proxy server that makes network requests on behalf of workstation users. A firewall is often installed in a specially designated computer separate from the rest of the network so that no incoming request can get directly at private network resources.

There are a number of firewall screening methods. A simple one is to screen requests to make sure they come from acceptable (previously identified) domain name and Internet Protocol addresses. For mobile users, firewalls allow remote access in to the private network by the use of secure logon procedures and authentication certificates.

When part of an intranet is made accessible to customers, partners, suppliers, or others outside the company, that part becomes part of an extranet

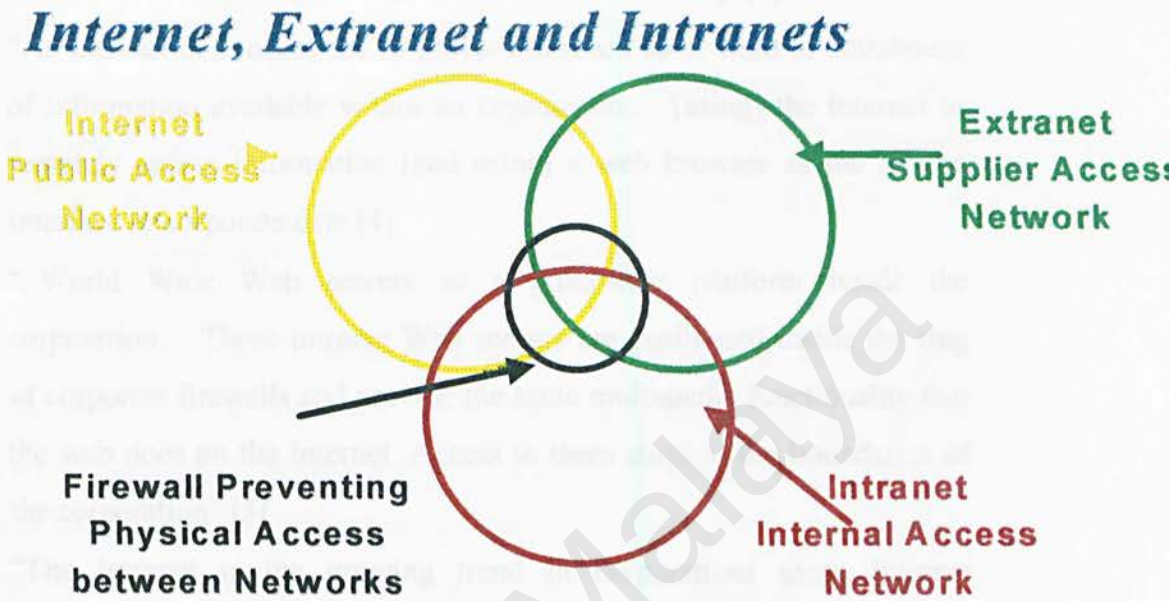


Figure1:Internet, Extranet and Intranets

2.3 Defining Intranets

- "Think of an intranet as an organization's virtual library"[3]
- "An intranet is a means for employees to reach some kind of storehouse of information available within an organization...[using] the internet to remotely access information [and using] a web browser as the human interface to corporate data.[4]
- "..World Wide Web servers as a groupware platform inside the corporation... These Intranet Web servers are positioned inside the ring of corporate firewalls and provide the same multimedia functionality that the web does on the Internet. Access to them stops at the boundaries of the corporation".[5]
- "The Intranet is the growing trend in corporations using Internet technologies to solve their internal communications and information needs."[6]
- Intranets are more than just internal Web sites. Unlike a corporation's public Web site that's usually used in a PR role, one's intranet sites are used, for example, to disseminate critical internal information, provide virtual meeting spaces, and allow workgroups to exchange ideas and information. As such, any intranet site must have good security and control systems.[7]
- "An internal network that uses Internet technology"[8]
- "...internal corporate networks built upon internet standards that provide dramatically improved communication and access to information.[9]
- Intranets are internal internets utilizing TCP/IP technology and the browsing software of the World Wide Web ...[to].. bundle information management and corporate communications within one, easily accessible interface of the web browser[10]

2.4 History of Intranets[30]

A search of the LEXIS/NEXIS Major Papers/Magazine Library identifies that the first articles using the term "intranet" began to appear in mid-1995 (Fox, 1997). According to SunWorld online, the earliest known printed reference to the term "intranet" was in April of 1995 (Shah, 1996). However, Hills (1997) attributes the original use of the term "intranet" to Amdahl who began using the expression in 1994 to describe internal use of Internet technologies.

Wodehouse (1997) provides a brief synopsis of the history of intranets, attributing most of its technological implementation to the success to its elder sibling the Internet. Many authors suggest that the mass (and rapidly increasing) interest of the World Wide Web, is in part due to corporate interest and the wide adoption by companies that have implemented web sites (Barberá 1996, McMurdo 1997, Pal 1997, Wodehouse 1997). A paper in SunWorld Online provides examples of companies experimenting with this technology internally to improve corporate communication and information dissemination (Esplin, 1997). The paper provides a review of both the development history for Sun Microsystems and Lockheed Martin and illustrates (in Sun's case) companies that developed tools for sale after developing them for their own internal means (Esplin, 1997)

2.5 Issues to consider when preparing to build an intranet: [29]

2.5.1Determining infrastructure requirements

When we talk about the network infrastructure, we mean a TCP/IP protocol suite running on a local area network or used as a gateway to the Internet as the intranet's logical infrastructure.

This physical infrastructure probably will be made up of a combination of token-ring networks, 10 megabit-per-second (Mbps) Ethernet, 100-Mbps Ethernet, FDDI and ATM networks, associated hubs and routers, and T-1 and T-3 lines linked directly to the Internet or to an Internet service provider. For most intranets, companies will need a minimum of a 100 Mbps network with T-1 (1.544 Mbps) and T-3 (45 Mbps speed) lines to the Internet

Infrastructure costs associated with building an intranet, is the expense of installing T-1 lines, buying and installing Web servers, desktop platform upgrades, the price of browser licenses on a per-seat basis, or the cost of associated HTML development tools .

In terms of how much physical bandwidth the company might need, the operative question is this: How does the company plan to use the intranet? Online transaction-processing systems require considerable bandwidth, but forms and text-based applications, such as displaying corporate policy manuals and telephone directories are not bandwidth hogs. Once a company adds video, audio, multimedia, or online job posting for interactive responses, they will need more bandwidth.

However, much existing bandwidth that a company has is essentially free, since the network is already installed and paid for, and a company will add applications that take advantage of this existing bandwidth. The additional cost would apply only when companies need to add significant network legs, upgrade to T-1 lines, add more network

segments, or upgrade the existing infrastructure from traditional 10-Mbps Ethernet to Fast Ethernet or FDDI.

"Probably the most important aspect of intranet development is that you need to consider upgrading your network infrastructure to support the intranet you are building," says Trent Waterhouse, Cabletron Systems Inc.'s program manager for LAN switching in Rochester, NH."In most large corporations, critical applications are still based on mainframe technology, and legacy mainframe environments require less bandwidth than the client/server Internet environment," he adds[11].

Network switching is a partial solution to increasing network bandwidth. Network switching dedicates bandwidth to every user on the network, which a shared-bandwidth network does not. When a company has new users or needs new ports, bandwidth is divided with the switch. It allows multiple, disparate networking technologies to be supported across the intranet in a way that shared-bandwidth networks, such as Ethernet, or even Fast Ethernet, simply cannot support.

2.5.2Determining Web server needs

The next step is to choose Web servers. Web server is the computer program (housed in a computer) that serves requested HTML pages or files. A Web client is the requesting program associated with the user. There are a wide variety of hardware servers that can be used ranging from Compaq PCs running Windows NT to high-end Unix- or proprietary-based servers.

On the software side other servers also are available, including public domain servers such as the Unix-based Apache, Windows NT server used in conjunction with Microsoft's Internet Information Server; Amiga Web Server; Netscape's Enterprise servers.

When selecting Web servers, consider the hardware and software platforms to be supported, the kind of performance required, and how much support is available from the vendor [11].

2.5.3Making a browser choice

The Web browser in the user's computer is a client that requests HTML files from Web servers Each desktop will need a browser; site licenses are available from the major vendors, enabling a gracious upgrade for the number of total users on the organizations intranet two years down the road. Netscape's Navigator and Communicator, Microsoft's Internet Explorer are some of the browsers available.

Not all browsers implement all elements of the HTTP protocol and HTML. The company will want to inquire about how the browsers implement graphics, support style sheets, and so on, when deciding what kind of content will be provided and how it will be displayed.

2.5.4How will the intranet be used?

Company executives, department heads, and staff will decide how the corporate intranet will be used. Part of the value an IS manager or systems administrator can add is to recommend to management which end-user intranet applications make sense today based on the functionality and technical aspects of the application and which ones will want to be expanded toward in the future.

What kind of content the company intends to put onto it is very important. Common uses of corporate intranets include numerous human resource applications (such as policy and benefit manuals, OSHA documentation, staff directories, and online job postings), collaborative computing applications, multimedia, as well as applications linked to sales and marketing applications (like success stories), engineering and design departments, and customer service, among many others.

2.5.5Determining the application development software needed

After selecting servers and browsers and decide what types of applications the company plans to run, there is a need to consider Web server interface tools. Some of these tools include:

- An HTML (Hypertext Markup Language) editor for marking up and coding information to be published on the intranet
- Common Gateway Interface (CGI) scripting tools for forms handling and image maps; GIF (graphics image file), JPEG (Joint Photographic Experts Group), and MPEG (Motion Picture Experts Group) file format tools
- For resource-intensive database applications, especially online transaction processing (OLTP), such as job-posting applications, there will need message-passing architectures that enable Web pages to incorporate interfaces to databases and other applications. There will also be a need for SQL tools. In addition, there may also be a need for Java for Java-enabled applications.
- If the company opts for an NT-based approach, it can select application development tools such as Microsoft's Front Page; Adobe's Page Mill, Hot Metal, and Hotdog; as well as HTML text editors and file format converters, e.g., Internet Assistant for Microsoft Word 6.0 and RTF to HTML tools. Unix-based tools with similar functions also are available.

Many HTML authoring tools use, or are part of, a text editor that can be used to write HTML code. In fact, HTML editors are *not* a requirement and often are an added and unnecessary expense.

2.5.6Weeding through the pros and cons for firewall

When it comes to protecting the intranet from the outside world, attention turns to firewall. Security is such a significant issue, it is divided into two sections: determining the type of firewall needed and how to build it. Not every intranet is vulnerable -- only those with Internet connections. However, most companies that have internal networks

use the same infrastructure for both the internal network and the link to the outside world.

The firewall the company selects is the key element by which all users will gain or be denied access to information on intranet. Though the primary purpose of the firewall is to block the public from accessing the intranet, the firewall may also be used as a one-way service for employees to go from the intranet directly to the Internet.

Two types of firewall design are commonly used: network level and application level. The firewall functions as a traffic router sitting between the Internet and the intranet. When routing is implemented at the IP level (the Internet Protocol level), the firewall is known as a network-level firewall. This network-level firewall functions like a simple router in that it directs packets without necessarily knowing where they came from. The key disadvantage of network-level firewalls is that they are essentially traffic routers and require a good IP address block to ensure security.

On the other hand, application-level firewalls that run proxy servers can be used for traffic auditing and traffic logging tasks. These offer far greater security because they control access much better. Their key disadvantage is that they are neither as fast nor as transparent to users as network-level firewalls.

2.6 Key Intranet Questions [13]

Key intranet questions to decide whether to build an intranet

- *Are employees familiar with Internet and has organization invested in Internet technology?*
- *Are employees located in multiple sites, and is there a need for information exchange?*
- *Are there business processes involving info sharing between team members in multiple locations?*
- *Complex systems needing extensive cross-functional communication?*
- *Is access to frequently updated information critical to organization's success?*
- *Do most employees have access to a PC?*
- *Will there be cost savings through electronic updating & publishing?*
- *Is there a long-term commitment to intranet and its technologies?*
- *What are the technology costs and the return on investment?*

Technology cost includes the cost of hardware (web server, network adapter and related hardware), software (server operating system, add-on software, utilities) & labor (setup & maintenance). It also includes long term costs such as server and network upgrades to handle traffic, management tools and manpower required, software licenses and upgrade fees, information publishing and archiving costs. [14]

- *Is it manageable[33]*

  An intranet is one of those things which is east to start and can be a management nightmare as it grows. There is a need to be prepared to spend a lot of resources for the management of the intranet if the growth is not planned well in advance. Some of the things to be prepared for are increased traffic and an increasing number of publishers and users. Web and network management tools should be used to reduce the amount of manual work involved. To add new users, online forms that will automatically setup the required accounts should be provided [14]

- *How will it affect productivity?*

  If done right, an intranet can enhance productivity to a great extent. A lot depends on the type of system the intranet is replacing. If an intranet solution is replacing a traditional paper based information access methodology (ex. printed manuals) the improvement in productivity will be tremendous. On the other hand, if it is introducing a completely new process the productivity will not be able to be measured in an accurate manner.[14]

- *Will Intranet change current processes?*

- *What training will be needed for the employees?*

  Intranet applications need employees to be trained for more efficient usage.

- *How secure is it?*

The intranet will be as secure as its weakest link, which is usually the people managing and using the intranet. If the company does it by the book and use a secure server, firewall, password protected access and physical security for the server machines, all the bases are covered. Also have a policy in place to check for creeping links to unsecured locations, backdoors from the Internet to the intranet, proper use of passwords and other security mechanisms provided by the intranet setup.

- *How much time will it take to start one? [36]*

Not much if done right. Unlike most other IT ventures, an intranet can be setup real fast. All that is needed to get started is an existing network (preferable TCP/IP based) and a spare machine, which can act as web server. Once a web server package is installed on this machine and browsers are installed in client machines, and clients are connected to the server we are on our way. Intranets usually grow and improve with time. The initial phase does not take up a lot of time or a huge financial commitment.

- *What are competitors doing with the Intranet?*

How are they increasing their competitive edge?

2.7 Some Intranet MYTHS[14]

1. Intranets are for BIG organizations

Not really. Even if the company has a handful of employees, intranet can be used to its advantage. The success of an intranet depends on the cost savings and increase in productivity. Also smaller companies may find it easier to cut through all the hype and use intranet technology right away.

2. Just another buzzword

Intranets are here to stay. We will see different variations of intranet technology over time and we will also see this technology evolve but its definitely here

3. Intranets are an IS "thing"

Leave the control in the hands of the chosen few from the IS support group and this maybe restricting its growth. Do not make it a free-for-all publishing method either. Let IS setup and manage the content publishers but also allow the publishers to use their own judgment and creativity to come up with content.

4. Intranets are internal webs

An intranet is not limited to a web site. The technology is adapted from the Internet and the Internet is a lot more than web sites. Simple technology like enterprise-wide email, push technology, newsgroups, chat etc. that are all based on TCP/IP protocols can be used within the intranet.

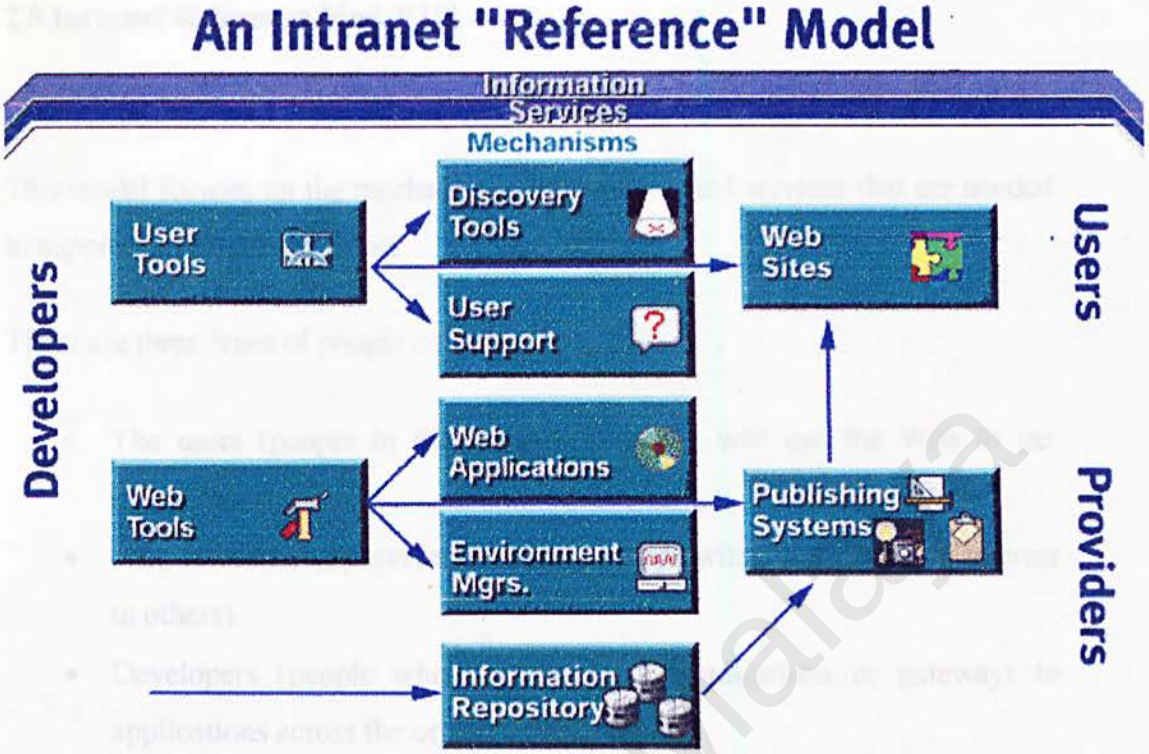


Figure 2:Intranet Reference Model

2.8 Intranet Reference Model[15]

This model focuses on the mechanisms, information and services that are needed to support large-scale Web use.

There are three types of people considered

- The users (people in the organization who will use the Web to get information)
- The information providers (internal groups with information of interest to others)
- Developers (people who develop tools, applications or gateways to applications across the organization).

Each of these classes of people has different needs. To meet the needs of these three groups nine specific types of mechanisms are identified:

1. User tools
2. Discovery tools
3. Support systems
4. Web toolbox for developers and publishers
5. Web applications (or gateways to existing applications)
6. Environment managers
7. Shared or reference pages
8. Publishing systems
9. Information repositories

2.8.1 User tools

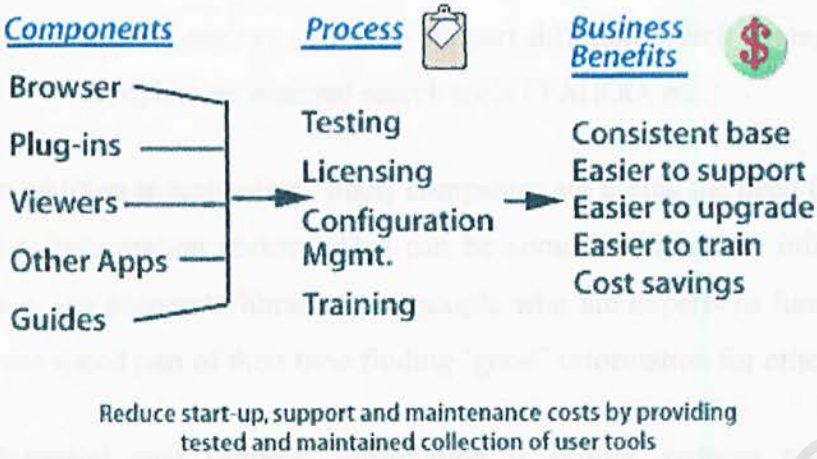


Figure 3:User Tools

2.8.2 Discovery tools

Problem: As the intranet grows finding information will become the biggest challenge users have. There could be hundreds of internal servers, and thousands of interesting external servers. How do people find information? How do they know what is available and avoid Web thrashing? There is no **one** answer or approach to this problem. Rather, there will be a need to develop several approaches. Some of these might include:

- Page navigation aids -Consistent tools to help people travel through Web-space
- Navigation metaphors -Desktops, newspapers -- whatever audience feels comfortable with
- Index of internal servers -Similar to Alta Vista(and they offer tools you can use internally, as do other vendors), using spiders to periodically gather index information from known servers, and provide users search tools that work with that data.
- Announcement directories -One or more directories to store and retrieve information about shared Web resources (name, URL, keywords, description). It could be a simple file or something more elaborate.

Similar in concept to Yahoo, where it receives and stores announcements for later retrieval by others.

- Search engines -Tools to support different search strategies. These tools complement external search tools (YAHOO, etc.)

In addition to technology, many companies are seeing the need for a new expert - the "information seeker." This can be someone trained in information science (e.g. the corporate librarian), or people who are experts in functional areas and who spend part of their time finding "good" information for others.

Potential cost savings: information is visible; reduces time searching for information; reusable software components.

2.8.3 User Support

Problem: As the intranet becomes more integral with the work of the corporation effective support will become a critical requirement. As with all distributed systems it is not always obvious where the cause of the problem resides. And as with all large-scale environments cost will be a concern that must be addressed. User Toolkits can reduce the cost of support if done well. Much of the support tools can be provided on the intranet-- online FAQs, access to problem reporting systems, help pages. We can also use the Web as a base for training and help tools where users help and learn from each other. Some support will have to be provided through documentation (a "How to Get Started on the Web" Guide might be one useful document), and many companies find that training on use of the intranet is very useful.

2.8.4 Web Applications

Identify applications needed, where there will be done, how they will be staged. Some companies have plans in place to create or purchase specific applications, with the goal of eventually moving all shared applications to the Web.

Some of the types of applications are:

Sales and Marketing

- product info
- customer info
- war stories
- leads
- competitive information
- online training
- presentations
- customer database access
- Newsgroups - feedback, what works, issues

Product Development

- Product specs
- Schedules
- Team assignments
- customer issues
- competitive info
- Project Information
- Software Libraries

Customer Sales/Service

- Sales Support Centers
- Product Information
- Product Support Databases
- Problem status
- Customer concerns
- News flashes
- Online Training

HR

- Benefits updates
- Employee and Group Information
- Policies and Procedures
- Job postings
- Phone directories
- Employee Infobases
- Maps
- Medical referrals

General Applications

- Access to Data Warehouse
- Newswire Clippings
- Conference Room Reservations
- Libraries
- Subscription Services
- Historical Information
- Technology Centers
- Competitive Analysis
- Strategies
- Financial-Management Query
- Corporate Newsletters
- Knowledge Preservation
- Official Travel Guide
- Existing Catalogs
- Employee Property Management

□ Engineering Groups and Information	□ Lookup of personal info	□ Literature Ordering
□ Sharing Design Drawings	□ Training and Registration	□ Stock Quote
		□ Performance Tracking
		□ Surveillance
		□ Application Front-end
		□ Whiteboard
		□ Conferencing
		□ Events diary
		□ Art Libraries
		□ Indexing Engines
		□ Information Catalogs

Table 2: Intranet Applications

2.8.5 Environment Managers

Problem: An intranet is a distributed environment, and has many of the problems we have seen in the past with distributed systems. It may become difficult to know how the overall system is performing, or to isolate problem areas. It is also important to be able to plan for growth, making sure the networks and systems are in place when needed (or as soon after as possible). Environment Managers are the tools that help us manage a distributed, changing environment. These include tools that do link validation, user administration, document control, statistics tracking and reporting, version control, HTML validation, site viewers, and other security tools.

2.8.6 Information Repositary

Problem: How do we keep the core business information current? How can users be confident the information being used is the right information (most timely, accurate, valid)? To be widely used by non-technical people the Web will need to eventually

provide access to "corporate data". The Web Information Repository is a collection of shared information used by the enterprise (e.g. on the external Web server) as well as internally. It will need to include security, levels of access, distribution mechanisms. How we source this will depend on where our information resides. Connections to existing information are the best strategy. Archive tools may need to support extensions, different security levels, multiple feeds, filtering and be able to support daily updates.
Cost savings: Reduced cost of information sourcing. Other benefits: improved information quality, improved ability to manage information.

Costs: development/testing/production costs.

2.8.7 Publishing Systems

Problem: How can we make it easy to create new Web information sites? How can we best share tools, icons and experiences? How do we publish "standards"? Publishing tools are configured, tested, packaged collections of tools that are used by the business to create and maintain information. Having a solid base to use helps these groups get online quickly, and allows us to focus our training, documentation and support on a narrower set of options. We will need to monitor changes in the tools, as this is one of the most active areas of development, with better tools coming online all the time. Unfortunately the base standards are also constantly changing--another reason someone should watch the trends and we need to insulate users as much as possible. Some of the tools that will be in the system include:

HTML editors
converters
HTML templates
Links to the Web repository
search mechanisms
Feedback forms

Navigation Aids (graphics, HTML code)

Java applets

One of our goals should be to not force users to learn and use new tools, but give them tools that work with what they already have whenever possible. For large projects consider tools to convert commonly used documents for large-scale use. In addition to tools, we can also provide process and information aids to the business users--a nice way to share learning between groups. Examples of this can include process descriptions ("this is the way we create we sites....", taxonomies (what types of information the users should consider for their site), design guidelines and examples of good and bad design. Behind this the company will need a policy on who can publish information.

2.8.8 Web Sites

Problem: There is an overwhelming amount of places to go on the Web. How do people get started? How do they keep up with constant changes to information?

To a lesser or greater extent, depending upon the corporate commitment to the intranet, the development of web sites is one of the overarching goals of our work. At many high technology companies (e.g. Sun, Digital) where the intranet is a key component of their intranet strategy, there are thousand of internal web sites, and many external

Developing these pages involves a combination of the tools we discuss as part of the Model. Publishing tools help us create content and create the actual pages, Discovery tools help people find the site and the information it contains, the Repository may provide some of the information we use, and the User Tools influence the technologies we can use on our site (ActiveX, Java, etc.). In addition to technology we need education programs to teach business groups about the value and purpose of the intranet, and we need to work with local developers on good design practices. In addition to the many diverse web sites many companies have a central internal home site. This is a set of web pages with classes of information of most interest across the enterprise, with a consistent

set of navigation tools. This provides a consistent starting place for users, and (if done right) provides navigation to relevant internal, and possibly external, resources available. This simplifies using the Web for non-technical people. Because it is already there and neatly categorized they can quickly see what is available. It can also be used as a communication vehicle to employees. Well-done internal home sites do require an investment in design, maintenance and ongoing information discovery, but this work can be leveraged across the larger user base, and can greatly reduce the overall cost of the intranet. The development team needs to monitor usage to see what is of most interest, or what is not being accessed, and as with all web sites, will need to continually refine the site to improve navigation and support new information.

Potential cost savings: reduced page creation and maintenance costs across the enterprise. Pages can be reused and referenced in other enterprise servers.

Costs: Someone (an *information finder* needs to do this on a regular basis).

2.8.9 Web Tools

Problem: How do technical people learn what is available? How can they share experiences and tools? How do we help developers get started? The Web Toolbox is a collection place for descriptions, reviews and links to anything that makes creating or using the Web easier. It can also be used as a library for development tools. These tools are constantly being improved, and an argument can be made that there is a need for technology trackers in many companies, especially where there is a strong emphasis on web development. As new tools are tested and reviewed these notes can be included in the Toolbox, and tools that are "approved" can also be included there. This could include licensing and purchasing tools for wide use--which can significantly reduce overall software costs.

Some of the types of tools that could be in the Toolbox include:

Adobe Acrobat	Indexing tools
Announcements	Information Retrieval Tools
Authoring Tools	Messengers
Browsers	Real Audio
Converters	Robots
Data Base Access	Searching tools
Diagnostic Tools	Security
Editors	Scripts
Filters	Sound Players
Firewall	Video players
Forms	Spiders
Gateways	Tracking tools
Graphics Tips	Verifiers
Icon libraries	Viewers
Image maps	VRML
News sources	Other toolboxes
Shockwave	Java Applets

Table 3: Types of Tools

2.9 Intranet Benefits & Challenges

2.9.1 Intranets benefits:

- *Disseminate information cost-effectively [32]*

  Even the simplest example of a static web page that provided generic "brochure ware" information (such as library opening times, services available, staff lists) could be altered, updated and disseminated far faster than a print based version of the same information. This was both noted in the literature (Cameron 1996, McGrath & Schneider 1997).[38] Web technology can help us achieve cost effectiveness by: drastic reduction in cost of office supplies, printing, and copying and also drastic reduction in the amount of file and shelf space required.

- *Intranet improves data/document communication.*

  Data /document are available on-line and can also be distributed throughout the organization as attachments in e-mails.

- *Encourage knowledge sharing*

  Increasingly, corporations are recognising that there is a wealth of information and knowledge (often unnoticed and consequently untapped) possessed by their staff (Walker, 1996). Some writers argue that intranets increase collaborative work online thus encouraging knowledge sharing between departments and staff (Internet & Intranet 1997, Nanfito 1996). Others suggest that intranet based discussion groups can supplement project meetings and encourage new ideas to flow unhindered between different staff and business units (Cameron 1996, Bater 1997). Cameron (1996) provides an illustrative example based on the intranet at Silicon Graphics, Inc. where the manufacturing department have access to call records from customer service. Cameron (1996) suggests that because of the intranet, manufacturing is better equipped to monitor the components that are in need of better quality control

- *Platform independence*:

  There are browsers on every major platform developers no longer need to worry about cross-platform client development. Intranets will work across a number of platforms. Pages can be viewed by browsers on UNIX boxes, Macs, Windows and a number of other platforms

- *Intranets don't require an Internet connection*

  Intranet can be up and running by itself without and connection to the outside world. Technologies prevailing on the Internet like web servers, browsers, chat scripts, news and mail servers etc. will still be used but there is no need to be connected to the Internet unless intranet users need to access content from the Internet.

- *Delivering Information Where Its Needed*

  Companies are now delivering information to a wide variety of locations. Mazda North America gets information down to the repair shop floor, where mechanics access details about a car by its VIN. 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.

- *Assist business process re-engineering*

  Increase in enterprise functionality and reliability, for example-enabling electronic commerce.

- *Be a principal training vehicle*

  Training can be conducted through the intranet using multimedia tools, it cheaper and employees can go through the training materials in their free time at their own pace.

- *Improved organisational image*

  Increased speed of organization, better quality of product and better employee performance will increase competitive edge. Therefore organization's reputation will increase among consumers, clients, competitors and society at large.

- *Improved profit margin on product/service*

  Operating cost, through the reduction of technological cost and labor cost will decrease. Increase in product quality through better employee performance and customer service will increase sales. Both of these will increase profit margin on product.

- *Support employee empowerment*

  Intranets typically cut across all hierarchical boundaries and management lines within an organization. It shifts power to lower work levels This improves the process of decision making.

- *Increase employee performance[42]*
  - Employees feel engaged and valued, with their views and opinions being considered through interactive intranet.
  - Better clarification of employee's role & response, collaboration will help to distribute responsibilities among employees.
  - Improved decision-making- employees are able to access information and superiors with speed, at the same time experts of different fields are able to collaborate, this will result in better decisions.
  - Improved employee's relationship due to more collaboration and communication.
  - Increase employee's work productivity- less manual work to perform since most tasks are computerized. Since quantity is reduced , quality can be stressed. Work productivity will also increase due to better access to information.

- *Integrate corporate information*

  There is interoperability between platforms to expedite workflow. Integrated applications, data, multimedia and e-mail for information sharing and also integrated databases, data marts, data warehouses and legacy systems for access to corporate data worldwide, therefore corporate information can be integrated

- *Improved productivity through quicker access to info resources. [32][34][38]*

  If an intranet solution is replacing a traditional paper based information access methodology (ex.printed manuals) the improvement in productivity will be tremendous. 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 lull times, rather than be interrupted during key projects

- *Better control of redundant or out-dated information through single-point storage and access.*

  Integrated and uniformly updated support at the server side.

- *Intranets are easy to set up.*

  Web servers are fairly easy to set up, and companies are finding the web an easy way to distribute information Elimination of complex operating system is achieved with browser integration at the desktop

- *New Business Opportunities*

  As companies do a better job of capturing and sharing information, some are finding new opportunities. CKS, which focuses on capturing knowledge from its 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.

- *More Support for Collaboration*

  More webs are helping people work with each other, not just inside corporations but also with other business partners. 3Com has its 3Community site, and the U.S. Navy and Boeing have a system called GOSNET that helps them share information. Oncology Research Center, 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, true collaboration is difficult because it often directly challenges existing management structures, as the best collaborative environments have little formal structure. Intranet encourages corporate culture of shared knowledge and collaborative workers, resulting in productivity improvements.

- *Integration into All Business Processes*

  Intranet value is best created by deep integration with the entire business process.

- *Multiple data types*:

  Developers can easily provide access to multimedia as well as textual information compared to file usage where information is only presented through text.

- *Better resource utilization*

  Resources like information, machineries, and office items can be kept track of and at the same time resource sharing among employees is encouraged

- Improved network security[35]

  Intranets run on private networks. There are firewalls, which protect intranets from outsiders. Firewalls allow employees to look out but prevent outsiders from looking in therefore the security is assured. There is no need for employees to access the Internet as most information they need is already available on the intranet.

  Password authentication, IP blocking physical security for the server machines, policy in place to check for creeping links to unsecured locations, backdoors from the internet to intranet, and other techniques are available to secure intranet from intruders.

- *Increased organization speed*

  Availability of fresh information, increased resource utilization, better communication and collaboration among employees, departments and branch offices, better decision making. All these factors will ensure processes in the

organization are always on the move on a fast rate therefore increasing organization speed.

- *Standard client reduces maintenance and training*

  Intranets based on web technologies are platform independent. Browsers used are standard therefore training given to all employees is also standard. This reduces cost of training and employees can teach on another on intranet usage. Browsers don't need much maintenance and training takes very little time since the GUI(graphical user interface) web interface is easily mastered

- *Minimal software investment*
  Intranets using web technology don't need extensive software, therefore software investment can be reduced. There is only need for some limited user tools such as browser and multimedia based programs which is already discussed in section 2.8.1.

- *Reduction in paperwork*
  Electronic publishing and updating and on-line processing reduces a considerable amount of paperwork

- *Integration with legacy systems*

  Intranet can be integrated with legacy systems; functions of legacy systems need not be abandoned and rebuilt into the intranet as they can be integrated.

- *Standard access interface regardless source*

The browser on the clients provides standard interface for all employees no matter the source of the data. Therefore, different employees will not be seeing different screens on their computers and create confusion

- *Better competitive edge*

Better speed, better decision making, better access to information and better communication and collaboration will lead to better competitive edge

- *Increases return on investment by saving costs*
    - The starting justification for many intranets is the decreased cost of producing, accessing and distributing information within an enterprise. Documents that are printed and mailed, such as internal phone books, policy and training manuals, requisition forms and marketing materials, can be put on an internal web server and updated for a fraction of the cost of reprinting material. It is not only the publishing but also the updating of information that leads to savings.
    - Intranets also allow information to be rapidly and economically deployed to a dispersed group of employees. Fast access to information is another key intranet cost saving. If an intranet means that every employee in an 50,000 person corporation saves 10 minutes per day, the cumulative cost saving is enormous - much greater than the savings from reduced printing and mailing costs.
    - 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.

2.9.2 Intranet Challenges & Disadvantages

- *Integrate data from diverse sources*

  The information repository in the organization must be able to connect to all available servers located in the organization, whether central or branch offices. Only then access to all information is guaranteed. This can be expensive as infrastructures may need to be newly installed or upgraded.

- *Provide Access to data by all stakeholder in company's value chain*

  Every person who is important to the company, whether as provider or receiver of information should have access to the intranet.

- *Present information in the format appropriate for each stakeholders*

  Different stakeholders will have to be allowed different level of access to information. The browsers for different stakeholders may support data differently. Therefore personalization is important in an intranet

- *Guarantee Performance, Availability, Serviceability, and Security*

  Since intranet offers boundless benefits, it is relied upon heavily. Therefore if the intranet fails to guarantee performance, serviceability, availability and ensure high standards of security, it will affect the organization in a very large scale.

- *Latest technology is not supported by all browsers*

  Intranets will work across a number of platforms. Pages can be viewed by browsers on UNIX boxes, Macs, Windows and a number of other platforms. But once advanced applications and latest technologies (Java, ActiveX etc.) are used there will be a need to fine tune applications to support a "certain" type of browsers.

- *Intranets require a lot of maintenance[40]*

  Intranet can grow real fast. Without a good plan and growth strategy in place, we have to prepare to spend a lot of time on small, routine maintenance tasks. Adding new publishers, adding users, maintaining the user database, keeping the content and technology current, coping with growing demand for bandwidth, applications and information. These are just a few issues to deal with. There will also be a need for a good set of policies. The bigger the web becomes, the more to maintain.

- *Intranets are expensive*

  The initial costs in setting up an intranet might seem low. Find a spare PC lying around, add some memory and disk space, install as web server software, network card and there it is. This might be a bit misleading. If the intranet is expected to grow, costs grow with growth. There will be a need for one or more of the following

  a. A faster web server

  b. Increased disk space and memory

  c. Better applications like database connectivity, interactive forums, multimedia support

  d. Increased bandwidth

  e. Support staff for managing your intranet

- *Low usage of intranet*

  A lot of intranet projects don't take off as expected. Sometimes for a simple reason. People don't know or don't remember. A lot of promotional techniques have to be used not only to get people to visit the intranet, but for them to keep coming back.

  a. Request the help of marketing department and use their expertise.

  b. Promote intranet through management. Have them mention it at all meetings and with all correspondence.

  c. Hold an "intranet day". Give away prizes. Make a huge banner with your URL.

  d. Update content regularly with useful information. Add local news, weather, press release etc.

- *How does it fit into existing systems? [33]*

  Legacy systems will have to be tweaked to work with intranet solution. Ways to move data between legacy systems and the intranet must be figured out.

- *Intranet is a productivity trap*

  Intranet waste of employee time, in particular when applications are linked to leisure activities or other non-essential tasks.

- *Not everyone within an organization has access to a computer on a regular basis*

  Since not everyone has a computer, two groups will form. One will be the informed group and the other will be the uninformed group. Therefore the objective of intranet being the information-distributing vehicle will not be achieved.

- *Intranet sometimes causes power conflict*

  Many departmental managers may have controlled effective fiefdoms and regarded information as power. This type of manager can get upset when that power is

knocked once their employees can get the same information from their desktops. Afflicted managers can then resent the intranet and be reluctant to allow all members of their department to have full access. This is a management situation, which has to be handled delicately. Somehow the manager has to realise that distribution of information is the true power, not retention.

- Network congestion

Increased users on the intranet will cause network congestion, the server has to accommodate all client requests and at the same time if the network bandwidth is not adequate then accessing information will be tediously slow and this will put off employees. Instead of increasing organizational speed it will only reduce it.

- Increasing number of users and publishers

As users and publishers increase, they need to be managed such as setting up accounts and access rights. If possible, these processes should be automated to reduce burden of the administrator. An administrator should also be in charge of monitoring the many contents in the intranet so that it doesn't go beyond company policies.

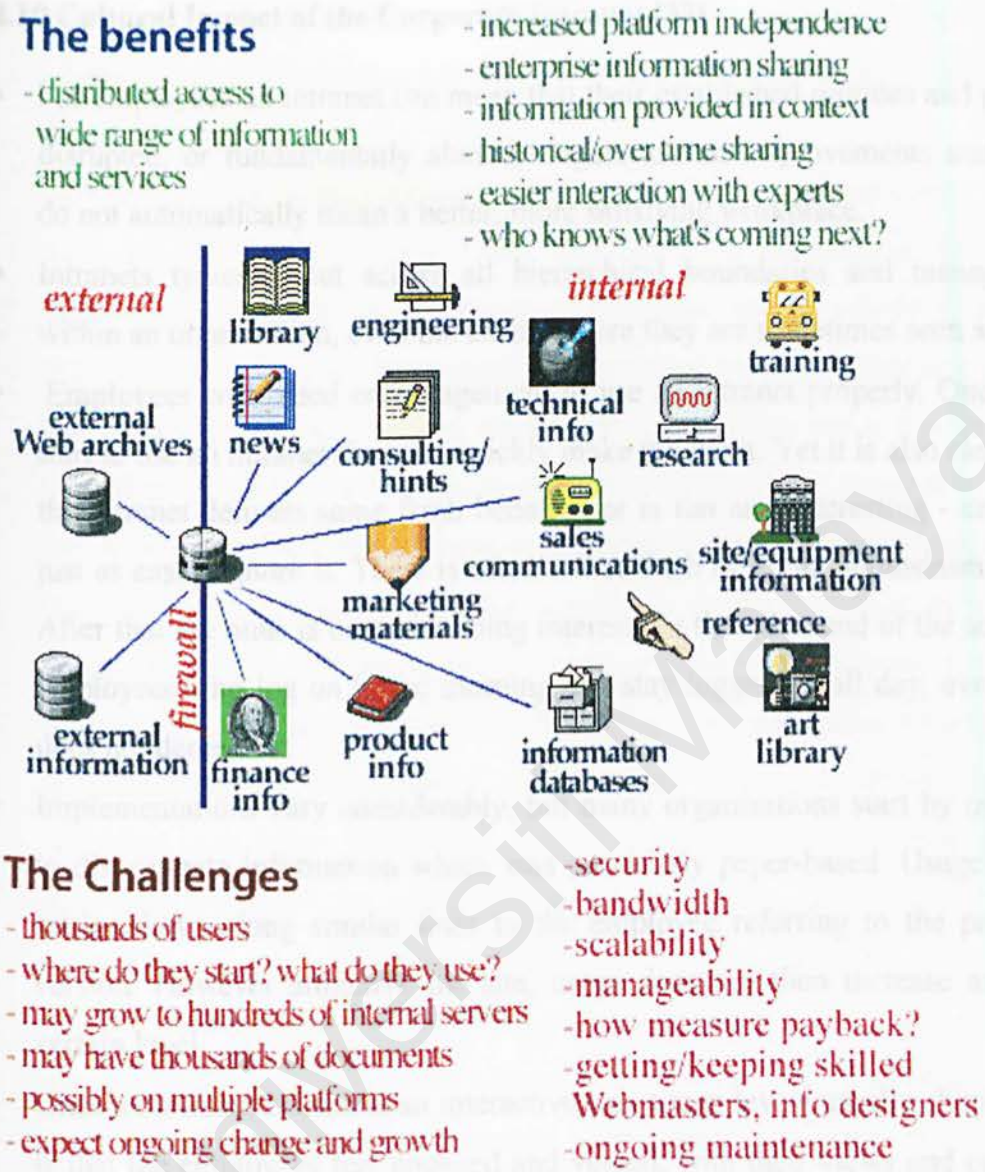


Figure 4: The Benefits and Challenges of Intranet[40]

2.10 Cultural Impact of the Corporate Intranet [37]

- For employees an intranet can mean that their established routines and processes are disrupted, or fundamentally altered. Organisational improvements and efficiencies do not automatically mean a better, more satisfying workplace.
- Intranets typically cut across all hierarchical boundaries and management lines within an organisation, even the extent where they are sometimes seen as anarchical.
- Employees will need encouragement to use an intranet properly. Once employees start to use an intranet they can quickly make it a habit. Yet it is also clear that unless the intranet delivers some fresh benefit - or is fun and interesting - employees can just as easily ignore it. There is often a first flush of initial enthusiasm and novelty. After that the onus is on maintaining interest. At the other end of the scale are some employees who log on in the morning and stay logged on all day, even if their job does not demand it.
- Implementations vary considerably, but many organisations start by using intranets to disseminate information which was previously paper-based. Usage then usually settles down along similar lines to the employee referring to the previous paper version. However attractive the site, usage does not then increase much above a certain level.
- Once an intranet is used in an interactive way usage levels usually shoot up. The key is that the employees feel engaged and valued, with their views and opinions being considered. Some organisations which encourage individual employees to create their own pages have reported high and sustained usage levels.
- Sometimes senior managers regard the intranet as a waste of employee time and a productivity trap, in particular when applications are linked to leisure activities or other non-essential tasks. Yet the consensus is that the more employees use the intranet for those tasks, within reason, the more they will also use it for their core functions. This makes it an integral part of their daily routine.

- The whole point of an intranet is that information can be updated rapidly. If the intranet is to be accessed regularly, it must present fresh information every time an employee logs on.
- One problem can be the fact that not everyone within an organisation has access to a computer on a regular basis. Many employees do not have a desk either. One solution can be the kiosk, located in a communal area, available to all employees who pass by. Unless the information disseminated by the intranet is available to all, two camps can quickly emerge, namely the information haves and have-nots. This kind of situation is clearly divisive and unsatisfactory. It is important to make sure that, somehow, all employees have equal power to access intranet resources.
- One effect of intranets has been that employees demand information to be available almost instantly. While previously it was acceptable for announcements to take a day or two, or even longer, to filter down through management, once an intranet has been up and running for a few months it is quite common for employees to anticipate a negligible time delay. The answer to this is for intranet management to ensure that all updates are posted the instant they appear, so that the information is disseminated promptly.
- Another possible downside is that many departmental managers may have controlled effective fiefdoms and regarded information as power. This type of manager can get upset when that power is knocked once their employees can get the same information from their desktops. Afflicted managers can then resent the intranet and be reluctant to allow all members of their department to have full access. This is a management situation which has to be handled delicately. Somehow the manager has to realise that distribution of information is the true power, not retention.
- Sometimes departments can feel stronger after intranet implementation, because they have greater control over the content. Conversely, others who previously perceived themselves as core to the organisation, can feel put out. There is no doubt that an unexpected side effect of an intranet can be an exposure of internal rivalries, territorialism and distrust. Information which was previously jealously guarded by

one department can now be available to all, upsetting the balance of power. All these possibilities need to be foreseen if possible and carefully managed to avoid disruption to operations.

2.11 Practical Tips for Creating High-Impact Web Content[39]

- ***Present instructional content in small chunks or "sound bites"***
  Information can be easily digested and remembered. Web documents should contain "layers of information" with lots of leading keywords and headings.
- ***Meet the needs of multiple audiences.***
  People with all types of background will be visiting the web site. The design of the documents should give the reader navigational choices - technicians can access details; managers may only need the high-level view. Complex graphics can be selectively viewed
- ***Web documents should promote two-way, interactive communication*** between the author and reader so that readers can quickly give their feedback. With procedures, it is critical for the user to be able to tell the author an instruction is incorrect, missing a step, or hard to follow. Techniques for doing this include automatic E-mail feedback or survey/questionnaire attachments for collecting data and validating instructions.
- **Build in "hot" links and cross-references to related information.** Procedures should have cross-references to related policies and supplementary information that may provide pre-requisite knowledge the reader should have in order to perform the job. Setting standards for links and content organization is critical.
- **Provide media options** to meet the multiple learning and comprehension needs of a vast audience. Intranet technology provides the ability to document work using multi-media video clips, graphics, photos, flow diagrams, charts, and other objects to supplement text..

- **Do not force the reader to scroll through the entire document.** Documents should be dynamic, providing navigational buttons to jump to topics. Complex process documents should provide "drill down" navigation so that the reader can selectively access detail information. Avoid two-column formats in which readers have to scroll down and then back up to get to the top of the second column. Provide users an easy way to go back to sections and jump back to indexes
- **Provide search tools and content structures so readers can easily find information**

  Attach search engines and provide subindexes so that users can access just the information they need without wading through all the information on the site. Readers must be able to locate and retrieve the level and type of information they need quickly and on demand.
- **Change is inevitable** Web documents are easy to maintain. System should make it easy to post content changes, update indexes, and maintain links/cross references across topics and pages.

2.12 Case Studies of Companies using Intranet

Five companies were studied to know how the organizations are practicing intranet and what people in the organization have to say on the intranet.

2.12.1 US West (Feb 1998,CIO Web Business Magazine)

Global Village Labs is a 40-person SWAT team of programmers and business strategists working for U.S West a U.S telephone company.

The primary purpose of the Global Village Labs is to discover how Web technology can knock tens of millions of dollars off U S West's expense ledger. The rumored secondary purpose is to take the hierarchical structure of this $11 billion, 50,000-person company and stand it on its

head.

Example of US West's intranet application achievements:

- Product Catalog Procurement Project

A supply chain management application to order hardware and software system This application, cuts ordering time of US WEST's Centrex 21 system from 10 minutes per line to two minutes per line. This saved more than 12,000 worker hours since it was launched. It took only six weeks to build and cost about $48,000.

- EMOS, for Email Ordering System,

An interconnector named McLeod claimed that U S West was not providing information fast enough. Woo's solution, called EMOS, for Email Ordering System, took three weeks to build. Using an extranet, it sends order status information to McLeod quickly and inexpensively. In addition to the productivity gains, says Haddock, the applet demonstrates U S West's willingness to cooperate with McLeod. Problem solved.

- An engineering Web site

Job status information is accessible to the local marketing group, who can check on work in progress and tell the managing engineer if the client changes his plan.

U.S West staff's comment on intranet:

- Barbara Bauer, senior director of U S West Communications Information Technologies.

  "The rate of return on some Global Village applications ranges from 1 to 1,000 percent. If we can stop an employee from making a phone call that takes a half hour and instead give him or her a transaction that takes 30 seconds, there is huge savings."
  That kind of huge savings, most U S West department heads realize, is needed to keep their company competitive.

- Woo Sherman, Global Village Lab technologist.

  "What the Web does is create more conversations," says "It reveals knowledge gaps faster and allows people to act on it. We took 400 pages of information and put it on a Web page. In one year, the number of people using that information went up 400 percent.."

- Daya Haddock , U S West, product manager

  "The decrease in held orders and increase in customer satisfaction were well worth the effort".

2.12.2Sun Microsystems Inc(Nov 1997,CIO Web Business Magazine)

In this case study the author focuses on what the CIO Of Sun Microsystems has to say on intranets. Bill Raduchel, is also currently chief financial officer and acting vice president of human resources at Sun. These are excerpts of his interview with Randy J. Hinrichs.

- What intranet feature do you find the most valuable?
  E-mail allowed Sun [to participate] in a decision and do it fast.
- How has [Sun's intranet] helped business-process improvement?
  We use the network as a fundamental place to conduct business and provide benefits to employees. Place doesn't matter anymore in working together. We can get global involvement in a decision and keep everyone fairly well informed.
- Can you talk about [intranet] costs?
  Infrastructure costs are very high and getting higher. Current ideas are to load a complex operating system plus data on each desktop, and configure and support it. It costs an awful lot of money.
- In order to reduce the risk, do you see the intranet as a centralized or decentralized infrastructure?
  Infrastructure gets centralized, content gets decentralized.
- What kinds of measurements do you use for the intranet evaluating your success factors?
  Business metrics: revenue per employee, gross margin per employee, gross margin growth, cycle times and measuring internal processes. It's a simple equation of more orders and more profits

- What about measuring human performance?
  Cycle times are human performance times. People can process more information, but information is valuable only if it leads to better decisions.

2.12.3 Ford Motor Co(June 1997,Webmaster Magazine)

- Ford's intranet lets employees disseminate information, share best practices, conduct research, communicate and begin to collaborate in ways they never could before. There's still some resistance and results aren't yet quantifiable.
- "Competitive advantage is what we're after: better quality, better speed, better cost," says Bob Matulka, director of Ford's Product Development Leadership group.

- Mike Ledford, Ford's director of process reengineering says:
  "If you don't have a collaborative network set up, you're going to be at a competitive disadvantage."

- Professional employees, were drowning in documents. Even people who could find information couldn't necessarily rely on it. That's because a lot of the hard-copy information was outdated.
- As department after department signed on, the intranet's global user base grew from that initial 2,000 to 80,000.Training was easy. Cote estimates that even the newest users learned Netscape in 10 or 15 minutes.
- "We're trying to de-emphasize the graphics and emphasize the functionality, just getting the information out there," says Louisa Russo, a supervisor in Ford's Vehicle Center Systems department.
- The intranet, the home page of which receives more than a million hits a month, also enhances some employee benefits. For example, the company lets employees buy vehicles at discounts. Before the intranet was developed, workers had to meet personally with corporate sales representatives to make their choices.

Now, employees can use the site to check their eligibility, click through option packages, compute monthly payments, place orders and check their status.

- But the intranet's real strength is its ability to help users gather a wealth of information that would previously have required several phone calls or a library visit.
- The intranet's graphical and multimedia capability has been the greatest value for engineers, who buy heavily into that whole picture-thousand words equation. By allowing people to access images on an intranet from wherever they are in the world, Ford shaves weeks off design processes because project managers no longer have to physically mail masses of product documentation all over the globe.
- Intranet use has improved efficiency, reduced phone calls, all but eliminated redundancy, cut down on mistakes .
- It's also taken a mighty swipe at paper consumption. Matulka estimates that the information now available on the company intranet would total 30,000 pages if printed-a quantity of hard copy that would be highly impractical if not impossible to manage and distribute through traditional methods.

2.12.4 Weyerhaeuser Co.(Nov 1997, CIO Web Business Magazine)

Results from each day's cutting, such as the number of board feet and type of wood harvested, are fed into a database and linked to daily reports, which are published on the mill's home page and linked into Roots, Weyerhaeuser's growing intranet

- intranet-based applications enable the $ 11 billion forest products company to share real-time production, environmental, personnel and safety data with workers at locations all over the Northwest.
- Quality control documents are converted into electronic format that is accessible on the intranet, fundamentally changing the way procedures are followed and eliminating the use of outdated printed manuals, geographical data and maps are readily available to foresters, engineers and loggers via the intranet.

- Roots is the corporate home page for Weyerhaeuser's many interconnected Web sites, and around the company, the name is used to refer to the entire and rapidly expanding intranet.
- Roots began as little more than a company wide table of contents, providing online directions to the growing ranks of the company's online community. Today, employees can track down personal information, such as 401(k) balances, and more and more business units, such as Timberlands and Wood Products are linking their data into the intranet so that information is widely available and easily accessible. Before the intranet was in place, most of such information could only be found in cumbersome three-ring binders that Weyerhaeuser typically updated on a quarterly basis. Now the binders are disappearing, and the money saved this year on that and other communications materials adds up to $150,000.
- Roots is also intended to simplify distribution models, speed order processing and decrease customer support staff. New distribution models will eliminate the circulation of redundant and outdated materials. The intranet will reduce reliance on support staff by letting employees directly access information such as human resources data and internal job listings. All of these capabilities will save money.
- The intranet is really going to help foster that teamwork notion because it allows people to get together in another way, irrespective of geography.
- There must be sponsorship from management, something that will come only with demonstrated business value.
- Different people at Weyerhaeuser have different ways to measure the value of Roots. For workers at a particular site,value comes from their own empowerment, while from a management perspective, value comes from a more efficient way to disseminate information.

2.12.5Hewlett-Packard Co.(June 1997, WebMaster Magazine)

- In 1993, HP by cobbling together an array of TCP/IP-based desktop videoconferencing and data- and application-sharing software, the company enabled its employees in North America, Europe and Asia to gather online occasionally to discuss situations and pass on fixes to lower levels of support staff.
- HP can organizes problem-solving sessions on its intranet and deliver fixes to engineers at their desktops in easy-to-absorb doses during collaborative, real-time training sessions
- Participants in Hewlett-Packard Co.'s HP Desktop Classroom can do everything they would in a normal classroom. Collaboration among group members generally centers on a distributed Powerpoint presentation about the task at hand. High-level engineers training lower-level support staff can schedule short sessions, run through a set of slides describing problems and possible responses, annotate the slides using a whiteboard tool, answer questions from participants in a chat window and break the group into smaller teams for targeted discussion and development -- all in real-time. The Desktop Classroom workgroup met online while developing the application, and now Project Manager Garry Orsolini manages it over the Web.
- The Desktop Classroom is intended for large-scale, top-down information sharing. But right now, HP employees work together in smaller groups, using the spaces such as "rows," "classrooms" and "situation rooms" in the Desktop Classroom application.
- "The interactive nature makes it a lot easier to facilitate questions and get a dialogue going. It's an online, real-time meeting of the minds."

2.12.6 INTRANET IN SABAH

- In order to bring the Sabah Electronic Government into realisation, the on-line applications were developed to relieve the Electronic Government officers and the general public. To gain access to the intranet site,he or she must own a Sabah.Net Dial-up account which is given free to Malaysian citizens residing in Sabah and the Federal Territory of Labuan ..
- The Electronic Circular was designed to improve the distribution of the State Government's official circular to other Government officers and also the community that make the most of Sabah.Net links. In time to come, this application will made the centralized archive for various State Government circulars that have been distributed.
- Human Resource Information System (SM2), formely known as SMAPAN, is created for Government staff to get information from each department or agency regarding its human resource information. With this system, employee information can be easily updated on-line in a smart and effective way. A complete data would be helpful for the personnel administration and upper management in order to plan and strategise personnel development under the public sector in the State Government.
- The Electronic Leave System (e-Leave) is a leave application system for use by the State Government employees and designed using Sabah.Net as its infrastructure. e-Leave provide users with the method of applying and receiving of leave requests on-line where all leave records are updated automatically and precisely.Compared to the old paper-based system that takes one to three days, e-Leave allows the application process to be done in only one minute. This new system is also cost-effective in delivering and filing of information, eliminating the use of paper all together.
- e-Invitation is a standard application for use by all State Government departments and agencies. The system contains the following benefits and uses:

1. Allows users to access information via Sabah.Net for maintenance of invitation information;
2. Lowers the use of human resource;
3. Lowers communication cost and expense between the invitees and event organisers;
4. Lowers paper usage;
5. Provides convenience for users to view invitations any time and any where through Sabah.Net;
6. Increases work efficiency to organise events.

- **e-Course** is made for the State Government staff to obtain information about courses that are sponsored by the Sabah Government. The staff can then apply on-line to participate the courses from the sponsoring departments. Before the application process can be approved, the staff's applications goes to his or her department Head for authorisation and recommendation before it can be further processed and approved. All the process involved are automated using a back-end database and electronic mail.
- **Izin - Overseas**
  This system allows State Government staffs to apply for permission to travel outside of Sabah. Applicant fills in an on-line form and all the process involve will be handle through the system.

2.13 Existing System studied for SPOT I.T

The development of SPOT I.T was based on tips on requirement and design acquired from existing systems .Three existing intranets systems were studied. They are as follows:

2.13.1 Mitre's Information Infrastructure(MII)

http://www.mitre.org/pubs/intranet/#section2.1.2

This site explains on the redesign of Mitre's Information Infrastructure (MII),improved system usability. This website was very helpful to the author for

reasons below:

- It made a comparison between the existing intranet and the newly designed intranet; This site explained in detailed how Mitre intranet team when through the process of redesigning; Processes mentioned include the requirement gathering process, the redesign process, the user evaluation process performed throughout the redesign and the lessons learned. It was a real eye opener for the author.
- A walk through of both new and old intranet screen designs were given.

The intranet features of both new and old intranet design which the author found interesting:

- Search engines, Live announcement area-send corporate wide message of general interest ;Homepage which explains the purpose of web site and offers high level options for users to begin browsing sites with information of interest; Complex sub sites contain their own homepage; navigation mechanism and search engines. Navigation layers; Phonebook feature-a search engine for phone numbers and employee details.; Every individual page consist three basic elements-static text, graphics and hyperlinks.; Links to documents, homepages and other topics of interest. Shortcuts-hyperlinks that took users directly to a content page skipping intermediary navigation pages.; Help system-contains links to major topics about MII.; Text only link-allow users to display an alternative MII homepage (no graphical elements only text links) to support text-only browsers or connections whose speed made downloading graphics too slow.

2.13.2 Galaxy Television Productions Intranet

http://galaxytelevision.intranets.com/

This intranet site was available on-line on the internet, guests have to be granted permission by the intranet administrator before being able to access this site. Protection is in the form of logon name and password. Each guest will be provided a logon name and password if granted permission to access this site via

their e-mail. The author was fortunate enough to be granted permission to view this site.

Features of interest:

- The homepage contains an announcement area, main links in the intranet, a navigation layer, a calendar featuring important events and an area announcing what's new in the intranet.; Members are able to send e-mail to other members via this website and also view their mailboxes; Shortcuts to add announcement, event, contact; A document library, which you can add documents or open documents posted by other members; A discussion page where members are able to give or read opinions ;A list of members in the intranet, names are listed according to alphabetical order. A section to add polls and cast vote for open polls. The results of closed polls can be viewed .Personalization of pages according to members who log in, where the member is greeted by name.

2.13.3 Solution Center

(Industrial Training Report by Koh Yun Sing in Ericsson Business Consulting)
This internal website was developed by the above student of University Malaya for Ericsson Business Consulting. A very attractive web site that was the source of inspiration for the design of SPOT I.T.

Some interesting features of Solution Center:

- A navigational layer; The homepage contains news on current events happening within the solution Center. A list of time in different countries where Ericsson is based.; Every main folder contains its own homepage explaining on its sub folders. ;A folder on frequently asked questions; A discussion board; Contact search; Solution Center employee information.; Calendar featuring interesting events; A folder on interesting places to visit.

SYSTEM ANALYSIS & REQUIREMENT SPECIFICATION

3.0 Introduction

Reasons for analyzing systems:

There are several reasons why an organization may require a new (computer based) information system: [1]

- It is a newly established organization and therefore needs an information system to manage its business operations more efficiently and effectively.
- It has a manual system that is inefficient and ineffective in meeting the needs of the business.
- It has a computer – based system that is inefficient and ineffective in meeting the needs of the business.
- It needs a new information system for strategic reasons-to seize a new business opportunity and/or to provide new services.

3.1 Project Description

SPOT I.T is an internal web site within the intranet of a mock organization, West Indies Oil Refiners, an oil refining company.

It is designed for the use of the I.T department of the company and at the same time it also serves all employees of the organization on aspects of I.T.

This web site handles I.T complaints and requests from all employees in the company By having this website employees are no longer needed to fill in forms or make unnecessary unattended calls to get the attention of the I.T personnel.

At the same time it helps I.T personnel to keep and update data on what kind of services were provided to whom., I.T personnel can also keep track of complaints or requests

which were attended to or still in progress or have not been attended to at all. This can lessen the dissatisfaction among users as there is no chance of anybody going unnoticed.

In addition to this, the website all offers information on links to agreements, I.T links and tools, frequently asked questions, I.T employee handbook, projects, training and seminars, and also descriptions on I.T personnel. Lastly there is also a calendar feature on what is going on what date of the month.

All these functions are added to prove how an intranet web application can make a significant difference in an organization.

- Files and information is no longer kept in cabinets where most employees don't even know where they are located.
- Employees don't have to spend hours searching for the agreement they want to refer to.
- Information doesn't get lost and everybody has access to the same information, not different versions of update.
- Information is retrievable in seconds, thus increasing organization speed.
- Every employee is kept well informed, no one is left out and there is no feeling of prejudice.
- This website also portrays security concerns within the intranet, when an admin logs in, this website becomes personalized for the admin, certain functions which can only be carried out by the admin is only revealed at this point. When a normal user logs in only general functions that can be performed by the user is displayed.
- The system recognizes when an administrator logs in but at the same time it also has additional feature of password authentication for administrator. This is to ensure high level of information guarding.

- Earlier, in chapter 2, many intranet content were studied, this system only covers some basic content and there is room for more and more content to be added. This is the power of intranet.

3.2 Development Process Model

The development methodology for this project is the evolutionary prototyping model which is a subset of rapid prototyping model.

Rapid prototyping model is a process that enables the developer to create a model of the software to be built [1]

The developer builds a rapid prototype and lets the user interact and experiment with it. If the rapid prototype does what the user wants the developer draws up a specification with the assurance that the product meets user needs.

3.2.1 Rapid prototyping model

Evolutionary prototyping is the rapid prototyping model used. In this approach prototyping and production process are merged. The prototype gradually evolves to become the final product.

The advantages of evolutionary prototyping include:

- Systems are developed and delivered rapidly
- System development costs are reduced

- As users are involved in the development, the system is likely to be appropriate for user's real needs (leading to higher satisfaction).
- Help to analyze alternative for design
- Useful for verification and validation processes and enhances system quality

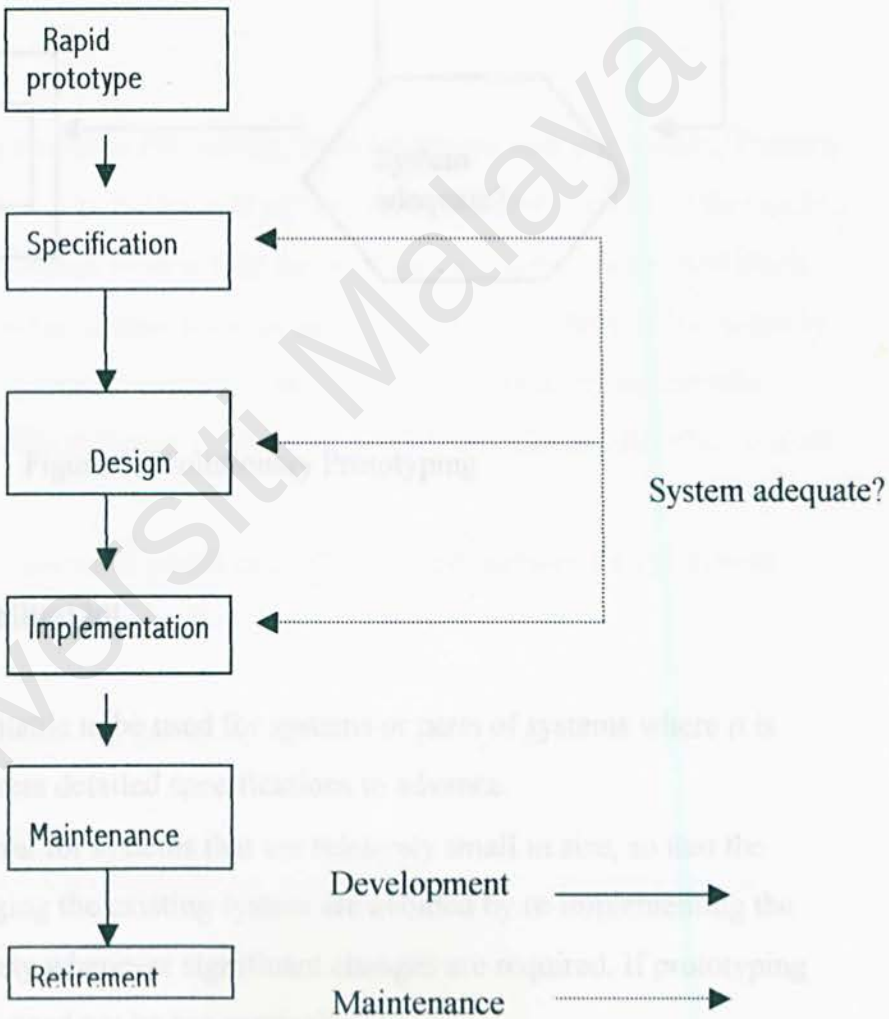


Figure 5:Rapid Prototyping Model

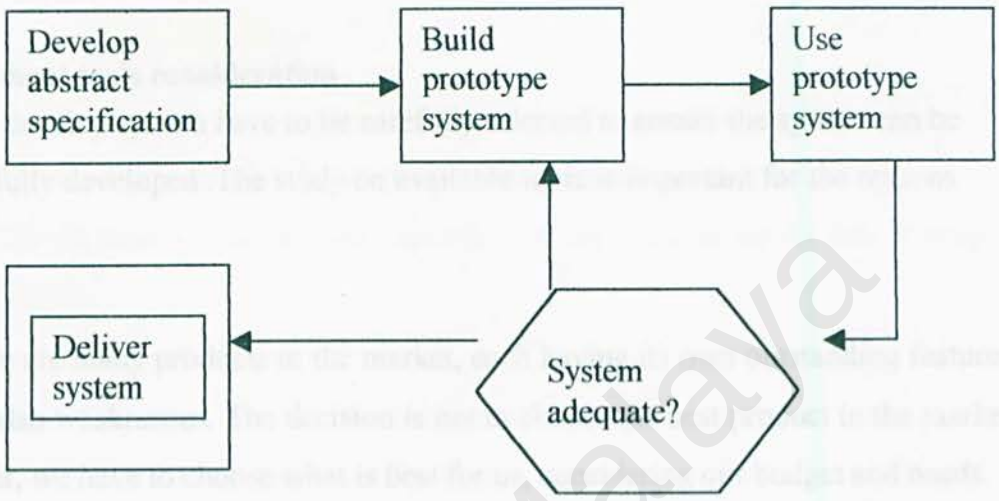


Figure 6:Evolutionary Prototyping

3.2.2Applicability/Suitability[20]

- This method is suitable to be used for systems or parts of systems where it is impossible to express detailed specifications in advance.
- Prototyping is useful for systems that are relatively small in size, so that the problems of changing the existing system are avoided by re-implementing the system in its entirety whenever significant changes are required. If prototyping model is used this need not be too expensive.

3.3 Development tools consideration

Tools to develop system have to be carefully selected to ensure the system can be successfully developed .The study on available tools is important for the reasons below:

- There are many products in the market, each having its own outstanding features and also weaknesses. The decision is not to choose the best product in the market; rather, we have to choose what is best for us, considering our budget and needs.
- There is also the factor of compatibility among tools, which have to be seriously considered before selection is made. The last thing we want to find out after purchase of expensive software products is the fact that they are not able to work together.
- We have to choose products which can offer the best features for our system

Further discussions will be on tool selections and justifications for SPOT I.T

3.3.1 Database consideration

The characteristics of Microsoft Access and SQL server are discussed below:

3.3.1.1Microsoft Access [12]

- Although designed to run on user's work station rather than a server, it is truly relational and supports SQL queries
- It supports a distinct split between client applications and server based data (several Access programs on different client computers can simultaneously access the same database files on the server)

- It is not able to handle very large databases, its Jet database engine supports neither as many simultaneous client connections nor the robust fault-tolerance mechanisms that true client/server database server supports

3.3.1.2 Microsoft SQL Server [12]

- SQL Server is Microsoft's database application server software package
- SQL Server runs on a server and responds to query requests for the data it stores from clients.
- SQL runs only on Windows NT
- SQL Server does not come with client access software beyond a few tools to test the database. A very own client software has to be created for a client to access SQL server By using access as a database front-end , publish to the internet wizard built into access can be used to create Active Server Pages for IIS. Web browsers can directly connect to SQL server through web pages stored on the Web server.

Summary of database consideration:
Microsoft Access 2000 is used as database for the development of SPOT I.T as it Is more convenient and easily available. Access can be installed in any workstation meanwhile SQL server needs to run on a server. Since windows 98 was chosen as the platform, access became the ideal database.

3.3.2 Web server consideration

3.3.2.1Internet Information Server (IIS) 4[12]

- IIS is an extremely fast web server. InfoWeek published the results of two tests that show IIS on NT is as much as 2.5 times faster as competitor servers on other operating systems [12]
- Provides integrated security and access to a wide range of product

- IIS 4 server only runs on Windows NT server
- IIS integrates with WINDOWS NT security, if an intranet application is built where everyone has an NT account and uses Internet Explorer, Windows built in security can be used rather than requiring logins and passwords. Internet Explorer(not Netscape) will authenticate with the application transparently without requiring an additional login and password.
- IIS allows security restrictions on a site-by-site basis.
- IIS provides access to content – all web servers can deliver HTML files but they differ widely in how they treat other types of content. IIS integrates directly into the Windows directly into the Windows registry. IS natively understands how to treat most common Windows file formats such as text files, application initialization (INI) files, executable (EXE) files, Microsoft Word(DOC), PowerPoint(PPT) presentations, Excel(XLS) spreadsheets and many others.
- IIS can be configured to run scripts, CGI programs and even ISAPI DLLs in separate memory spaces so that a programming error in one application will not interfere with the correct operation of other applications.
- Streaming media support with Microsoft NetShow
- Seagate Software's Crystal Reports 4.5
- SSL 3.0 Support for digital certificate authentication
- ActiveX Data Object (ADO) & Active Server Pages
- Microsoft Index Server 1.1 provides searching of HTML, ASP, NetShow, text, Word, Excel and PowerPoint(r) documents and properties in seven languages.
- HTML editing software (FrontPage 97 is included)
- Support for Microsoft FrontPage 97 Server Extensions

IIS and Windows NT Server together provide tools to create secure and flexible websites. IIS uses Windows NT users and groups to implement security on the web pages as well as on files and directories.

3.3.2.2PERSONAL WEB SERVER

PWS, an abbreviation for Personal Web Server, is Microsoft's version of a web server program for individual PC users who want to share Web pages and other files from their hard drive. PWS is a scaled-down version of Microsoft's more robust Web server, Internet Information Server IIS. PWS can be used with a full-time Internet connection to serve Web pages for a Web site with limited traffic. It can also be used for testing a Web site offline or from a "staging" site before putting it on a main Web site that is exposed to larger traffic.

PWS can be used together with Microsoft's FrontPage, a Web site design product, to upload Web pages from a remote location or to the local hard drive; to check for dead links; to create directories; and to set permissions. PWS is frequently used as part of the trend toward peer to peer exchange and publishing

Web Server Selection

PWS was chosen as the web server as it comes with Windows 98 and it is easily available. Though not suitable for deployment purpose but its features were good enough for the development of SPOT I.T.

3.3.3 Platform consideration

3.3.3.1WINDOWS NT

- Since Internet Information Server 4.0 and SQL Server only runs on Windows NT. Windows NT has some special features that make it an ideal intranet application development platform. [12]

- Windows NT has the strongest security mechanisms of any widely available operating system.

- Windows NT comes integrated with Internet Information Server 4.0

- Robust and reliable application services

3.3.3.2 WINDOWS 98

Windows 98 is a widely-installed product in Microsoft's evolution of the Windows operating system personal computers. Windows 98 expresses Microsoft's belief that users want and should have a global view of their potential resources and that Web technology should be an important part of the user interface.

In Windows 98, Microsoft's Internet Explorer is an integral part of the operating system. Using the Active Desktop of Windows 98, we can view and access desktop objects that reside on the World Wide Web as well as local files and applications. The Windows 98 desktop is, in fact, a Web page with HTML links and features that exploit Microsoft's ActiveX Control. .

Windows 98 also provides a 32-bit file allocation table that allows to have a single-partition disk drive larger than 2 GBytes.

3.3.4 Programming Tools

3.3.4.1Hyper Text Mark-Up Language(HTML)

Hypertext Markup Language, or html, is a system of coding text files for display by World Wide Web browsers. By embedding certain special codes in the document, the browser can be told how to display the text, what graphics to include, and what Internet services should be made available by hypertext links.

There are hundreds of other tags used to format and layout the information in a Web page. For instance, <P> is used to make paragraphs and <I> ... </I>is used to italicize fonts. Tags are also used to specify hypertext links. These allow Web developers to direct users to other Web pages with only a click of the mouse on either an image or word(s).

Due to the fact that HTML can't provide the real programming power for web programmers, many alternatives such JavaScript and VBScript are used for building dynamic interaction and content. They complement HTML

3.3.5 Scripting Languages

Scripting languages are commonly used as a key component technology of dynamic HTML. Using Dynamic HTML, properties of objects in the Web document can be accessed and manipulated, generating interactive and animated pages at the client end without recourse to interactions with the Web server.

To run a program written in any scripting language, your browser must be able to interpret the particular language that is being used.

3.3.5.1 VBScript[15]

Short for *Visual Basic Scripting Edition,* a scripting language developed by Microsoft and supported by Microsoft's Internet Explorer's web browser. VBScript is based on the Visual Basic programming language, but is much simpler. In many ways. it enables Web authors to include interactive controls, such as buttons and scrollbars, on web pages embedded as a small program in a web page, that is interpreted and executed by the Web client. The scripter controls the time and nature of the execution, and VBScript functions can be called from within a Web document, often executed by mouse functions, buttons or other actions from the user. VBScript can be used to fully control compatible browsers, including all the familiar browser attributes.

3.3.5.2 Java Script[16]

A scripting language developed by Netscape to enable Web authors to design interactive sites. JavaScript can interact with HTML source code, enabling Web authors to spice up their sites with dynamic content.. It is supported by browsers from Netscape and Microsoft, though Internet Explorer supports only a subset, which Microsoft calls

JScript. By operating on the client-side, JavaScript speeds up simple interactive behavior without needing to use the network. For example, simple verification of the data entered into a form (e.g. numbers only in telephone field) could be carried out in the browser via JavaScript inside the HTML of the form page. This reduces server load and speeds up performance at the client side. In general, the use of an embedded client-side scripting language can create a more event-driven page, reacting instantly to user input such as mouse clicks or text entry at the browser.

3.3.5.3Jscript[21]

JScript is Microsoft's extended implementation of ECMAScript (ECMA262), an international standard based on the Netscape's JavaScript and Microsoft's JScript languages. JScript is implemented as a Windows Script engine. This means that it can be "plugged in" to any application that supports Windows Script, such as Internet Explorer, Active Server Pages, and Windows Script Host. It also means that any application supporting Windows Script can use multiple languages - JScript, VBScript, Perl, and others.

JScript (and the other languages) can be used for both simple tasks (such as mouseovers on Web pages) and for more complex tasks (such as updating a database with ASP or running logon scripts for Windows NT). Windows Script relies on external "object models" to carry out much of its work. For example, Internet Explorer's DOM provides objects such as 'document' and methods such as 'write()' to enable the scripting of Web pages.

3.3.6 Web Site Creation and Management Tool Consideration.

3.3.6.1Microsoft FrontPage [20][23]

- The Microsoft FrontPage Web site creation and management tool gives everything needed to create and manage web sites whether creating a personal Web page or a corporate Internet or intranet site.
- It works like the rest of Microsoft Office Premium, FrontPage 2000 is easy to learn and use. Create, Edit, Manage, and Update Site—All from One Easy-to-Use Application
- The multiple views in FrontPage allow to see all the files in the Web, run reports to find slow pages and older files, set up site's navigational structure, and keep track of Web tasks. We can also create and edit Web pages in Page View, use Folders View to see all the content on the Web, then set up how pages link to one another in Navigation View.
- Comes integrated with Internet Information Server 4.0
- It adds extensions to IIS, which allow authoring to take place, and other functions such as the handling of form documents, comments, searching, discussion threads and other features. IIS 4.0 requires the FrontPage 98 Server Extensions or later.
- A number of helpful toolbars make the editor's window look like a powerful graphical creation product.
- The FrontPage 2000 editor supports a wealth of modern technologies, such as HTML 4.0, Cascading Style Sheets 1, insertion of Java language applets, JScript® and VBScript, ActiveX® controls, themes, and even Dynamic HTML effects.
- FrontPage also supports bots, a special set of tags within page code specifically interpreted by the server's FrontPage extensions and the editor itself.

- We can click on the HTML tab in FrontPage to switch to pure HTML mode or preview the page in an embedded browser's window.
- FrontPage now offers syntax highlighting (also known as color coding) to help distinguish among tags, parameters, and values.
- Designed as a visual editor, FrontPage 2000 is clearly the way to go for WYSIWYG page layout.
- FrontPage 2000 also gains from its association with Microsoft Office in a few other areas. For instance, when we're working on a page in FrontPage, we can insert spreadsheets, charts, Pivot Table® dynamic views, and other types of Office objects .Another standard feature of Microsoft Office applications is the Visual Basic for Applications editor. With its inclusion in FrontPage 2000, we can automate some common tasks and add functionality to the product.

3.3.6.2Visual Interdev 6.0 [23]

- Visual InterDev is part of Visual Studio®
- Visual InterDev 6.0 is less impressive as a visual page editor (It includes basic HTML functions that are available through the menu or toolbars, but there is no native support for dynamic effects .This is partially because Visual InterDev 6.0 is a developer's tool, and advanced developers are used to dealing directly with the code
- Visual InterDev has a terrific built-in code editor

- When working in the Source mode we get all benefits of the integrated Visual Studio package, like configurable syntax highlighting and automatic code completion
- Visual InterDev 6.0 comes with a detailed and comprehensive HTML, JScript, and VBScript reference
- Another vital part of the Visual InterDev documentation is its ASP reference

- To ensure no one can modify the web pages, sites often use passwording or the Windows NT® security model to deny access to unauthorized persons. Visual InterDev bases its security on this model, meaning we can make use of domain security. This allows us to apply systemwide restrictions to sites

Summary: Microsoft Frontpage will be chosen as the web development and management tool .

3.3.7 Active Server Page(ASP)[17]

A specification for a dynamically web page created with a *.ASP* extension that utilizesActiveX scripting -- usually VB Script or Jscript code. When a browser requests an ASP page, the web server generates a page with HTML code and sends it back to the browser. Active Server Pages are HTML pages that contain embedded scripts. IIS (Internet Information Server) and third party providers offer server software that interprets Active Server code.

ASP pages contain either server side or client side scripts which performs functions such as database access, page personalization, or interactive functions. ASP (Active Server Pages) is a *server-side* technology from Microsoft for building dynamic and interactive Web pages. ASP code is embedded in the HTML page. When such a page is requested from the Web server, the server first executes the ASP instructions, then constructs the page including any ASP-generated information, and returns it to the client.

By default Microsoft Web servers (Internet Information Server 3 and above) can run ASPs (may need to install/configure the server software to do this). ASP pages are browser independent.

ASP code is usually written in a language called VBScript which is embedded inside the HTML on a page within <% and %> tags. ASP pages (with extension .asp) can contain any combination of HTML and script commands.

ASP uses an in-built set of objects and components to manage specific aspects of interactivity between the Web server and browser. Objects include the Request (made to the server), the Response (returned by the server) and the Session (allows the user's visit with the Web site to be treated as a continuous action, rather than a series of disconnected page requests).
Active Server Components provide ready-made functionality. Examples include database access, determining browser capabilities and linking to and writing into text files.

ASP scripts are text files and can be written by hand in any simple text editor. Tools are also available. Visual InterDev provides a fast way of building ASP scripts. Also some general Web authoring programs such as Microsoft FrontPage and Allaire HomeSite enable to create and edit ASP scripts.

ASP is also a feature of Microsoft's Internet Information Server. When a web client makes a HTTP request to an IIS, the request will be checked, if it is for an ASP file, Active Server takes over from IIS and then gets the file and checks from top to bottom sequence. Active Server will then run server side scripts such as VBScript or any other supported language and return back HTML files to the web server .IIS then will send this file back to the client. If the request is for a HTML file IIS takes over, gets the web page and sends it to the client. ASP technology enables the transition of static web site into dynamic and data driven applications. The proprietary source code in ASP applications remains on the server side and does not affect client side browser compatibility.

3.4Requirement analysis

A requirement is a feature of the system or a description of something the system must do in order to achieve the objectives of the system [1]

System requirements fall into two categories:

- Functional requirements-Requirements clients need to do business.
- Non-functional requirements-requirements not directly needed by business but nevertheless important. They represent constraints placed on the system. These include performance, security and usability. It also includes constraints placed on the system such as hardware/software the system must use.

3.4.1Non- functional requirements for SPOT I.T

Usability:

- As every employee in the organization will primarily use the program, it must be easy for computer novices to use.
- Program should have context-sensitive help: Context-sensitive help should cover each main program function and all of the controls in the user interface.
- Program should prevent obviously invalid or illegal data from being entered:
- Input fields should not allow the user to enter illegal characters (i.e. letters in a number field.) or an illegal number of characters.
- User input should be checked to see if it is in the valid range for that particular data when possible. The user shall be notified if it is not.
- User should be asked for confirmation before destructive operations are performed on data items. .

- Home Page on all pages of web site make it much easier to navigate and understand.[25]
- Hyperlinks that lead to error messages will annoy users

Security:

- Strong data security is necessary.
- The system should be able to differentiate users and provide personalization of web pages, therefore those who don't have the rights to certain functions will not be able to view those functions in the first place.
- Even though the system is able to recognize admin when he/ she logs in, additional steps of security should be taken by providing password authentication.
- Not all users have access to every document/link, therefore access rights such as read, write or no access at all should be given according to individuals or groups

Reliability:

The system has to operate without failures and be available when required. Reliability can be achieved by three strategies:

- Fault avoidance-The design and implementation process should be organized with the objective of producing fault free system.
- Fault tolerance-Facilities are provided in the software to allow operation to continue when these faults cause system failures.
- Fault detection-Faults are detected before the software is put into operation

Maintenance:

This system should be able to be changed as user requirements change, changes made is what maintainability is all about. There are three types of maintainability

- Corrective maintenance fixing reported errors in the software. These errors can be coding /design/requirement error.
- Adaptive maintenance-changing the software to some new environment such as different hardware platform or for use of different operating system.
- Perfective maintenance- implementing functional or non-functional system requirements as business needs change.

Response Time:

- The number of seconds it takes from the moment users initiate an activity (by pressing an ENTER key or mouse button) until the system begins to present result should be within a considerable range.
- Users prefer shorter response times
- Longer response times (greater than 15 seconds) are disruptive[24]
- Users should be advised of long delays

User friendliness:

- User friendly if users find it easy to use
- Generally: user friendliness depends on consistency of user interfaces[26]

- The essence of user-friendliness is the ability to use a product to bring about a desired outcome.
- A product that can be used by anyone without prior knowledge or experience.[27]

Availability:

The website must be available 24 hours a day and seven days a week as this is an intranet system and I.T service is critical for an oil refinery company which operates at all hours

3.4.2 Functional Requirement for SPOT I.T

3.4.2.1 User Module

User module will consist sub modules personalized for users. This personalization is for security purposes as there are possibilities for some users to break into administrator-controlled functions. All user modules will contain navigational bar to other modules. The sub modules are as follows:

Home Module

This module will publish on new events taking place in the I.T department. This module is designed for the purpose of keeping all users well informed on what's new and happening in the I.T department. Every organization employee can view this module and the news attached to it unless certain events are restricted to be further read by some groups of users for confidentiality purposes.

Agreement & Forms Module

This module will explain what can be found within this module. Users will be given descriptions on sub modules

The sub modules are:

- Agreement Module:

  All links to agreement documents are provided here. Description of agreements are also provided for users to easily identify whether this is the agreement they are looking for.

  Complaint Module

  Complaint module will describe to users on the sub modules it contains. The complaint form and also the status check.

  - Complaint Form Module

    Users can fill in a complaint form , where they can lodge complaints on various matters pertaining to I.T. Complaints can be on anything - printer not working, software corrupted, server down, can't log in to the network or anything else related to I.T department. Users just have to type out their problems in the space given. User will be registered into the user database and when the user wants to lodge a complaint or make a request they only have to key in the employee i.d and all other data will be retrieved. At the same time a complaint i.d will be generated for future status check by user and user will asked to remember this i.d. This form is then submitted.

  - Status Check

    This module will allow user to know what is the status of their complaint. The status will be either be complaint in progress, complaint attended, or waiting for attention. If complaint is in

progress or have been attended, users can also view comment from admin as to what action is being /has been taken.

- Request Module

Request module will describe to users on the sub modules it contains. The sub modules are as follows:

- Request form

The user will be able to request services relevant to the I.T department. services can be in the form of :

- loan of I.T related items such as laptop, projector, video, cd's , cd roms, books
- Help to change pc position, help to assist in presentations, help to set up video conferences or any other service I.T department can offer.

The requestor has to fill in his/her request on the space available. All the user has to do is to enter employee i.d and all other data will be retrieved automatically. A request i.d will be generated for future status check by user and user will asked to remember this i.d .

- Status Check

Similar to complaint status check, the user has to key in complaint i.d and the user can view details of request whether it was approved, in process, rejected or waiting for attention. In addition they can also view admin comment.

Links & Tools Module

This module lists all links to other I.T related webpages and links to tools such as software and driver downloads. The descriptions of the links are given

Information Module

This module will describe on the sub modules it contains. The sub modules are as follows:

- Employee Benefits and Policies

  This module will contain description on employee I.T benefits and I.T department policies which should be followed by I.T employee staffs.

- I.T Training and Seminar

  Details will be on what I.T courses will held, where and who can participate. This information is intended to employees well informed on self-development and skill upgrading chances. No one will be left out due to not getting the right information at the right time.

- I.T Project

  This module lists all I.T projects that have taken place, is going on and under proposal. Project name, project status and project description and links to project is listed. A search engine is provided to match keywords with project description. Projects can be viewed by status also.

Frequently Asked Question Module

This module will provide link to 4 submodules:

Frequently asked questions on:

- Windows NT
- Microsoft Outlook
- Microsoft Office
- Unix

Miscellaneous Module

This module describes on the submodules it contains.The submodules are as below:

- I.T Department Chart

  This module will contain details of I.T employees and their role and position in the department.

- Interesting Places to visit

  This module will contain details on some interesting tourist location. The purpose of this module is to add some spice into this internal website.

- Calendar

  This module contains a calendar that will feature interesting events taking place everyday of the year including holidays.

3.4.2.2 Administrator module

Administrator modules will be same as user modules with extra modules to add, edit and update added. The additional modules will be discussed below.

Agreement & Forms Module

The additional modules are:

- Admin Agreement Module:

  Admin can add, delete or edit agreement links Admin can find link using existing search engine.

- Admin Complaint Module

  Admin can view complaints made by complaint id, date or status. Admin can add update status and add comment to each record of complaint.

- Admin Request Module

  Admin can view requests made by request id, date or status. Admin can add update status and add comment to each record of request.

- Admin User Module

  Admin can delete, edit or add user database.

Links & Tools Module

The admin is able to edit, update or edit the link records in the database

Information Module

Admin I.T Project Module

Project name, project status and project description can be updated. Project records can be also added or deleted.

Authorization module

This module allows the administrator into the system. Admin has to log in using log in name and password. Admin can also change password.

Other modules can be updated by the admin, as they are static web pages. Web pages are updated using web development tool, and kept in the web server.

3.5 Run Time Requirements:

The run time requirement, the hardware/software requirements for SPOT I.T are as follows:

3.5.1 Server Hardware Requirements

- Server with at least Pentium 166 MHz processor
- 32 MB RAM
- Network Interface Card (NIC) connection with bandwidth 100 Mbps
- Other standard computer peripherals

3.5.2 Server Software Requirement

To host this system, these server software requirements are needed.

Software	Description
Windows 98	Operating system
Personal Web Server	Web server
Microsoft Access	database

Active Server Pages 3.0	Server Scripting Engine
Microsoft Internet Explorer 5.0	Precondition for ASP

Table 4: Client Software Requirement

3.5.3 Client Hardware Requirement

- PC/laptop with at least Pentium 100 MHz processor
- 16 MB RAM
- Network Interface Card (NIC), connection to existing network
- Other standard computer peripherals

3.5.4 Client Software Requirement

- Microsoft Internet Explorer 4.0 or higher.

SYSTEM DESIGN

CHAPTER 4

4.0 System Design

Design phase builds on the knowledge obtained from the analysis phase, it uses the requirements to design a system that will meet user needs. Design focuses on both logical, physical and technical aspects of the system.[1]

Good design is the key to effective engineering. Design is a creative process requiring insight and flair on the part of the designer. It must be practiced and learnt by experience and study of existing systems.

A specification of some kind is the output of each design activity. This specification may be an abstract, formal specification that is produced to clarify the requirements or it may be a specification of how a part of the system is to be realized.

Using the information obtained from the system analysis phase, a new system that will meet user's current and future needs is designed.

The design processes for SPOT I.T are as below:

- System Architecture Design
- System Functionality Design
- Database design
- User Interface Design

4.1 System Architecture Design:

Large systems can be decomposed into subsystems that provide some related set of services .The initial design process of identifying these sub-systems and establishing a framework for subsystem control and communication is called architectural design. The output of the architectural design process is an architectural design document. This consists of a number of graphical representations of the system models along with

associated descriptive text. It should describe how the system is structured into sub-systems and how each sub-system is structured into modules. There is no clear distinction between sub-systems and modules, but it is useful to think of them as follows: [19]

- A sub-system is a system is in owns right whose operations don't depend on the services provided by other sub-systems. Sub-systems are composed of modules and have defined interfaces which are used for communication with other sub-systems
- A module is a system component that provides one or more services to other modules. It makes use of services provided by other modules. It is not normally considered to be an independent system. Modules are usually composed from a number of other simpler system components.

The architectural model used affects the performance, robustness, distribution and maintainability of a system.

SPOT I.T IS not composed of independent sub-systems, it contains modules which interact with one another. The modules can be divided into two, the user module and the administrator module. The functionality of both are discussed below:

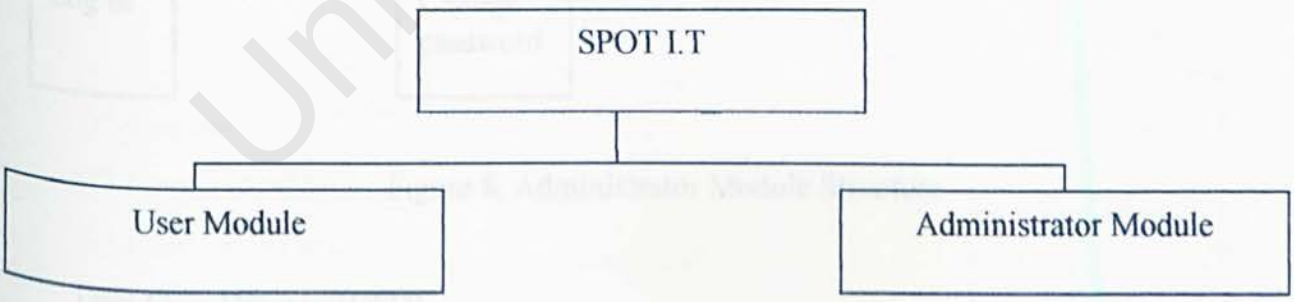


Figure 7:System Architecture of SPOT I.T

4.2 System Functionality Design

- Administrator Module

Administrator module allows administrator to add, edit and delete tables. At the same time it allows the administrator to update web pages. For admin request and complaint sub- modules it allows administrator to give comment and update status on complaint and request attended on. At the same time administrator has to log into the system and be allowed to change password.

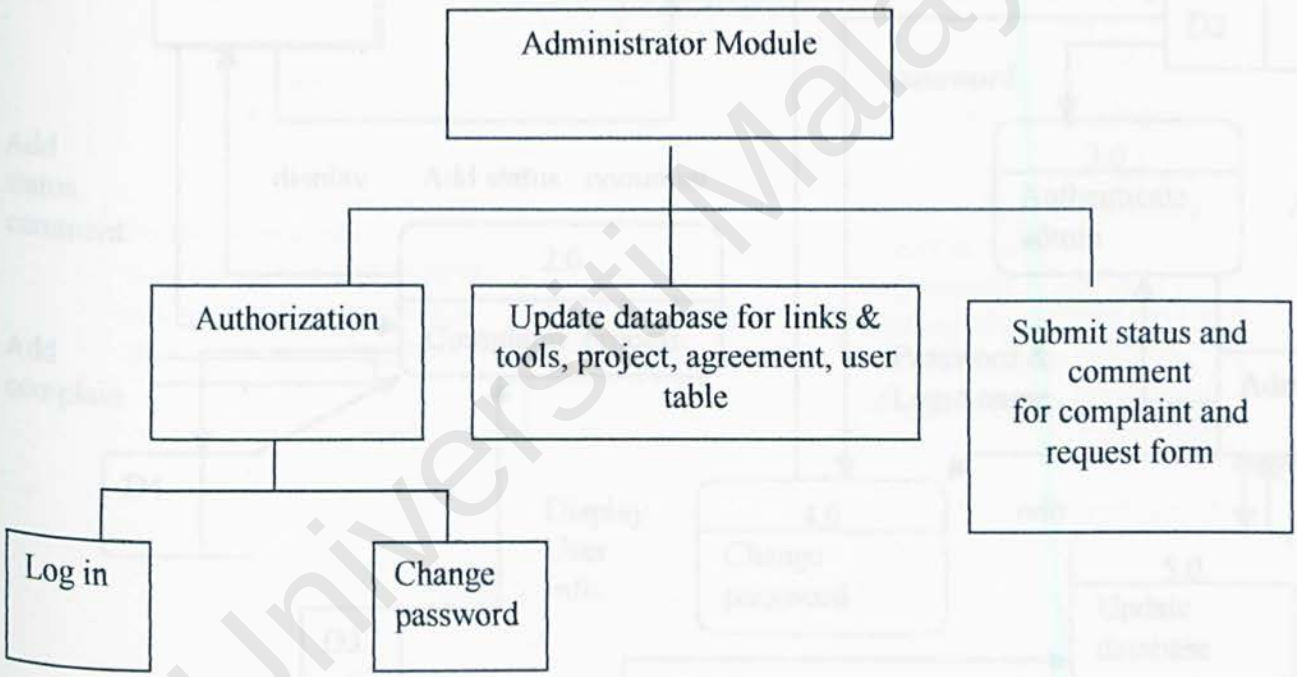


Figure 8: Administrator Module Structure

Data Flow Diagram(DFD)

The DFD for this module is drawn up to the level 0 diagram.

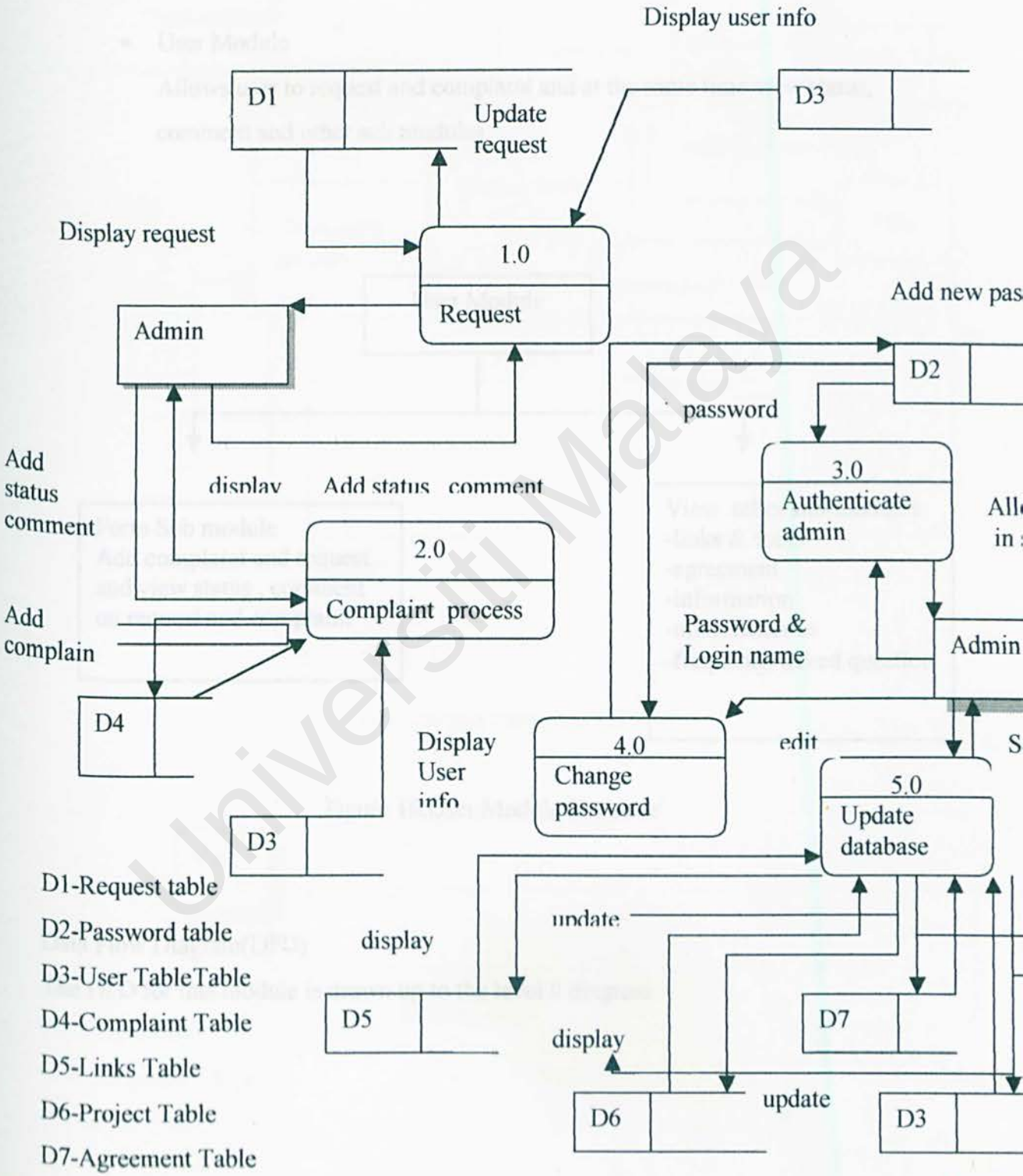


Figure 9:Level 0 DFD for the Administrator module

- User Module

  Allows user to request and complaint and at the same time view status, comment and other sub modules.

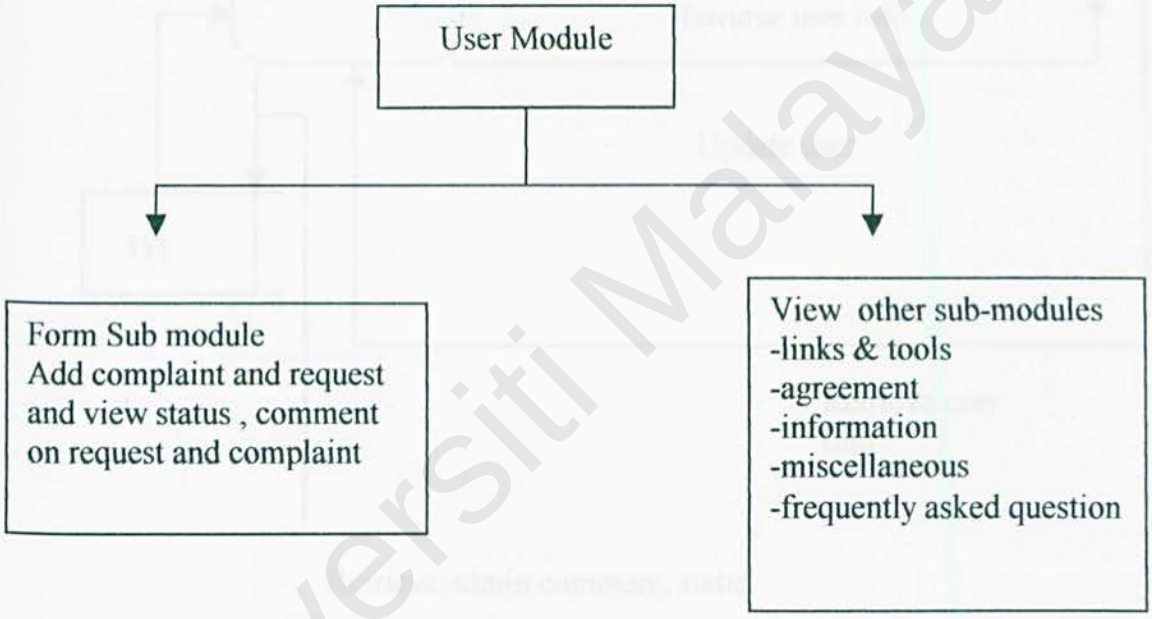


Figure 10:User Module Structure

Data Flow Diagram(DFD)

The DFD for this module is drawn up to the level 0 diagram.

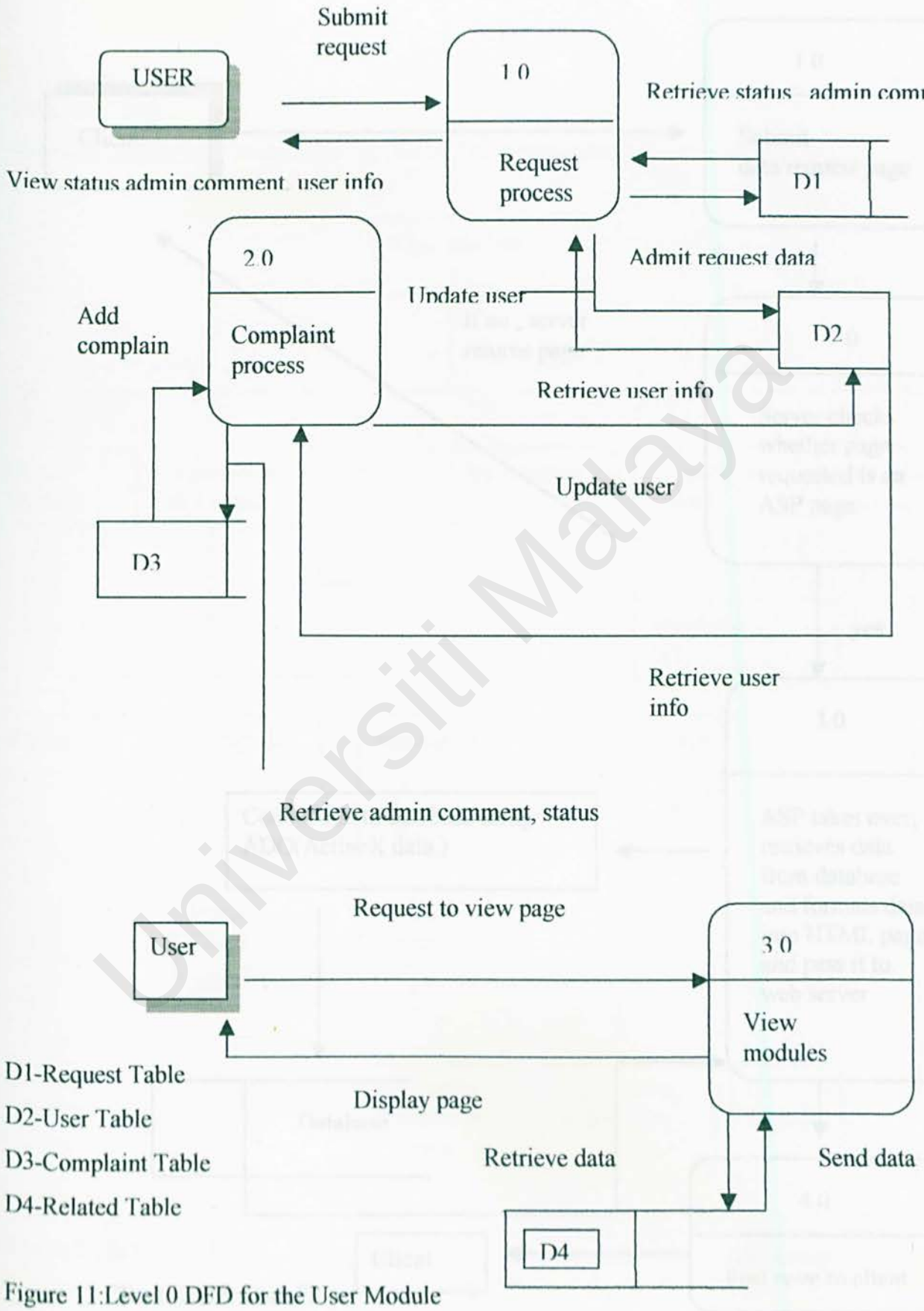


Figure 11:Level 0 DFD for the User Module

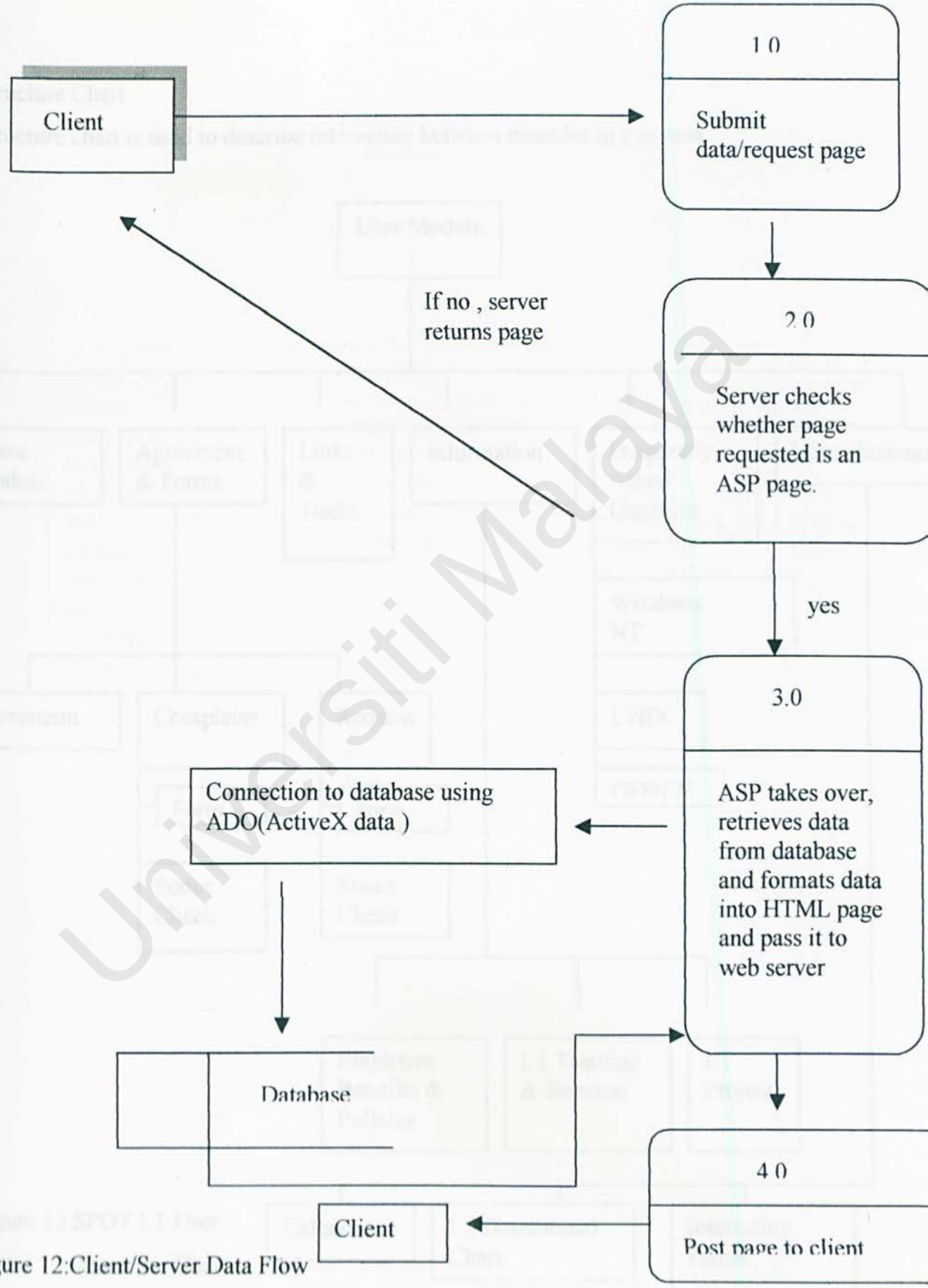
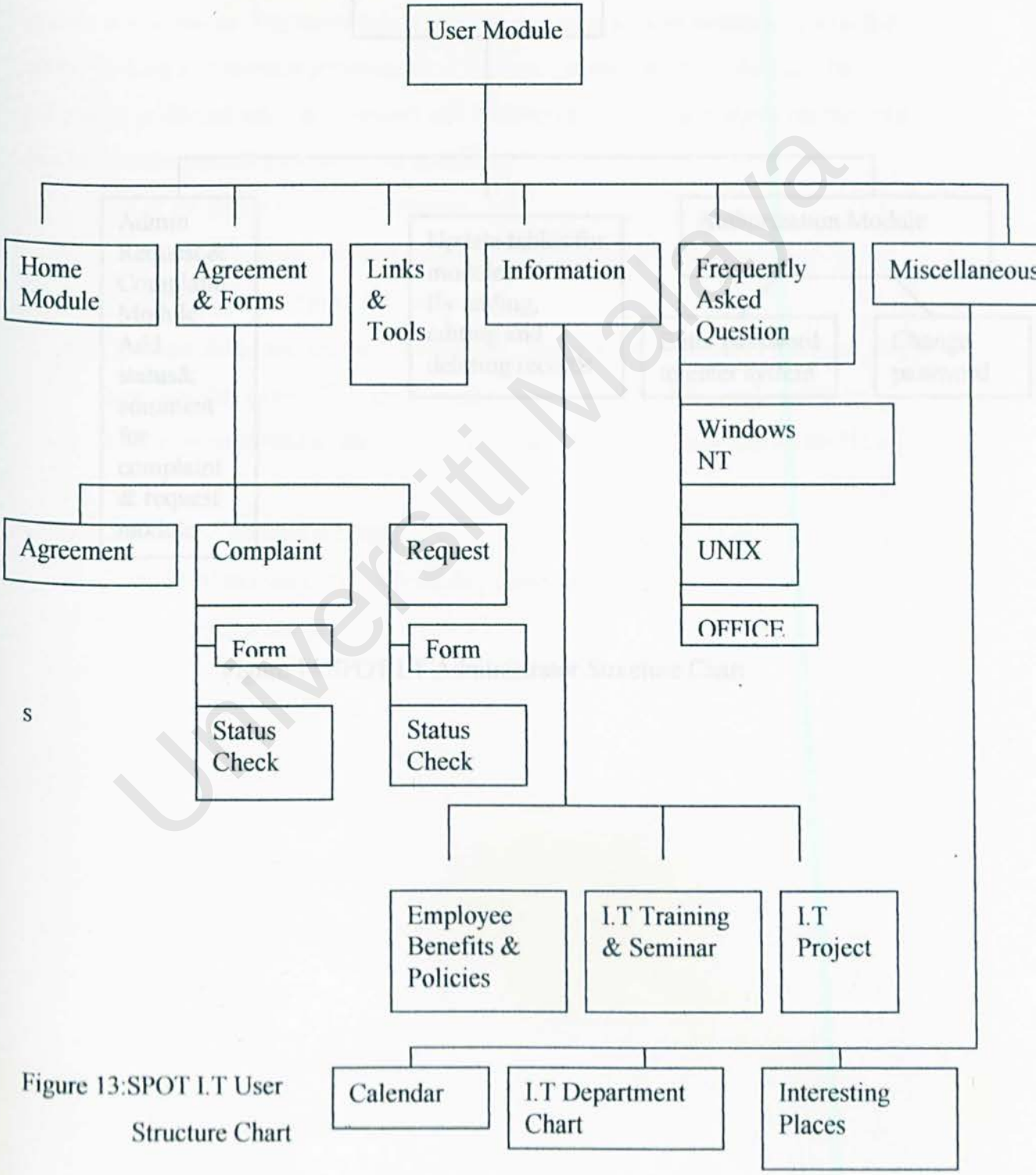


Figure 12:Client/Server Data Flow

Structure Chart

Structure chart is used to describe interaction between modules in a system



s

Figure 13:SPOT I.T User Structure Chart

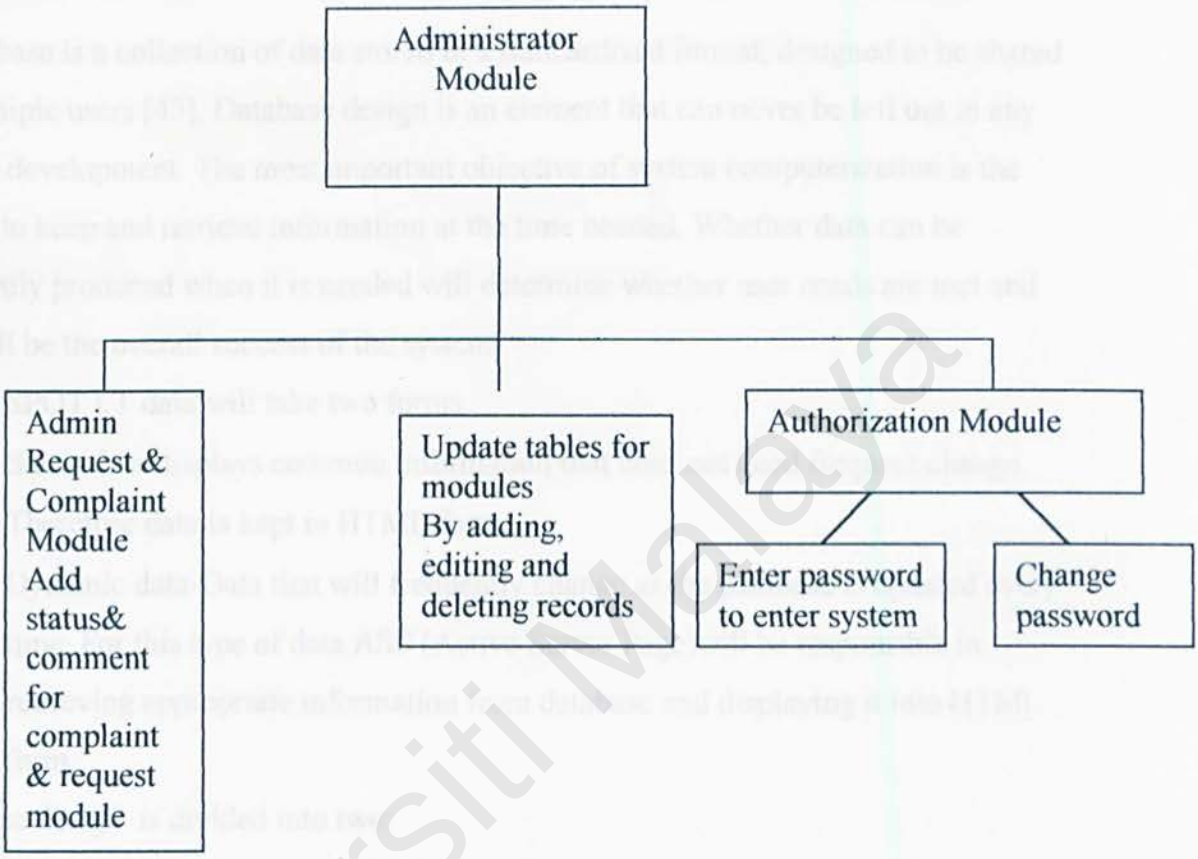


Figure 14:SPOT I.T Administrator Structure Chart

4.3 Database Design

A database is a collection of data stored in a standardized format, designed to be shared by multiple users [43]. Database design is an element that can never be left out in any system development. The most important objective of system computerization is the ability to keep and retrieve information at the time needed. Whether data can be efficiently produced when it is needed will determine whether user needs are met and this will be the overall success of the system.

SPOT I.T data will take two forms.

- Static data-displays common information that does not need frequent change. Therefore data is kept in HTML form.
- Dynamic data-Data that will frequently change as the database is updated every time. For this type of data ASP (Active Server Page)will be responsible in retrieving appropriate information from database and displaying it into HTML form.

Database design is divided into two:

- Conceptual design-entity relationship diagram
- Table structure design.

4.3.1Entity Relationship Diagram for SPOT I.T

- Create an entity relationship diagram to identify the relationship of SPOT I.T entities and therefore it will be easier to design database tables

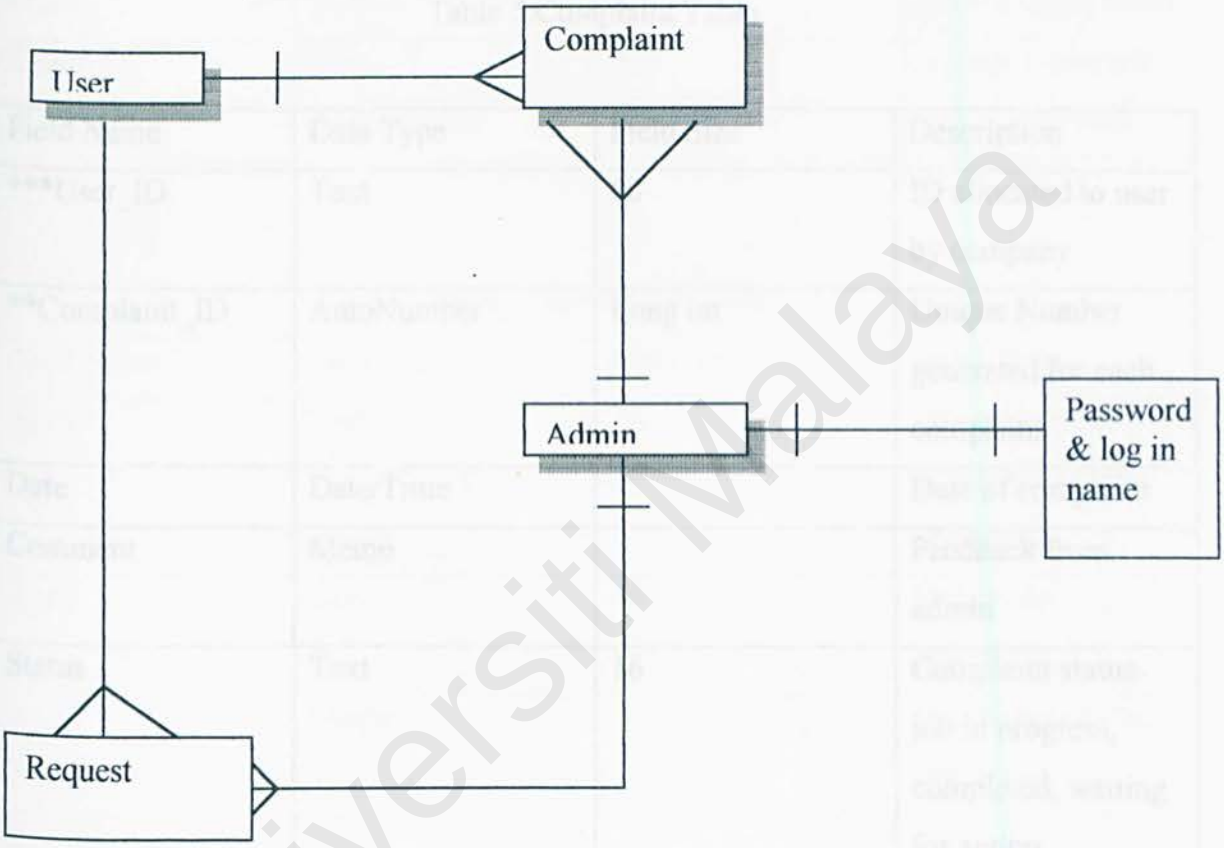


Figure 15:Entity Relationship Diagram for SPOT I.T

4.3.2 Table Structures

Sample tables of database that were designed for SPOT I.T. are included .These designs are subjected to change according to suitability , efficiency and flexibility during system development

Table 5:Complaint Table

Field Name	Data Type	Field Size	Description
***User_ID	Text	50	ID allocated to user by company
**Complaint_ID	AutoNumber	Long int	Unique Number generated for each complaint
Date	Date/Time		Date of complaint
Comment	Memo		Feedback from admin
Status	Text	16	Complaint status- job in progress, completed, waiting for action.
Complaint	Memo		User's complaint

Table 6:Password Table

Field Name	Data Type	Field Size	Description
Login	Text	50	Admin Login name
Password	Text	50	Admin password
**ID	AutoNumber	Long int	Auto Generated

Table 7:Agreement Table

Field Name	Data Type	Field Size	Description
AgrN	Text	50	Unique number generated for each agreement
AgrL	Text	50	Link to the agreement
AgrD	Memo		Description to the agreement

Table 8:Links & Tools Table

Field Name	Data Type	Field Size	Description
**NAME	TEXT	50	Unique number generated for each link& tools
DESCRIPTION	Memo		Description on link & tools
LINK	TEXT	50	Link

Table 9:CoProject Table

Field Name	Data Type	Field Size	Description
**ProjN	TEXT	50	Unique number generated for each agreement
ProjD	Memo		Description on project
ProjL	TEXT		Link to project documents

Table 10: User Table

Field Name	Data Type	Field Size	Description
**User_ID	Text	50	ID allocated to user by company
Name	Text	50	User's name
Location	Text	50	User's location
Department	Text	50	User's department
Contact_Num	Number	10	User's contact number
Mail	Text	30	User's mail address

Table 11:Request Table

Field Name	Data Type	Field Size	Description
***User_ID	Text	50	ID allocated to user by company
**Request_ID	AutoNumber	Long int	Unique Number generated for each complaint
Date	Date/Time		Date request was made
Admin_Comment	Memo		Feedback from admin
Status	Text	16	Request status- request in progress, fulfilled, request rejected, waiting for action.
Request	Memo		User's request

Table 12:UserPassword Table

Field Name	Data Type	Field Size	Description
Login	Text	50	Admin Login name
Password	Text	50	Admin password
**ID	AutoNumber	Long int	Auto Generated

Table13:Calendar Table

Field Name	Data Type	Field Size	Description
**ID	AutoNumber	Long Int	Unique ID
Subject	Text	50	User's name
Message	Text	50	User's location
Day	Text	50	User's department
Month	Number	10	User's contact number
Year	Text	30	User's mail address

**Primary Key

***Foreign Key

4.4 User Interface Design

The user interface of a system is often the yardstick by which the system is judged. An interface that is difficult to use will result in high level of user errors.

The advantages of graphical user interfaces are:[19]

- They are relatively easy to learn and use. Users with no computing experience can learn to use the interface after a brief training session.

- The user has multiple screens (windows) for system interaction. Switching from one task to another is possible without losing sight of information generated during first task.
- Fast full screen interaction is possible with immediate access to anywhere on the screen.

Design principles:

- User interface must take into account the needs, experience and capabilities of the system user.
- Potential users should be involved in the design process.
- Prototyping is essential for user interface development. Prototype should be made available to users and the resulting feedback is used to improve the user interface design.
- Designers must take into account the physical and mental limitations of the users. Need to recognize the limitations on the size of short-term memory and to avoid overloading user with information.
- Interface consistency. System commands and menus should have same format, consistency reduces time of learning. Knowledge learnt in one web page is applicable to other web pages.
- Interface should contain facilities allowing users to recover from their mistakes. These can be of two kinds:
    - Confirmation of destructive actions-If a user specifies an action which is potentially destructive, he/she should be asked to confirm that this is really what is intended before any information is destroyed.
    - The provision of an undo facility-Undo restores system to a state before the action occurred. It is expensive to implement therefore most systems only allow the last command issued to be undone.
- Interfaces should have built-in user interfaces or help facilities

User interface should be user centered (Norman and Draper , 1986).Please refer to the User Manual in Appendix for SPOT I.T screen designs .

SYSTEM IMPLEMENTATION

CHAPTER 5

5.1 INTRODUCTION

The development of SPOT I.T is divided into 2 modules. One is the User module and the other is the Administrator module. Since both modules were independent of each other, the development was done in parallel. Modifications were done to previous proposals of designs and development tools according to suitability, availability and convenience.

5.2 Development Environment

The development environment is very crucial for a project to be successful. In the case of SPOT I.T, the developer had chose to change the environment previously proposed as it was felt the same result can be achieved using a different environment which was more familiar and therefore easier to implement. Since many of us were working on this particular chosen environment , it was possible for information sharing and brainstorming therefore the success rate of this project was higher.

5.2.1 Hardware Requirement

The hardware used to develop SPOT I.T are listed below:

450 MHz Pentium Processor

32 MB RAM

7.85 GB Hard Disk

Other Standard desktop PC components

5.2.2 Software Requirement

5.2.2.1 Software Tools for Design & Report Writing

Many software tools can be used to in designing and report writing. Design involves structure charts and data flow diagrams.

Software Tools	Description
Microsoft Office 2000	Microsoft Word was used to write the report while Microsoft Power Point was used to design data flow diagrams and slide presentations.

Figure 16: Software Tools for Designing and Writing Report

5.2.2.2 Software Tools for Web Development

The Software Tools used for the development of SPOT I.T is as below:

Software Tools	Purpose	Usage Description
Microsoft Windows 98	System Requirement	Operating System (OS)
Personal Web Server 4.0	System Requirement	Web Server Host
Microsoft FrontPage 2000	System Development	HTML editor
Internet Explorer 5.0	System Development	Web Browser
Active Server Pages 3.0	System Development	Coding
Microsoft Access 2000	Database	Data Storage

Figure 17:Software Tools for SPOT IT

5.3 System Development

The development of SPOT I.T involves coding in HTML and ASP. FrontPage was used as the HTML editor. ASP was used to connect the web pages to the database and also validate user input. The developer first designs the forms in FrontPage then the result is viewed on the browser. Since most of the forms involved server side processing, the files had to be placed on the personal web server first from the very beginning of the project.

5.3.1 Web Pages Coding

ASP coding is differentiated from HTML coding by placing the sign <% at the beginning of the coding and the sign %> at the end of the coding. These signs indicate they are ASP codings. The example is given below:

```
<% Response..Write  link%> 'link is a variable
```

We can place HTML codings in ASP codings by placing double quotes at the beginning and ending of the HTML codes.The example is given below:

```
Response.write "<center><b>You Must Enter a Link"
```

We can also place ASP coding within the HTML coding as long as the ASP coding is within <% .....%>

```
<input type="hidden" name="id" value="<%=ID%>">
```

In ASP, the results of one form is sent to either the same page, a different page or a database or stored in a file. Two methods of sending the form is used. One is the POST method where the data is retrieved using Request.form method or the GET method where the data is retrieved using Request.querystring method. In the development of SPOT I.T the post method was largely used. The code 'action' was used to specify where the data is to be sent. The example is given below:

```
Response.Write"<form action='adminpwd1.asp' method='post'>"
```

This is how data is retrieved in another page.

```
name=Request.form("Agreement")
```

The code below is used to validate whether the user has filled up the textbox called name. If it is not filled, the user is redirected to the page before.

```
If IsEmpty(request.form("name"))or Request.form("name")="" then
response.write "<center><b>You Must Enter a Name"
response.write"<form>"
response.write"<input type='button' value='Retry' onclick=history.back()>"
response.write"</form>"
response.end
```

The code below is used to frame the form into table.

```
With Response
    .write"<br><br>"
    .write "<table border=3>"
    .write "<tr>"
    .write StartCell & "Name" & EndCell
```

```
.write StartCell &  name & EndCell
.write"</tr>"
.write"<tr>"
.write StartCell & "Link" & EndCell
.write StartCell  & "<a href=link>" & link & "</a>" & EndCell
.write "</tr>"
.write"<tr>"
.write StartCell & "Description" & EndCell
.write StartCell &  desc & EndCell
.write "</tr>"


 End With
Response.Write "</table>"
```

The code below is used to display data from database in the listbox

```
mydsn="DSN=dsn; uid=rekha;pwd=rekha"
  mysql="Select Employee_ID From User "
   set conntemp=server.createobject("adodb.connection")
   conntemp.open mydsn
   set rstemp=conntemp.execute(mysql)

<Select Name="r">
  <%Do while not rstemp.eof%>

  <option selected><% Response.Write rstemp(0)%></option>
  <%rstemp.movenext%>
  <%Loop%>
</select>
```

5.3.2 DATABASE CONNECTION

In order to make a connection to the database, the ActiveX data Object was used .The database was placed on the server and the Data Source Name (DSN) was configured to point to the database. Following are the steps as to how the DSN configuration is done.

Click on Start, Settings, Control Panel
Click on ODBC Data Sources
Choose System DSN
Choose Add
Select Microsoft Access driver (*.mdb)
Click Finish
Enter a Data Source Name(in this case it is dsn)
Select the database path on the server
Select Advanced to set id and password to the database

Now that we have already configured the Data Source Name. We will have to insert it into our coding where we insert the data into the database. First of all we define mydsn as the data source name. Then we write down the SQL statement used to perform whatever function we want to the database. A connection called conntemp is created. This connection opens the data source and executes the SQL statement

```
mydsn="DSN=dsn; uid=rekha;pwd=rekha"
mysql="Insert Into Agreement(Name, Link, Description) Values ('"
mysql=mysql & name & "','" & link & "','" & desc  & "')"
set conntemp=server.createobject("adodb.connection")
conntemp.open mydsn
conntemp.execute(mysql)
```

5.3.3 Development Tool

Though FrontPage was used as the web development tool, throughout the development of SPOT I.T more reliance was placed on ASP coding and not on FrontPage features.

There was a recommendation from the moderator to use Visual Interdev which better supports ASP coding. Unfortunately the developer was not fulfill his advice as there was some difficulty in connecting to the personal web server using Visual Interdev. The problem:

Though the personal web server (pws) was running, the pws icon didn't want to appear on the taskbar, this resulted in the failure of Visual Interdev and pws connection. Many days were wasted in figuring out this problem. Since time was running out , decision was made to create individual pages of ASP coding in FrontPage and run it on the server. No web project was created, not even in FrontPage.

TESTING

CHAPTER 6

6.0 TESTING

Testing is the process executing a program with the intent of finding errors.

A good test case is one that has a high probability of finding an as-yet undiscovered error.

A successful test is one that uncovers an as-yet undiscovered error.

[Myers, 1979]

6.1Basic terminology *[Pfleger, 1998]*

- A **fault** occurs when a human makes a mistake, called **error**, in performing some software activity
- A **failure** is a departure from system's required behavior
- **Validation** (Are we building the right product?): involves checking that the program meets the expectations of users and customers. Validation is the set of activities that ensures the software has been built according to the customer's requirements.
- **Verification** (Are we building the product right?): refers to the set of activities that ensure the software correctly implements specific functions. Verification involves checking that a program conforms to its specification (from one phase to the next).

6.2Nonexecution-based testing

General ideas:

- the review task must be assigned to someone other than the original author (the same wrong viewpoint can be applied on design and testing stage)
- more outside reviewers are required

Methods:

- Walkthrough: an informal interactive participants or documents-driven process based on discussions. Typically it is two-step process:
    - preparation
    - team analysis (of the document)

6.3Execution-based testing

can be roughly defined, e.g., as follows:

... a process of inferring certain behavioral properties of a product based, in part, on results of executing the product in a known environment with selected inputs *[Goodenough, 1979].*

A behavioural properties can be considered, for example, following characteristics of the product:

- correctness
- utility
- reliability
- robustness
- performance

6.4Testing includes following particular activities:

- unit (module) tests: verification of proper function of particular modules. Frequently used strategies:
    - black box testing:
        - can access only the module interfaces, internal code is irrelevant
        - tests are implementation independent
    - white box testing
        - the code is known and considered during the testing

SPOT I.T- The unit testing was done by compiling the code and eliminating syntax errors. Different types of test cases were used to check the output. For example codes to validate different types of user input were developed after unit testing was done.

- system (integration) tests: check the mutual cooperation of single (properly working) modules. At this stage also performance and other non-functional requirements can be tested. Integration strategies:
    - big-bang: code all modules individually and then put them all together
    - top-down: start to write modules from the top (possible problems with hitherto unknown lower-level functional parts)
    - bottom-up: doesn't provide the big picture

    SPOT I.T-Administrator and User modules were integrated and inputs on the administrator module were tested whether will produce correct outputs on the user module and vice versa.

- acceptance (client's) tests are performed on actual data and in real conditions. When the product has passed an acceptance test, the task of the developers is complete.

    SPOT I.T-Since there are no real users, sample data was used to test whether requirements were fulfilled

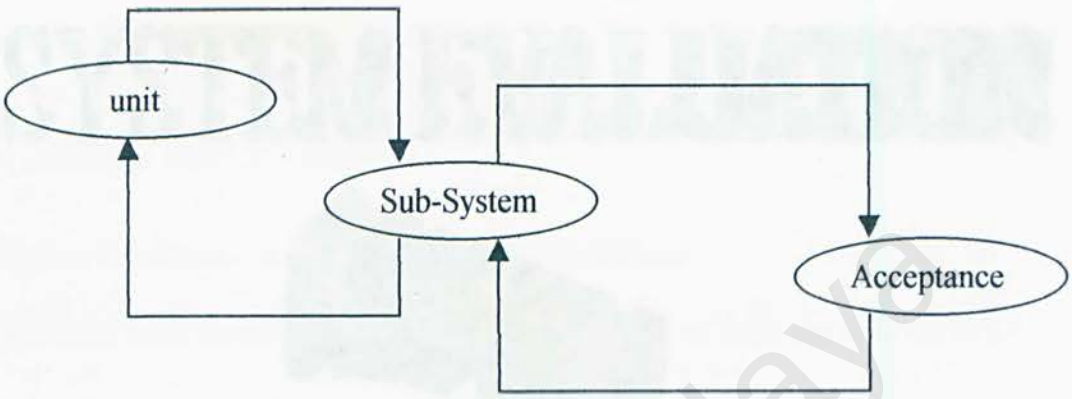


Figure 16 Testing Process

SYSTEM EVALUATION

7.1 Introduction

System Evaluation is the process of identifying the weaknesses and the strengths of a system. In this chapter , not only the developer is going to identify strengths and weaknesses of SPOT I.T but also discuss on the future enhancements that can be made to SPOT I.T and also discuss briefly on the difficulties faced and the steps taken to overcome those difficulties.

7.2 Problems Encountered and Recommended Solutions

Many problems were faced throughout this project. Some of them are enlisted below:

7.2.1 Unfamiliarity of the Programming Language.

Active Server Pages was at first very new to the developer. The capabilities and the features were not known therefore extensive study through books had to be undertaken . This consumed a lot of developer's time. Even studying books couldn't serve its purpose as the terms were new and difficult to understand. Finally surfing the net proved to be more fruitful as some websites provided demonstrations of how codes work for specific purposes.

7.2.2 Web Development Tool Combination

Initially the development package chosen was IIS4.0 as web server, SQL Server as database and Windows NT server as operating system. The developer had wanted to use the faculty server to not only develop the system but also initially learn up the features of the development tools. Unfortunately the faculty was not able to provide the server, instead provided a folder in the server to upload the project from any workstation. This made things more difficult as there was no background knowledge as how this is to be done. Since most of the developer's friends were working on Personal Web Server, there was no resource for reference. Finally, the developer decided to not waste any more time and with the supervisor's permission, went ahead with a different combination of web development tools. These tools include Personal Web Server as web server, Access 2000 as database and Windows 98 as

operating system. This combination was easily available on any pc in the project lab of the faculty.

7.2.3Script Errors

Throughout the project, many script errors arose. Even though the coding was similar as is was in the book, there were still script errors. These errors were able to be overcome by referring to the web. There are many ASP forum sites which concentrates on programmers frequently asked questions. The solutions for these script errors were easily available there. For example, the update sql statement was producing syntax error even though the coding was exactly same as in the book. The problem was due to the enclosing of a number type variable in single quotes. This can only apply to variables of string type and not numbers. Another problem was due to the naming of the fields in the database. Certain names that were chosen ,were Access's reserved words, therefore this also caused errors. Due to the change of field names, the coding of other forms which were already working had to be modified.

7.3 System Strength

7.3.1User Friendly

The pages were designed with simplicity as to not confuse users. Any one will be able to navigate easily through the web pages. Explanations on what certain forms do were given to facilitate users. Users also don't have to spend time keying in their details as the system retrieves their details from the existing company employee database. They only have to key in their id and request/complaint.

7.3.2Pasword Protected

Each user has to register first if he/she is a first time user in order to get a password. This password protection is to disable any user from using another person's id to

make a complaint or a request. At the same time the administrator module is also password protected.

7.3.3Reliable & Effective Error Recovery

The system is able to validate user input effectively. If user forgets to input a value the system will give a friendly message to remind user. If the user fills alphabets where the input should be numbers, the user will also get a friendly message alerting the user. The system is also able to recognize whether a complaint/request id belongs to that particular person, when the person is checking status. This is in order to protect the privacy of the complainant/requestor.

7.3.4Confirmation Pages

The administrator will be asked for confirmation before the system performs any task in order to avoid making mistakes.

7.3.5Database Maintenance

Full authority is given to the administrator to make changes to the database. The database is password protected so that administrator can only have access to it.

7.3.6Easy Accessibility

Since it is web based all the user needs is a web browser and a connection to the network to view the web page, no installation is required.

7.3.7 Database Resourced List box

When the user wants to view a particular agreement, project or link, all they have to do is to select it from the list box. The list box displays records from the database in alphabetical order. Therefore if the item is in the database the user will surely find it. In order to reduce errors while entering values into textboxes, most input boxes were designed as list boxes where user can just select the item needed.

7.4 System Limitation

There are few system limitations, which cannot be prevented, due to the constraint of time and the combination of development tools used.

7.4.1 Limited features

Intranet can cover very large functions in order to achieve maximum benefit. SPOT I.T only covers very minimum and basic functions.

7.4.2Mailing System

Since IIS 4.0 is not used , the mailing facility could not be added to SPOT I.T

7.4.3Browser Capabilities

SPOT I.T was designed to be viewed best in browsers that support frames.

7.4.4 There is No Link Validation

Since the administrator has to enter links as inputs, there is no validation whether the link exists. The validation has to be done by administrator.

7.5Future Enhancement

SPOT I.T can be made to rise to its maximum potential by developing it further more. Some of the enhancements suggested :

7.5.1Include Mailing System

By using IIS4.0 , mailing system can be integrated with SPOT I.T. The users don't need to check their status, the administrator can straight away mail them.

7.5.2Browser Capabilities

SPOT I.T is designed to be viewed only in Internet Explorer 4.0 and above , no tests have been done on other browsers. The design can be tested and modified so that it can be viewed in different browsers.

7.5.3 More Features

SPOT I.T only covers a small portion of intranet benefits. Many other features can be added to extend its potential.

7.5.5 IIS 4.0,SQL Server,Windows NT

This combination can be used to support large and fast data retrieval. Many other positive features of this combination such as security will benefit SPOT I.T

7.6 Knowledge & Experienced Gained

- Gained in-depth information on the role of intranet and its importance in an organization.
- Exposed to fact finding techniques and research methods.
- Gained ability and confidence in designing ,developing, testing and evaluating a system.
- Exposed to a new programming language-Active Server Pages.
- Exposed to usage of SQL queries and database design.
- Exposed to usage of Personal Web Server and Microsoft FrontPage.

7.7Conclusion

On the whole SPOT I.T has achieved its overall requirements as proposed in WXET 3181.Basing on the study conducted, intranets highlights some very positive features. SPOT I.T justifies this in a smaller scale. Through the usage of SPOT I.T ,not only information can be disseminated faster to a large number of people but also it allows two way interactivity. To make requests or complaints , users don't have to call the person in charge .All they have to do is to fill in their request/complaint in the SPOT I.T forms. It is recorded and is sure to get the attention of the administrator. There will be no problem of unattended calls and waste of telephone usage. At the same time users don't have to spend time filling up long details about themselves when making the request or complaint since all their information can be obtained from the already existing company employee database. This is to make things fast and simple. Users also don't need to waste their time finding for files in cabinets, all they have to do is to choose what agreement, project or link they want to view. They were divided into different categories to refine search. Users can also be notified of

trainings or seminars that are happening in the near future. This ensures nobody gets left out. Some other interesting features such as calendar and places of interest were added to make SPOT I.T more interesting.

It is an undeniable fact that the research and development of SPOT I.T has increased awareness and knowledge in the field of system development. This is the first step in utilizing the knowledge that was acquired for the past three years as an Information Technology undergraduate. The programming and software engineering skills have been very helpful in making this project a success.

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