Abstract

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DAS, an abbreviation for Dynamic Attendance System, serve the purpose for Flexi Hour Working System. It is developed to replace the current attendance system, which is not computerized in Guan Seng Stationary Sdn. Bhd. By using this system, the attendance information of all the employees will be automatically recorded. This will reduce the job of administrator and also reduce the cost for paper. This will help to increase quality and accuracy in data keeping, yet provide up-to-date and economical way of information management. More important is this proposed system will provides safeguards to ensure reliability, accuracy and confidentiality of the information.

DAS consists of several modules or sections. Staff module, which enable employees to view their record. Supervisor module, which enable the supervisors to get automatic report weekly and also they will be able to view the report they selected. Administrator module enable administrator to edit staffs' information; for example like adding new employees and also deleting employees. The proposed system will be develop by using Waterfall with Prototyping model.

Tools that are chosen for the system development are Visual Basic .NET, Windows 2000, MS SQL Server 2000, HTML, Microsoft Photo Editor, Microsoft Scheduler, and Internet Information Server.

The Web-based DAS is a kind of office automation, which is developed with the purpose to replace current paperwork used in Guan Seng Stationary Sdn. Bhd. This system is hope to reduce the data storage cost and increase the efficiency of data storage.

ACKNOWLEDGEMENT

In the process of completing this thesis paper, several people have contributed to the success in the compilation of it. Most of all, I would like to thank my supervisor, Encik Noor Zaily Mohammed Noor, for being so dedicated and patient in giving me consultation at any time and providing me with useful knowledge. His encouragement and kindness in helping me throughout the project is deeply appreciated. I would also like to thank my moderator, Mrs. Nornazlita Husin, who has contributed suggestions and ideas to further enhance value of this project. Last but not least, I want to express my greatest gratitude to Mr. Ng, who is working in *Guan Seng Stationary Sdn. Bhd.*. He has given me a lot of explanation about the history of attendance system in his company. Besides, he also provides me with a lot of suggestions and ideas to develop the proposed system, yet improve the functionality of the current system.

Contents

Contents

List of figures

List of tables

Chapter 1: Introduction

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1.1 Overview of Dynamic Attendance system

Dynamic Attendance System is developed to keep up with new idea; Flexi-Working-Hour, which is recently been introduced, to advance and developing countries to comply with the countries hectic life style.

Traffic jam and transportation problems have been major problems in these countries. So Dynamic-Working-Hour is introduced to eliminate this problems altogether. Employees will no longer have to rush to their working places at 8 am and back at 5 pm. Cases of tension or nervous break down will be low thus improving productivity. They could reach their offices at a time that is convenient to them as long as they fill up the certain time required in a week, say, 40 hours a week according to Labor Law.

With Dynamic Attendance System, attendance records of each and every employees of a company will be calculated. Employees will key in their login time and log-out time according to their badge number and also password that will be given to them, in any computer in the working place. They will be able to view their record anywhere even if they are not in the offices. If in a week they did not achieve the intended working hour, automatically, e-mail will be send to their superior informing them of this misbehave. They then could consider what action should be taken against their employees. Decisions making could be make faster without having

to waste time on waiting for the report. Besides that, e-mail will also be send to the employee as a warning to them. Super administrator will be given the authority to delete, add and modify information in the database.

DAS in short is design in such a way that it could be use for all types and all levels of working citizen; executives, offices workers, part-timers, blue-collar employees, white-collar employees and also complex workers.

In my project, Guan Seng Stationary Sdn. Bhd. will be use as a test floor.

1.2 Problems Definition

Employees are part of the company and they determine the ups and downs of a company. So every details of employees should be kept to maintain its' integrity, quality and safety. It will also help in problem solving and decisions making especially when it comes to evaluating the employees.

In the current system, punch card system is use. These are problems that are found in this system:

- ***Waste of resources***

  a) Cost - Volume for documents will increase day after day because Punch Card system uses a lot of paper.

  b) Human resource - Attendance Management team will have to do extra job; calculating working hour manually and gather all the related information to pass to HR department and finance

department and updating to prepare a report for all supervisors.

- ***Inefficient communication***

  Staffs have to travel from one place to another to pass document. For example attendance management team will have to walk from their office to finance department just to pass the relevant document.

- ***Difficult Management and decisions making***

  Managing and controlling attendance task become tougher since it is difficult to view staffs' history records. Decision making regarding employees will be time consuming.

- ***Insecure System***

  Punch card system is not secure. User can easily re-adjust the time of the machine.

- ***Slow overall life cycle***

  No computer usage for attendance system in the whole company.

- ***Employees are not update***

  Employees could not accessed attendance information effectively to check for record of working hour because most of the information has not been calculated.

1.3 Project scope

DAS will be implement in the whole organization for all the staffs ranging from executives to all the employees. This system consist of a few modules:

- Interface and calculation of working hour
- On-line attendance status
- E-mail to supervisors
- Warning mail to employees
- Editing by super administrator
- Change password

To make sure that this system completes successfully, project scope have to be define so that it could be completed in the assigned time. It will cover some of the basic requirement that will fulfill the needs for its' attendance system.

Following are some of the functionality of Dynamic Attendance System:

- Staffs can log in their own attendance and view their personal record
- Supervisors get the report of staffs automatically every Friday through mail
- The administrator can query the information they need
- Super administrator can add, change or delete the data of the staff
- It can be divided into web-based system and stand-alone system
- The system will be able to support the growth and future enhancement
- The system is stable, reliable and user-friendly
- Complexity of the system will be kept to the lowest possible while maintaining the quality of the system.

1.4 Objectives and purposes

Core objectives of the project are as below:

- Enable employees log in and log out by using computer system
- Enable employees to view their record of attendance
- Change the attendance system from Punch Card system to computerize
- Ease the job of HR and Financial Department by automated the whole system.
- Ease the job of administrator in writing report to submit to supervisors.
- Increase efficiency and effectiveness of the attendance system
- Minimize the waste of resources when printing reports and updating records.
- Improve the overall life cycle
- Ensure safety through access control
- Increase quality and speed.

1.5 System's Limitation

In designing this program, a few thoughts come across that might hinder the system. Some of them are:

- Most of the employees do not have a single knowledge of computer. Training will have to be given to them.
- Resources allocated for this system is not sufficient.
- Employees might not be able to accept the drastic change from Punch Card System to Dynamic Attendance System.
- It is difficult to find attendance system to do research on since attendance system is companies' confidential information.

1.6 System's development Scheduling

Before each project can be built, scheduling and activities control have to be done to ensure that the project can be completed successfully. Scheduling is carried out to determine the duration for every phase. It is also to make sure that every phase is completed in the time stated. Control is the usage of feedback to control a project. This includes comparing project plan with real evolution of the project. In other words, control means taking the appropriate measure to reschedule a project so that the project can be completed timely.

Gantt chart is an easy way to schedule a job for a project. It is a chart where each bar shows tasks or activities that will or is going on. Gantt Chart advantage is it is easy to use besides it's bar representation which shows that a particular activities or tasks is carry out on time.

The length of the bar shows relative duration time that is needed to complete a tasks. Figure below is an example of Gantt chart where time is indicated in horizontal dimension and description of activity makes up the vertical dimension. This is the schedule for the system.

Project Scheduling

Task Name	Duration	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Feasibility study	2 wks									
Literature review	3 wks									
Requirement analysis	3 wks									
System design	2 wks									
System prototyping	4 wks									
Development	8 wks									
Testing and maintenance	4 wks									
Documentation	36 wks									
Implementation	3 wks									

Figure 1.1: Project Schedule

Chapter 2: Literature Review

Chapter 2: Literature Review

Literature Review is a section which serves to help the student understand and do research for their project. Thus, the student must locate previous research studies or current situation that have contributed to the field in a theme similar to what their own thesis or dissertation propose.

Attendance system had been a major component in some of the gigantic companies worldwide. With this system, attendance and reports can be managed more efficiently and affectively. Most of the systems that exist in the market now are stand-alone.

Prior to the beginning of organization, attendance system had contributed a lot in making sure that employee's detail are kept correctly. Thus enabling companies to grow with capable human resources.

The first evolution of attendance system was Punch Card System, which was introduced by our Prime Minister, Datuk Seri Dr. Mahathir Mohamad due to the introduction of 'Dasar Pandang ke Timur' to keep record of companies' employees.

Later, with the introduction of computer, management of attendance system is carried out with computer. Basic function was included in the system. This included key-in and key-out. This was added with functions like viewing attendance status, overtime calculation, and application of leaves. On-line system was later introduced to enhance the functionality of attendance management.

2.1 Definition of DAS

DAS is an abbreviation of *Dynamic Attendance System, which* means new attendance system for dynamic hour attendance. The system is used to collect attendance details of each employee of that particular organization.

Some of the functions that it performs are clock in and clock out for employee. Besides that it also automatically send e-mail to supervisors informing them of their subordinates' attendance if they do not accomplished the intended working hour. Employees can also view their status when they perform clock in or clock out. This system also enable super administrator to edit information, in cases where employees forgot to clock in or clock out or to create a new account for new staffs. Warning mail will be send to employees if they do not fill up the stated working hour. Password can also be change by clicking on of the module in the system.

It will be a web based system so that employees can easily view their status where and when they wish to so as to enable them to plan their schedule.

2.2 Review on current attendance system.

2.2.1 Optimum Solutions system

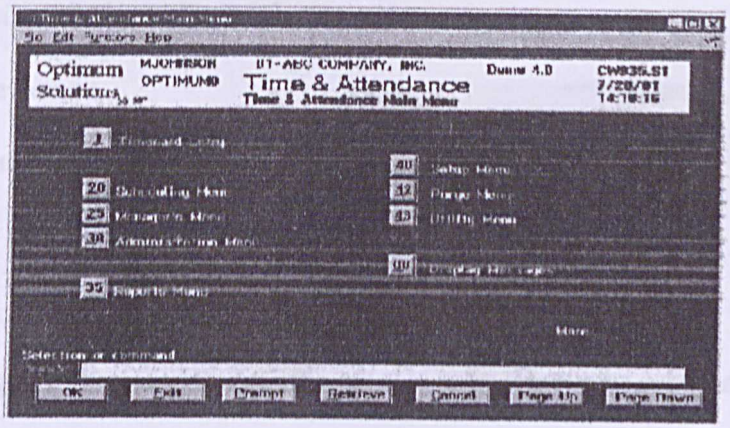


Fig 2.1: Optimum Solutions System

Above is the system that I found on the web site. It is a stand-alone system. Modules that are in this system are:

- Timecard entry

  -This module allows employees to clock in and clock out

- Scheduling menu

  -This module allows user to view their schedule

- Manager's menu

  -Allows manager to approve leave and also work with spool files

- Administration menu

  -Allows administrative to edit information

- Reports menu

  -Consists of a number of sub modules that is use to get different report

- Setup menu

  -Allows users to state their policies

- Purge menu

- Administrative can easily purge the information they need.

- Utility menu

  -Consists of other sub modules

- Display menu

  -This module is to display messages for all the employees.

Strength

- It is tightly integrated to Payroll and/or Human Resources systems.
- Automation of collecting employees' time allows administrator to eliminate the use of time cards.
- Allows administrator to monitor their employees' time, schedule employees, and track attendance through various on-line displays and reports. All reviewing and maintenance is done on-line, so the system is "paper less".
- Reduce error rate due to manually calculating timecards. (From 1% to 7%)
- Elimination of time cards.
- Controlling unauthorized employee time. (Manually totaling and validating timecards takes up to 7 minutes per timecard)

Weaknesses

- Contains too much information that a normal employee should not see.
- Poor site flow design – it takes too many step and long flow of pages to accomplish a single task.

2.2.2 ITAS (Integrated Time & Attendance System)

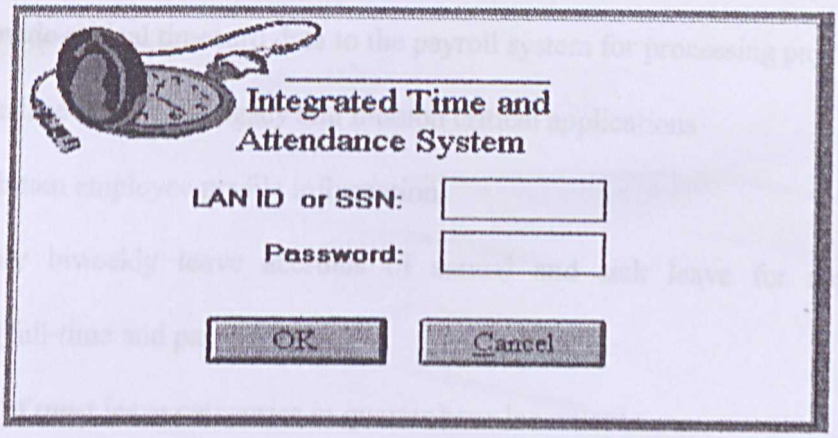


Fig 2.2: Integrated time and attendance system

The Integrated Time and Attendance System (ITAS) is an application that operates under the MS Windows and Macintosh OS environment. The ITAS application supports most aspects of tracking and reporting work hours and leave activity for federal employees. The application was originally developed at the National Science Foundation (NSF).

After an initial rewrite of the software to adapt it to NIH requirements, two initial two small components of the agency, the National Institute for General Medical Sciences and the National Human Genome Research Institute conducted a pilot. ITAS went live at these components in May 1996. In early 1997, NIH decided to implement ITAS for all 18,000 employees.

The major features of ITAS include:

- Capture of sign-in and sign-out data for employees each work day, weekends, and holiday. (optional feature)
- Ensure daily compliance of the Fair Labor Standard Act (FLSA)

- Record advance days or hours of leave
- Provide critical timecard data to the payroll system for processing payroll
- Interface with other legacy and mission critical applications
- Maintain employee profile information
- Apply biweekly leave accruals of annual and sick leave for applicable employees (full-time and part-time)
- Use of most leave categories in quarter hour increments
- Online access to current leave balances
- Calculation of the employee's leave balances real-time
- Support of the Voluntary Leave Transfer Program
- Enforce user level security
- Online leave request and approval with automatic posting to the appropriate timecard upon approval
- Support changes to prior timecards as well as current timecards

ITAS accomplishes the following business objectives:

- Eliminate paper timecards
- Support timekeeping by exception
- Reduce the number of data entry and payroll errors that occur in current systems
- Reduce the amount of time timekeepers were spending to record time and attendance information accurately
- Reduce the number timekeepers needed to record time and attendance information
- Allow better access to more data

2.2.3 Guan Seng Stationary Attendance System

At the moment, computer attendance system does not exist in the company. Current attendance management is using punch card system. Fig 2.3 shows the current attendance system of this company. These are some of the reason why it should change to Dynamic Attendance system:

- The company is expanding
- Using Dynamic Attendance System, all calculations will be computerized and ease Finance Department's tasks.
- Lessen the use of paper.
- Speed up overall life cycle
- Update the employee of their current status
- This system is more secure than current system
- Management and decisions making will be easier

2.2.4 Gamuda Security

This company uses log book attendance system for security guard that are located at different place. In every hour, guards have to write their position and what is the current status of the company under their watch. All the attendance status had to be written on a book especially for this.

This system has the same disadvantage like the previous system; which is the Punch Card system. Besides that, this system is not time conscious. Employee can write in any time they want since no standard time is available and not precise.

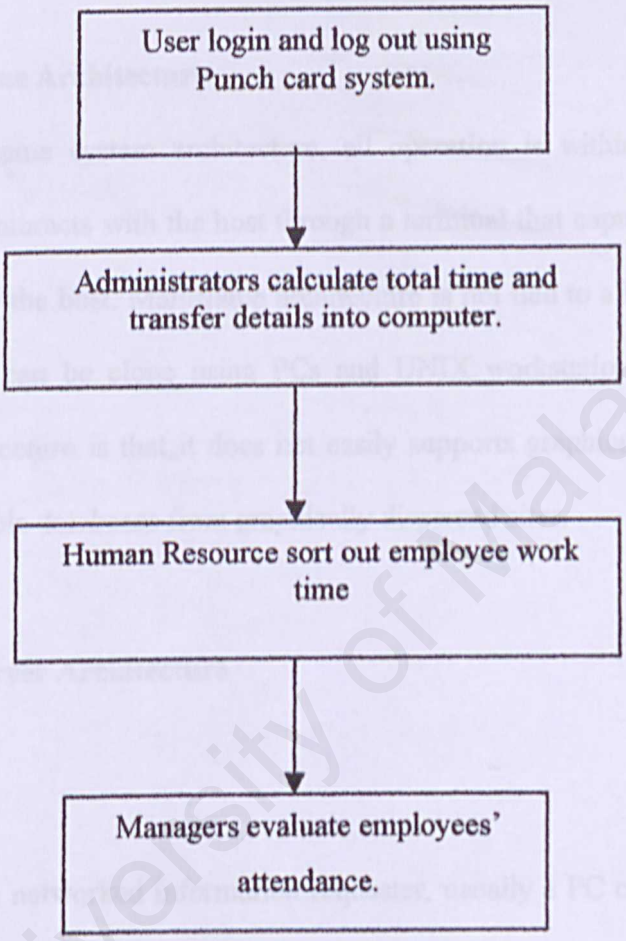


Fig 2.3: Current attendance system in Guan Seng Stationary Sdn.Bhd.

2.3Software Architecture

There are a few software architectures available now: mainframe architecture, client-server architecture, two-tier architecture and three-tier architecture.

2.3.1 Mainframe Architecture

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

2.3.2 Client-server Architecture

Client

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

Server

Server is a computer, usually a high-powered workstation, a minicomputer, or a mainframe, that houses information for manipulation by networked clients. Server is

dedicated to managing disk drives (file servers), database (database servers), printers (print servers), or network traffic (network servers).

Client-server

Client-server is a network architecture in which each computer or process on the network is either a client or a server. Client-server architecture implies a cooperative processing of requests submitted by a client, or requester, to the server, which processes the requests and returns the results to the client. The client manipulates the data and presents the result to the user.

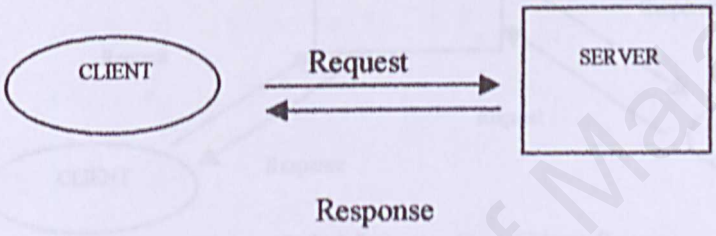


Figure 2.4: One-to-One Client Server

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

2.3.3 Two-Tier Architecture

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

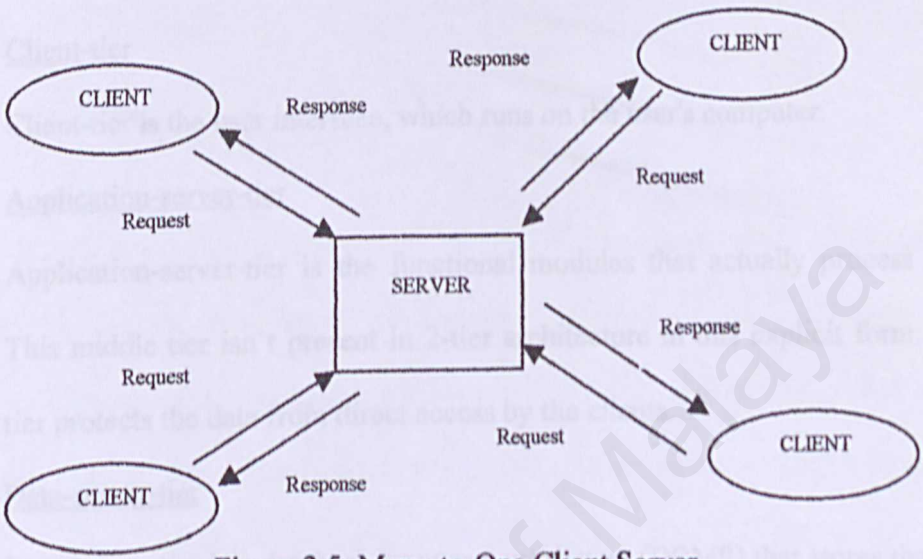


Figure 2.5: Many-to-One Client Server

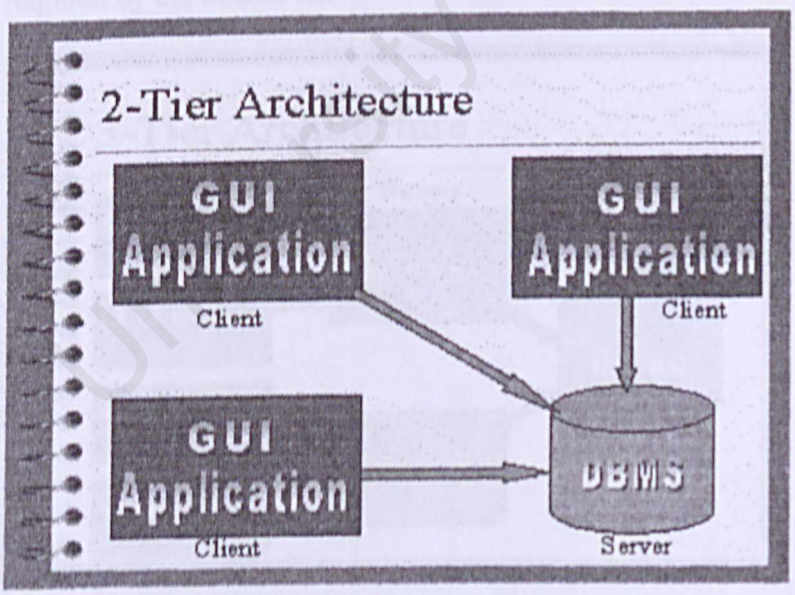


Figure 2.6: 2-Tier Architecture

2.3.4 Three-Tier Architecture

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

The three tiers consist of:

1. Client-tier

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

2. Application-server-tier

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

3. Data-server-tier

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

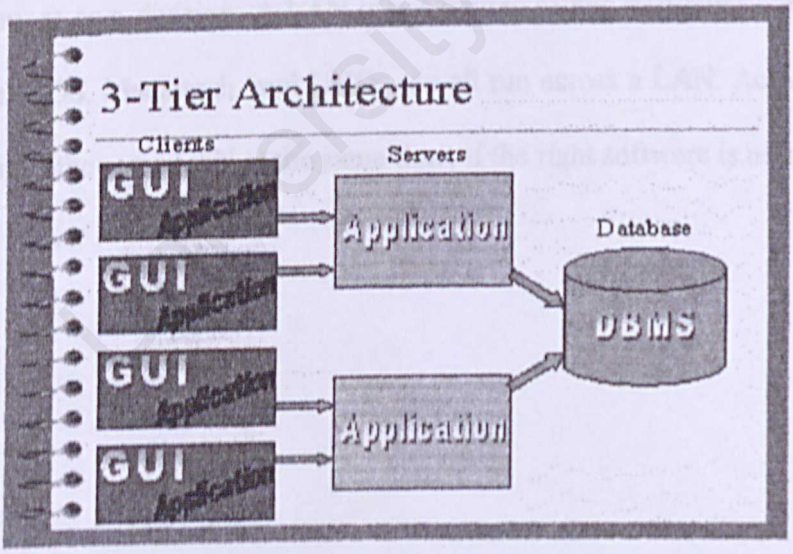


Figure 2.7: 3-Tier Architecture

2.4 Network

A network is nothing more than two or more computers connected together by a cable so that they can exchange information. There is a few types of network can be considered to be used in this project: LAN, WAN, Internet, intranet and extranet.

2.4.1 Local-Area Network (LAN)

A LAN is a connection between two or more computers, which allows users to share files, programs, or data with a minimum of effort. A LAN is usually local; this means that the machines are located in one physical location -- like a building or just one floor of a building. A LAN tends to use just one set of networking options. For example, a LAN generally uses one network operating system, one type of cable, and one logical topology. A LAN is usually set up for a small group of people such as a department or a division. A LAN is not limited to any particular computer operating system. DOS, Macintosh, and UNIX can all run across a LAN. Actually, they can all run across the same LAN at the same time, if the right software is used.

2.4.2 Wide-Area Network (WAN)

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

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

2.4.3 Internet

Internet is a collection of communication networks interconnected across 2 or more LANs or sub-networks. It is a global network connecting millions of computers. More than 100 countries are linked into exchanges of data, news and opinions.

Each Internet computer, called a host, is independent. Its operators can choose which Internet services to use and which local services to make available to the global Internet community.

There are variety ways to access the Internet. Most online services offer access to Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP).

2.4.4 Intranet

Intranet is a term used to refer to the implementation of Internet technologies within a corporate organization. It is a network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access.

Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest-growing segment of the Internet because they are much

less expensive to build and manage than private networks based on proprietary protocols.

2.4.5 Extranet

Extranet is a new buzzword that refers to an intranet that is partially accessible to authorized outsiders. Whereas an intranet resides behind a firewall and is accessible only to people who are members of the same company or organization, an extranet provides various levels of accessibility to outsiders. User can access an extranet only if user has a valid username and password, and user's identity determines which parts of the extranet user can view.

2.5 Security Technology

Security is an important part in developing a web site. Without a good security system, a web site can be hacked and make the user to loose confidence of web site. SSL is considered for securing the transport of information.

2.5.1 Secure Sockets Layer (SSL)

SSL is a security protocol designed to ensure data moving between a browser and a server remains private. In theory, someone could intercept information, such as a credit card number while it is in transit between the browser and the server. One solution to prevent information from being usable if it is intercepted is to encrypt it. The most widely implemented encryption system for the web at present is SSL.

SSL is an open, non-proprietary protocol developed by Netscape Communication. It uses industry, accepted RSA public key cryptography for authentication and encryption. The SSL protocol was designed to provide a data security layer between TCP/IP and application protocols such as HTTP, Telnet, NNTP or FTP. SSL provides data encryption, server authentication, message integrity and optional client authentication for TCP/IP connection.

The advantage of the SSL Protocol is that it is application protocol independent. A "higher level" application protocol (e.g. HTTP, FTP, TELNET, etc.) can layer on top of the SSL Protocol transparently. The SSL Protocol can negotiate an encryption algorithm and session key as well as authenticate a server before the application protocol transmits or receives its first byte of data. All of the application protocol data is transmitted encrypted, ensuring privacy.

2.6 Tools Consideration

Following are the tools that will be considered before the implementation:

- Platform development
- Database management system
- Web server
- Web development technology
- Data access technology
- Others

2.6.1 Platform development

Proper planning had to be made to ensure that no clash happen between applications. Operating system (OS) is a platform that performs basic tasks, such as recognizing input from keyboard, sending output to screen, keeping track of files and directories on disk, and controlling peripheral devices such as disk drives and printers.

Besides that, OS makes sure that different programs and users running at the same time do not interfere with each other. For security, OS ensures that unauthorized users do not access the system. OS provides a software platform to allow application programs run on it.

Thus a few platforms are being considered in this section. The most popular operating systems currently are UNIX, Windows 98, Linux and Windows 2000.

2.6.1.1 UNIX

UNIX is a much older operating system that was created in the late 1960s. UNIX is designed to provide a multi-user, multitasking system for use by programmers. It began as an open source project that became widely used in Universities, scientific labs, and by the U.S. government. The philosophy behind the design of UNIX was to provide simple and powerful utilities that could be pieced together in a flexible manner to perform a wide variety of tasks. Over the years, hundreds of talented programmers contributed their own improvements to Unix making it extremely robust, stable, and fast.

However, UNIX is more difficult to learn and isn't as widely supported as Microsoft Windows 2000.

2.6.1.2 Windows 98

Windows 98 is based on the popular Microsoft Windows 95 Operating System, and is designed for the consumer market. Windows 95/98 were designed for backward compatibility with older DOS and 16bit programs, as well as providing a platform for the newer (back in 1995) 32 bit programs.

Windows 98 works better by making it simple to access the Internet and by providing better system performance along with easier system diagnostics and maintenance. With Windows 98, users' system plays better as well with support for the latest graphics, sound, and multimedia technologies, the ability to easily add and remove peripheral devices with support for Universal Serial Bus (USB), and it also

enables users to watch TV on PC. Besides that, Windows 98 is compatible with more software (including games) and hardware.

2.6.1.3 Linux

Linux has gradually become a popular operating system for Internet/ Intranet serving purposes. With a host of performance enhancements that will benefit Web sites and Internet sites of all sizes, Linux is a stable and high-performance operating system for Internet usage.

Linux has made progress, primarily in functionality important to Internet infrastructure and Web server capabilities, including a greater selection of drivers, easier installation; GUI-based front ends for Web administration and window management.

2.6.1.4 Windows 2000

Windows 2000 is Microsoft's latest version of popular Windows NT Operating System. It is used to run software applications, connect to Internet and intranet sites, and access files, printers, and network resources.

Built on Windows NT® technology and the easy-to-use, familiar Windows® 98 user interface, Windows 2000 Professional gives users increased flexibility. The changes, both fundamental and cosmetic, have made Windows 2000 faster, more reliable, heavier-duty, and easier to use.

The integrated Web capabilities let users connect to the Internet from anywhere, at anytime—giving companies access to host of flexible, cost-effective communications options. User support and administrative staff will particularly appreciate the reliability and manageability enhancements that make desktop management simpler and more efficient. Windows 2000 Professional lets user:

- Work how and where users want.
- Rely on PC to be up and running with enterprise level quality.
- Work the way user did with Windows 98, only much faster. Combine the ease of Windows 98 with the manageability, reliability, and security of Windows NT, at speeds 30 percent faster than Windows 98 on PCs with 64 MB of RAM or more.
- Communicate, share information, and use the Internet quickly and easily.

  With integrated support for Internet-enabled applications, business software developers incorporate the new ways to create and share information made possible by the Internet.

2.6.2 Database management system

Database is a computerized record keeping system [10]. More completely, it is a system involving data, the hardware that physically stores that data, the software that utilizes the hardware's file system in order to store the data and to provide a standardized method for retrieving or changing the data, and finally, the users who turn the data into information.

Databases were created to solve the problems with file-oriented systems in that they were compact, fast, easy to use, current, accurate, allowed the easy sharing of data between multiple users, and were secure. The important thing is that a database allows you to store data and get it or modify it when you need to easily and efficiently regardless of the amount of data being manipulated. For multiple purpose use, not only file system but also database management systems (DBMS) were expected powerful in this sense. The effectiveness of the database include:

- Ensuring the data can be shared among users for a variety of applications.
- Maintaining of the data is accurate and consistent.
- Ensuring that all data required for current and future application will be readily available.
- Allowing the database to evolve the needs of the users grow.
- Allowing the users to construct their personal view of the data without concern the way data are physically stored.

Web-based DAS attendance system is a system, which needs to handle and process a large volume of data. We need an application such as database management system, which can manage and access the data and maintaining its integrity. Database provides numerous advantages over the file-based system management by making it

easier to eliminate most of the system's data consistency, data anomalies and data structural dependency problems.

There are some good points from the perspective of using integrated data as databases [11].

- Decrease the redundancy of data by integrates the data.
- Unnecessary to keep the consistency of redundant data.
- Easier protection from hackers.
- Unnecessary to create the same data for each program.

Some of the databases that are being considered are Microsoft SQL 2000, Microsoft Access 2000, and Oracle 8i.

2.6.2.1 Microsoft SQL Server

Performance, scalability, and reliability are essential, and time to market is critical. Beyond these core enterprise qualities, SQL Server 2000 provides agility to data management and analysis, allowing organization to adapt quickly and gracefully to derive competitive advantage in a fast-changing environment. A complete database and data analysis package, SQL Server 2000 opens the door to the rapid development of a new generation of enterprise-class business applications that can give company a critical competitive advantage. The record-holder of important benchmark awards for scalability and speed, SQL Server 2000 is a fully Web-enabled database product,

providing core support for Extensible Markup Language (XML) and the ability to query across the Internet and beyond the firewall.

Fully Web-Enabled

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

Access to data through the Web will be easy. With SQL Server 2000, user can use HTTP to send queries to the database, perform full-text search on documents stored in database, and run queries over the Web with natural language. Powerful, flexible Web-based analysis is much easier. SQL Server 2000 Analysis Services capabilities are extended to the Internet. User can access and manipulate cube data by means of a Web browser.

Highly Scalable and Reliable

Achieve unparalleled scalability and reliability with SQL Server 2000. With scale up and scale out capabilities, SQL Server meets the needs of demanding e-commerce and enterprise applications.

SQL Server 2000 takes advantage of symmetrical multiprocessor (SMP) systems. SQL Server Enterprise Edition can use up to 32 processors and 64 GB of RAM.

Scale out distributes the database and data load across servers.

SQL Server 2000 achieves maximum availability through enhanced fail over clustering, log shipping, and new backup strategies.

Fastest Time-to-Market

SQL Server 2000 is the data management and analysis backbone of the Microsoft .NET Enterprise Servers. SQL Server 2000 includes tools to speed development from concept to final delivery.

With SQL Server 2000, user can build end-to-end analysis solutions with integrated tools to create value from data. Additionally, user can automatically drive business processes based on analysis results and flexibly retrieve custom result sets from the most complex calculations.

Quick development, debugging, and data transformation is possible with SQL Server 2000. SQL Server 2000 features the ability to interactively tune and debug queries, quickly move and transform data from any source, and define and use functions as if they were built in to Transact-SQL. Users can visually design and code database applications from any Visual Studio tool.

With SQL Server 2000, it is easy to manage databases centrally alongside all enterprise resources. Stay online while easily moving and copying databases across computers or between instances.

2.6.2.2 Microsoft access 2000

Increasingly, users require better tools for finding and managing data. Microsoft Access 2000 meets these demands by focusing on three key areas. First, Access 2000 simplifies the skill set needed to create simple, useful databases with improved interface offers more consistency, plus new features that increase productivity. Second, Access 2000 adds Data Access Pages that let users interact with

data over the Web and maintain live links to a database. Finally, through its support of OLE DB, it can act as a front end to high-end database engines such as Microsoft SQL Server™, making Access 2000 databases more scalable than ever before.

2.6.2.3 Oracle 8

Oracle is a multi-user database. It provides unprecedented ease-of-user and is pre-tuned and pre-configured for today's dynamic workgroup and line-of-bus environment.

Oracle includes a fully integrated set of easy-to-use management tools, full distribution, and replication and web features. Oracle also provides the highest levels of availability through fast fail over, easier management, and zero data loss disaster protection, with Data Guard, the only complete data protection solution available on the market.

Oracle can runs on UNIX, Linux and Windows platform. However, it is expensive and separate licenses are required for each of its database engine.

2.6.3 Web Server

A Web server is a program that serves Web pages upon request. Every Web server has an IP address and possibly a domain name. For example, if a user enters the URL http://www.pcwebopedia.com/index.html in your browser, this sends a request to the server whose domain name is pcwebopedia.com. The server then fetches the page named index.html and sends it to the user's browser. Web servers and browsers communicate using HTTP (Hypertext Transfer Protocol), a simple but effective language for requesting and transmitting data over a network.

Web servers come in various shapes and sizes. They run under a variety of operating systems, have varying levels of power and complexity, and range in price from rather expensive to free. Studies on several web servers will be carried out: Apache, Microsoft Internet Information Server (IIS) and Personal Web Server (PWS).

2.6.3.1 Apache

Apache is a high-end enterprise-level server developed by a loosely knit group of programmers. The original version of Apache was written for UNIX, but there are now versions that run under OS/2, Windows and other platforms. Apache has become the world's most popular Web server. By some estimates, it is used to host more than 50% of all Web sites in the world.

The keys to Apache's attractiveness and popularity lie instead in the qualities listed above and its extensibility, its freely distributed source code, and active user

support for the server. And version 1.3.0, now in official release, is already being touted as the most stable and fastest version of Apache ever.

Among the most notable features are its cross-platform support, protocol support (HTTP/1.1), modularity (API), security, logging, and overall performance and robustness. Apache distributes a core set of modules that handle everything from user authentication and cookies to typo correction in URLs.

2.6.3.2 Internet Information Server (IIS) v5.0

IIS is the best Web server available for Windows. This version, which comes exclusively as part of the Windows 2000 Server operating system, contains many new features along with performance and reliability enhancements.

IIS v5.0 is good as both a first-time Web server for those familiar and comfortable with Windows operating systems, and a high-end server for hosting providers and large corporate installations. It handles the basics well and is better integrated in Windows than previous versions. IIS v5.0 also comes with performance and feature enhancements that will be attractive for mission-critical tasks.

The ideal computer to run IIS on is at least a 200 MHz Pentium with 128 MB of RAM. Organizations should plan on doubling the RAM and CPU speed if they intend to run Advanced Server's clustering, SQL or Transaction services on the same machine as the Web server.

2.6.3.3 Personal Web Server (PWS)

PWS is entry-level/mid-range server for Windows 9x/NT platforms. It is a scaled-down version of the commercial Information Internet Server (IIS) included with the Server edition of Microsoft Windows NT. PWS is a great entry-level Web server that makes it easy to publish personal home pages, serve small Web sites, and share documents via a local intranet.

PWS is one of the best servers available for helping to get users up and running quickly. Wizards are included to guide users through the process of setting up home pages and sharing files, and the PWS administrator reduces the complexity of actually running the Web server itself. Users can also use the familiar Explorer interface or PWS's Personal Web Manager to share directories, start and stop the server, and view Web site statistics.

One of the best uses for PWS is as a platform for testing out Web sites on Windows 95/Windows NT Workstation computers before hosting them on the Internet. This allows users to check the validity of links, scripts, and applications as well as to ensure that the overall organization of the site is functioning correctly.

PWS presents the ability to develop transactional Web applications using the Microsoft Transaction Server. Overall, while most large enterprises will likely bypass Microsoft's Personal Web Server for the high-end Internet Information Server, PWS will remain one of best available options for individuals wanting to serve their own personal home pages and for small organizations needing to host their own Web sites.

2.6.4 Web application

Web-based applications are computer programs that execute in a web browser environment. An example of such an application would be an online store accessed via Netscape Navigator or Internet Explorer. Built on the foundations of the World Wide Web, such applications can be run anywhere in the world at any time and are completely cross platform. Web applications provide a rich interactive environment through which the user can further define their unique online experience.

Regardless of the specific tasks they perform, all web applications do the same things generically. Specifically, all web applications must do the following:

- Get data from a user on the web
- Validate the user's data
- Process that data

ASP.net, Javascript, HTML, PHP, Visual Basic.net and JSP are some of the tools that are under consideration.

2.6.4.1 ASP.Net

Writing dynamic, high-performance Web applications has never been easier. ASP.NET combines unprecedented developer productivity with performance, reliability, and deployment.

ASP.NET helps deliver real world Web applications in record time with easy programming model, flexible language options, great tool support, and rich class framework.

ASP.NET lets users serve more users with the same hardware. Compiled execution, rich output caching, web-Farm session state, and .NET outperforms J2EE improved performance and scalability.

ASP.NET ensures that application is always available to users. Memory Leak, Deadlock and Crash Protection are used to enhance reliability.

ASP.NET takes the pain out of deploying server applications by using "No touch" application deployment, dynamic update of running application, and easy migration path.

2.6.4.2 PHP

PHP Hypertext Preprocessor is an open-source server-side; HTML embedded scripting language used to create dynamic Web pages for e-commerce and other Web applications. In an HTML document, PHP script (similar syntax to that of Perl or C) is enclosed within special PHP tags. Because PHP is embedded within tags, the author can jump between HTML and PHP (similar to ASP and Cold Fusion) instead of

having to rely on heavy amounts of code to output HTML. And, because PHP is executed on the server, the client cannot view the PHP code.

PHP offers excellent connectivity to most of the common databases (including Oracle, Sybase, MySQL, ODBC and many others). PHP also offers integration with various external libraries, which allow the developer to do anything from generating PDF documents to parsing XML.

PHP is the natural choice for developers on Linux machines running Apache server software, but runs equally well on any other UNIX or Windows platform, with Netscape or Microsoft Web server software. PHP also supports HTTP sessions, Java connectivity, regular expressions, LDAP, SNMP, IMAP, COM (under windows) protocols. It also supports WDDX complex data exchange between virtually all Web programming languages.

2.6.4.3 Visual Basic.NET

Microsoft Visual Basic® .NET is the newest, most productive version of the Visual Basic toolset that enables developers to address today's pressing application development challenges effectively and efficiently. Visual Basic .NET enables user to create rich applications for Microsoft Windows in less time, incorporate data access from a wider range of database scenarios, create components with minimal code, and build Web-based applications using the skills user already have.

It is fully object-oriented construct, and also equipped with XML web services that enable us to call components running on any platform. With VB.NET, we build applications more rapidly and deploy and maintain them with greater efficiency.

Powerful Windows-based applications can be built in less time with VB.NET. Build more robust Windows-based applications with less code. Using control anchoring and docking, programmers can build resizable forms automatically without the need for complex resize code. The in-place menu editor enables developers to visually author menus directly from the Windows Forms Designer. And, simplified localization and accessibility expand the reach of your rich Windows-based applications.

Create Web solutions in Visual Basic .NET using the shared Web Forms Designer and HTML Designer. Developers can use Microsoft IntelliSense technology and tag completion, or choose the WYSIWYG editor for drag-and-drop authoring to build interactive Web-based applications using the skills user already have.

Seamless deployment function in Visual Basic .NET, user not only can build applications more rapidly, but user can also deploy and maintain them with greater efficiency. Visual Basic .NET answers your application setup and maintenance problems and makes DLL overwrites a thing of the past with side-by-side versioning, XCOPY deployment, and Web auto-download of Windows-based applications.

Tackle any data access scenario easily with Microsoft ADO.NET and Microsoft ActiveX® Data Objects (ADO) data access. The flexibility of ADO.NET enables data binding to any database, as well as classes, collections, and arrays, and provides true XML representation of data. Seamless access to ADO enables simple data access for connected data binding scenarios.

Improved coding faster and more effectively. A multitude of enhancements to the code editor, including enhanced IntelliSense, smart listing of code for greater readability, squigglies, and a background compiler for real-time notification of syntax errors transform user into a rapid application development

(RAD) coding machine. Enable flexible and simplified data access with Microsoft ADO.NET and Microsoft ActiveX Data Objects (ADO).

2.6.4.4 HTML

Hypertext Markup Language (HTML) in computer science, the standard text-formatting language since 1989 for documents on the interconnected computing network known as the World Wide Web.

HTML documents are text files that contain two parts: content that is meant to be rendered on a computer screen; and markup or tags, encoded information that directs the text format on the screen and is generally hidden from the user. HTML is a subset of a broader language called Standard Generalized Markup Language (SGML), which is a system for encoding and formatting documents, whether for output to a computer screen or to paper.

HTML allows the individual elements on the web be brought together and presented as a collection. HTML isn't the only way to present information on the web but it's the glue that holds everything together. In addition to being a mark-up language for displaying text, images and multimedia HTML provides instruction to web browser in order to control how documents are viewed and how they relate to each other. For simplicity, HTML is a very powerful language. The users can add many functions inside HTML to make it a dynamic HTML. Besides displaying information, they can show database record in the Internet and get response from other users.

2.6.4.5 JSP (JavaServer Pages)

JavaServer Pages™ (JSP) is a web-scripting technology that can mix static HTML content with server-side scripting to produce dynamic output. By default, JSP uses Java as its scripting language; however, the specification allows other languages to be used, just as ASP can use other languages (such as JavaScript and VBScript). While JSP with Java will be more flexible and robust than scripting platforms based on simpler languages like JavaScript and VBScript.

JSP provides a number of server-side tags that allow developers to perform most dynamic content operations. So developers who are only familiar with scripting, or even those who are simply HTML designers, can use JSP tags for generating simple output. Advanced scripters or Java developers can also use the tags, or they can use the full Java language if they want to perform advanced operations in JSP pages.

2.6.4.6 Javascript

Javascript is a scripting language developed by Netscape to enable web authors to design interactive sites. Javascript is different from Java. Although it shares many of the features and structures of the full Java language, it was developed independently. Javascript can interact with HTML source code to enable web authors to spice up their sites with dynamic content. JavaScript is endorsed by a number of software companies and is an open language that anyone can use without purchasing a license. It is supported by recent browsers from Netscape and Microsoft, though Internet Explorer supports only a subset, which Microsoft calls Jscript.

2.6.5 Data Access Technology

DAS will require data access technology to enable communication and access to its various database. A few of the Microsoft Data access strategy and technology is reviewed and considered.

2.6.5.1 Universal Data Access (UDA)

UDA is a high-level specification developed by Microsoft for accessing data objects regardless of their structure. The strategy of Universal Data Access is to assure open, integrated, standards-based access to all types of data, that is from SQL to non-SQL to even unstructured data across a wide variety of applications, from traditional client/server to the web. The main components of UDA are ADO, OLE DB and ODBC.

2.6.5.2 ADO (Active Data Object)

Active Data Object (ADO) is the Microsoft's newest high-level interface for data objects that most applications developers will use.

ADO is designed to eventually replace *Data Access Objects (DAO)* and *Remote Data Objects (RDO)*. Unlike RDO and DAO, which are designed only for accessing relational databases, ADO is more general and can be used to access all sorts of different types of data, including web pages, spreadsheets, and other types of documents.

ADO provides consistent access to data for creating a front-end database client or middle-tier business object using an application, tool, language, or even an Internet

browser. ADO is the single data interface for developers creating 1 to n-tier client/server and Web-based data-driven applications.

2.6.5.3 OLE DB

OLE DB Providers are the data access engines or services, as well as the business logic components that these applications can use in a highly interoperable, component-based environment.

OLE DB is a set of interfaces that are designed to provide data access to *all* data, regardless of type, format or location. It effectively "componentizes" database and related data processing functionality, breaking it up into interoperable components that can run as middleware on the client or server across a wide variety of applications. The OLE DB architecture provides for components such as direct data access interfaces, query engines, cursor engines, optimizers, business rules and transaction managers.

The concept of OLE DB is to explode the database into its basic parts. OLE DB delivers components, external to the database, that provide this typical database functionality in reusable component architecture. And these components, because they are not directly linked to the database itself, can be shared across multiple applications, systems and data stores to provide a higher level, universal interface.

2.6.5.4 ODBC (Open Database Connectivity)

ODBC is a standard database access method developed by Microsoft Corporation. The goal of ODBC is to make it possible to access any data from any application, regardless of which database management system (DBMS) is handling the data. ODBC manages this by inserting a middle layer, called a database *driver*, between an application and the DBMS. The purpose of this layer is to translate the application's data queries into commands that the DBMS understands. For this to work, both the application and the DBMS must be *ODBC-compliant* -- that is, the application must be capable of issuing ODBC commands and the DBMS must be capable of responding to them. Since version 2.0, the standard supports SAG SQL.

2.6.5.5 JDBC

JDBC technology is an API that lets you access virtually any tabular data source from the Java programming language. It provides cross-DBMS connectivity to a wide range of SQL databases, and now, with the new JDBC API, it also provides access to other tabular data sources, such as spreadsheets or flat files.

The JDBC API allows developers to take advantage of the Java platform's "Write Once, Run Anywhere" capabilities for industrial strength, cross-platform applications that require access to enterprise data. With a JDBC technology-enabled driver, a developer can easily connect all corporate data even in a heterogeneous environment.

2.6.6 Others

2.6.6.1 Microsoft Photo Editor

Microsoft photo Editor is used to capture and save some of the pictures that will be use in the web development.

2.6.6.2 Microsoft Scheduler

Microsoft scheduler is one of Microsoft product. It support scheduling based on time and date given stated by developers.

Chapter 3: Methodology

Chapter 3: Methodology

Methodology represents a particular approach or philosophy for building system. One is not better than other; each has its advantages and disadvantages, and there may be situations when one is more appropriate than another [12]. These are several software process models such as Waterfall Model, V Model, Prototyping Model, Spiral Model, Code-and-Fix Model, Evolutionary Development Model, Transform Model, and "Fountain" Model, which prescribe the software development activities in a variety of contexts. Before choosing which model is more suitable, comparisons have to be made. Below are some of the pros and cons of some of the models. This will help in making a wise decision.

3.1 V Model

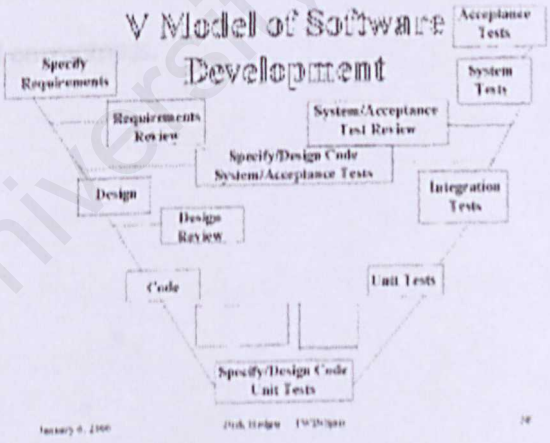


Fig 3.1: V Model

Unit and integration testing addresses the correctness of programs. The V model suggests that unit and integration testing also be used to verify the program design. That is during unit and integration testing, the coders should ensure that all aspects of the program design have been implemented correctly in the code. Similarly, system testing should verify the system design, making sure that all system design aspects are correctly implemented. Acceptance testing, which is conducted by the customer rather than the developer, validates the requirements by associating a testing step with each element of the specification; this type of testing checks to see that all requirements have been fully implemented before the system is accepted and paid for.

The model's linkage of the left side with the right side of the V implies that if problems are found during verification and validation, then the left side of the V can be re-executed to fix and improve the requirements, design, and code before the testing steps on the right side are reenacted. In other words, the V model makes more explicit some of the iteration and rework that are hidden in the waterfall depiction. Whereas the focus of the waterfall is often documents and artifacts, the focus of the V model is activity and correctness.

3.2 Waterfall model

The classic model of software development was the Waterfall model, which considered the process as progressing through a series of stages from requirements analysis through specification, design, coding, testing to documentation and maintenance. Each stage was completed before the next was started. The absence of any significant iteration between the different stages has led to the abandonment of this model. Below are some of the stages in Waterfall model:

a) Requirements Analysis and Definition

System services, constraints, and goals are established. Definitions are understandable by both developers and customers.

b*) System and Software Design*

System design partitions requirements to hardware and software systems. Software design represents functions as a precursor to implementable executable programs.

c) Implementation and Unit Testing

Program units are produced. Each unit is tested to verify that it meets its specification.

d) Integration and System Testing

Program units are integrated into the system. The system is tested to verify that it meets specifications.

e) Operations and Maintenance

Correct undiscovered errors, improve implementation, enhance system services, and modify as new requirements are mandated.

The benefits of the Waterfall Model

- Useful in helping developers describing, what they have done to clients.
- Gives software developers a high level in sight during development process.

The drawbacks of the Waterfall Model

The waterfall model is a very alluring approach because it takes the beeline between specification and launch. But, there are a few major drawbacks to this way of organizing projects:

- Changes during product development are inevitable, costly, time consuming and a source of disagreement between the Web agency and the client.
- No guidance on how to handle changes to products and activities that are likely to occur during development causing the thrashing of development activities.
- Does not reflect the way code is really developed.
- Mask poorly understood requirements with elaborate specifications.

- There are no insights into how each activity transforms one artifact to another, such as requirements to design.
- Fail to treat software as a problem-solving process since it is derived from hardware world, which presenting a manufacturing view of software development.

3.3 Prototyping

But experience has proven that these negative aspects can be overcome by using prototyping to avoid major changes during product development

With prototyping, we can improve the cost efficiency of the development workflow, by allowing client and user representatives to be involved in the process, discover interface problems at an early stage, and thus avoid major overheads on reworks down the line. This up-front investment will pay off in the long run. In the world of software design, it's a common lesson that the costs of changes grow exponentially throughout the development process. It's a rule of thumb that the cost of fixing a problem is 10 times higher during product development, than in the period of prototyping, and 100 times as high after product release.

The value of prototyping

Prototyping can save you both time and money because it's a fast and inexpensive way to concretize, what a requirement specification fails to do. Since prototypes can visualize the product's workings to the client, you can deal with the

shortcomings, misconceptions and disagreements that tend to appear as the product takes form.

The full benefits of prototyping is multiple:

- Prototypes comply with the wish to show fast results to the client
- Prototyping legalizes experimentation and many revisions because it's inexpensive to alter
- Prototypes are easy to grasp because they simulate how the final product will work
- They can work as a common reference, and bring a disparate team together
- Users, developers and the clients will focus on content, structure and functionality, and will not be distracted by the details of graphic design
- Prototypes make it possible to get a formal approval of the design from both programmers and the client before preceding the development stage

Drawbacks of Prototyping

- Standardization--Prototypes, particularly in a high-technology prototyping environment, tend to be shaped by the tools that are available, rather than by users' needs.
- Distraction--Work on the prototype can take attention away from the problems to be solved.

- Seduction--Developers can be trapped in an endless loop of refinement.
- Rejection--If the cost of implementing an idea is too high, ideas will be rejected too early in the cycle.
- Obscured historical perspective--Prototypes tend to lose the reasoning that went into them--why decisions were made, for example, or which requirements led to a set of behaviors or functions.

3.4 Waterfall with prototyping

For this system, waterfall with prototyping model is chosen. This model combines the benefits of both the Prototyping and Waterfall model thus minimizing the drawbacks of each model. Below is the figure model for Waterfall with Prototyping. Each of the steps is from Waterfall with some additional steps such as prototyping, evaluating, and verifying.

Waterfall Model with prototyping consists of eight stages that are depicted as cascading from one to another (see Figure 3.2). Each development stage should be completed before the next begins. The eight stages are:

1. ***Requirements Analysis***

   Understanding and determining users need by having brainstorming, eliciting and analyzing user requirements by having interview, survey or questionnaire session, collecting and specifying all the user requirements and validating requirements.

2. ***System Design***

   Outlining system functional by having feasibility studies or case studies on current system, determining and specifying hardware or software architecture and verifying system design.

3. ***Program Design***

   Determining and specifying program design and database design and verifying program design.

4. ***Coding***

   Involving programming, personal planning, tool acquisition, database development, component level documentation and programming management.

5. ***Unit and Integration Testing***

   Test units separately and integrate the tested units. Then, testing on the integrated units.

6. ***System Testing***

   Combining all the integrated units into a system. Testing on the system. Specifying, reviewing and updating of the system test and validating of system.

7. ***Acceptance Testing***

   Testing on system completed. The system is delivered.

8. ***Operation and Maintenance***

   Control and maintain the system. Revalidating of system.

The system has to be validated and verified during the stage of system testing. The verification is to make sure that the function in the DAS works correctly and to check the quality of the implementation. The validation is to ensure that DAS has implemented all the requirements in the specification.

Prototyping is a sub-process and prototype is a partially developed product or a simple simulator of the actual system to examine the proposed system and overview on the functionalities. A prototype of DAS will be built regarding to the project scope and the analysis of the system before start to built the actual system.

Advantages

Some of the advantages are:

- Useful in helping developers describing, what they have done to client who is not used to software development.
- Gives software developers a high level in sight during development process.
- Show faster results to the client
- Legalizes experimentation and many revisions because it's inexpensive to alter
- Make it possible to get a formal approval of the design from both programmers and the client before preceding the development stage

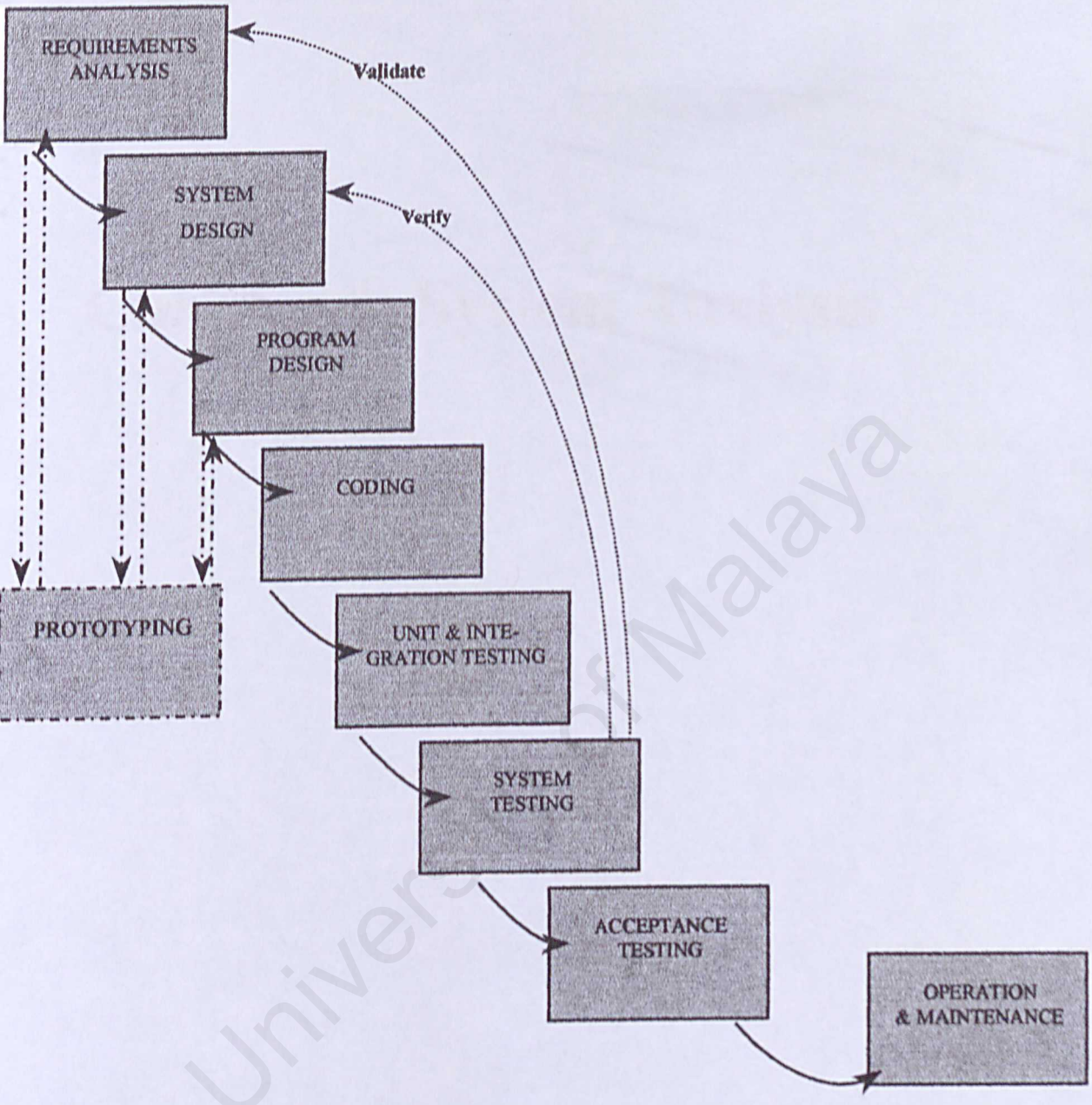


Fig 3.2:Waterfall with Prototyping

Chapter 4: System Analysis

4.1 Requirements gathering

A requirement is a feature of the system or a description of something the system is capable of doing in order to fulfill the system's purpose. First of all requirements will be elicit, then the requirements will be capture in a document or database, the requirements are often rewritten and a verification step ensures that the requirements are complete, correct and consistent.

There are varieties of technique that can be used to determine the requirements of the system or the users. This includes sampling and investigating hard data, interviewing, questionnaires, observing decision-maker behavior and office environment and even prototyping [11]. At this stage, the developer needs to know the details of current system functions about who are involved, what are the activities, where the work take place, when or the timing of the activities and how the current system's procedures are performed.

In order to develop DAS for Guan Seng Stationary, interviewing, library research, and on-line research has been chosen as the information-gathering techniques because the proposed system is strongly related to the current system, on-line implementation, and also users opinion.

4.1.1 Interview

Interview activities have been carried out in order to understand the loopholes and weakness of the current system. Besides, the documents related such as current time card, attendance records and so on. An interview has been conducted with a manager of this company, Mr. Ng who handles the current attendance system. Several questions have been prepared in order to understand the history of attendance in Malaysia and also in Guan Seng Stationary, the objective of this system how is the current system flow or procedure, and advantages and drawbacks of it.

Through the interviewing, positive sign have been observed that this project is encourage by administrator as the paperwork has caused some problems in keeping records, viewing status and collecting the cards. Thus, this project is expected to replace the current system. Thus, opinions and suggestions given by Mr. Ng are needed to develop the proposed system, yet improve the current system.

Reasons to use interviewing

There are several reasons stated as below why interviewing is chosen as an information gathering technique.

- Goals are important information that can be gleaned from interviewing, which is not being able to be determined through any other data-gathering method.
- Able to capture the opinions and feelings of the interviewee in order to understand the current system more deeply.
- Able to discover the key problems and solutions that the department wants to address by seeking opinions rather than facts.

Interview's question types

Proper questioning techniques are the heart of interviewing [11]. The two basic question types are open-ended and closed. Each question type can accomplish different from the other, and each has benefits and drawbacks.

Open-ended questions providing richness of detail as it allowing more spontaneity, revealing avenues of further questioning that may have gone untapped. However, open-ended questions may result in too much irrelevant detail, possibly losing control of the interview and allowing responses that may take too much time for the amount of useful information gained.

Closed questions are an alternative to open-ended questions. It limits the response available to the interviewee. The closed questions are getting to the point, keeping control over the interview, covering lots of ground quickly and getting to relevant data, but it were failure to obtain the rich detail due to the fact that the interviewer supplies the frame of reference for the interviewee.

4.1.2 Library Research

I went to library to search books related to online system and also book regarding attendance system. Libraries that I have been to are UM Library, and some of the public libraries.

Reason to do library research.

Some of the reasons to use this technique are:

- To have a deeper understanding on online system design
- How an online system can be implemented effectively.
- How previous attendance system had been carried out

4.1.3 On-Line Research

Since one of the major software that will be used in DAS is VB.NET, on-line search is important. Some of the search engines that had been used are http://www.google.com, http://www.yahoo.com and http://www.msn.com.

Reason to do on-line Research

Reasons for using this type of research are:

- Most of the software used is new. So, not much information can be found in the library. Alternative ways have to be chosen, for example, on-line research.
- Internet provide an accurate and straight to the point information.
- Save time.

4.2 Requirement analysis

One way to perform problem analysis is to identify people, processes, and resources involved and then document the relationship among them. Requirement analysis covers the area of functional and non-functional requirements of the DAS.

4.2.1 Functional requirements

A functional requirement describes an interaction between the system and its environment. The functional requirements probably can be divided into three categories, which are staff section, supervisor section and administration section as shown in figure below.

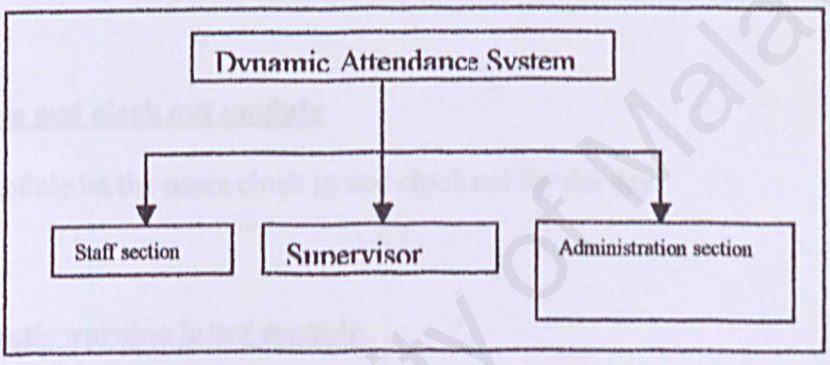


Figure 4.1: Structure of the system

The staff's section is where the staff can access the DAS system, key-in their badge number and password, change password and submit it. After the staffs have submitted the form, the status of their attendance will appear. If they do not complete the required working hour, warning mail will be send to them. Supervisor's section will be the view report, automatically get report, change password and also clock-in and clock out. The Administrator section is basically editing employee information, change password, and also clock in clock out.

4.2.1.1 Functional requirements for staffs

The structure of the Staff's section is shown as below:

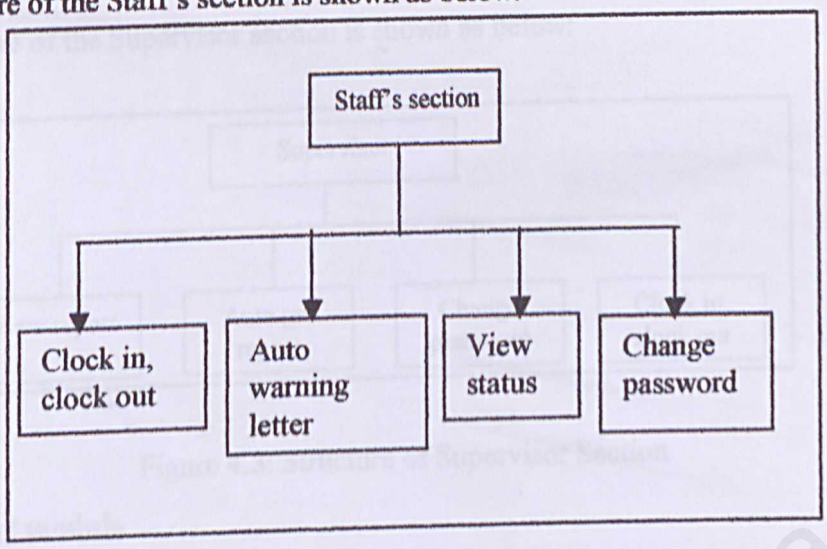


Figure 4.2: Structure of Staff Section

Clock in and clock out module

This module let the users clock in and clock out for the day.

Automatic warning letter module

Warning letter will be automatically sent to users that did not complete the required time needed.

View status

Staffs will be able to view their attendance status after they login the system.

Change password

Staffs are encouraged to change their password from time to time.

4.2.1.2 Functional requirements for supervisor

The structure of the Supervisor section is shown as below:

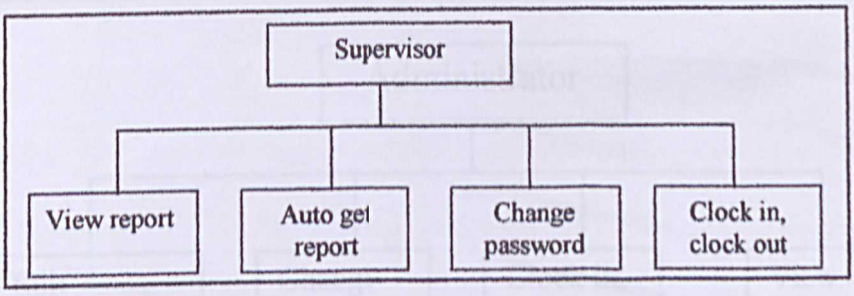


Figure 4.3: Structure of Supervisor Section

View report module

Supervisors will be granted the permission to view report of all the employees.

Automatic get monthly report module

This report only has information about those who did not finish the required hour in a week.

Change password module

Different password will be given to supervisors to enable them to view report.

Clock in and clock out module

Like the staffs, supervisors also have to clock in and clock out.

4.2.1.3 Functional requirements for Administrator

The structure of the Administrator section is shown as below:

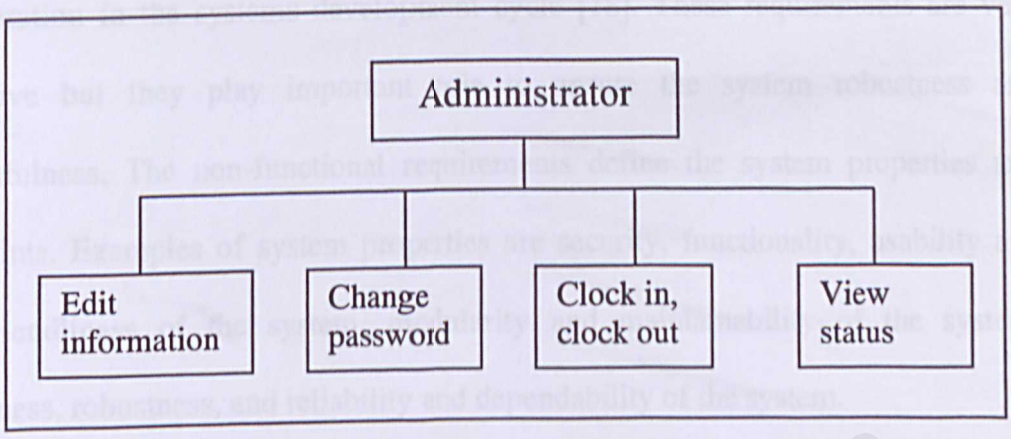


Figure 4.4: Structure of Administrator Section

Change password module

Different password will be given to administrator to enable them to edit information.

Clock in and clock out module

Administrator will have to clock in and clock out. Automatic calculation will be done every week to acquire the accumulated working hour for each employee.

Edit information

Administrator will have the privilege to edit employees' information.

View status

Administrators are able to view their attendance status like other employee.

4.2.2 Non- functional requirements

Non-functional requirements are the other factors that must be taken into consideration in the systems development cycle [18]. These requirements are very subjective but they play important role to ensure the system robustness and successfulness. The non-functional requirements define the system properties and constraints. Examples of system properties are security, functionality, usability and user friendliness of the system, modularity and maintainability of the system, correctness, robustness, and reliability and dependability of the system.

Below are the system property descriptions:

- **Security**

  The proposed system has also security measures to minimize the risk of data exposure to unauthorized people.

  Database will be guarded with password to make sure that it is secure. Besides that upon login user will have to key in their badge number and password. Badge number and password are issued according to their privileges.

- **Correctness**

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

- **Usability and user friendliness**

  The DAS utilizes the Graphical User Interface (GUI). The usage of suitable and meaningful icons will help ensure that users use the system with more confidence and avoid mistakes made by user unintentionally. The system will also display a confirmation message for any non-trivial process such as deletion and data updating. Appropriate prompts and instruction will be shown to guide the user along the operation of the system. The instructions also guide the users while using the system.

- **Modularity and maintainability**

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

- **Reliability and dependability**

  A system is said to have reliability if it does not produce dangerous or costly failures when it is used in a reasonable manner, that is in a manner that instructed by the system. Appropriate messages and prompts were designed to enable user follow step by step easily in using the system. Assumptions were encountered by the system design in order to prevent user acts in an unusual pattern.

- **Robustness**

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

- **Functionality**

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

4.3 Chosen Architecture and Network

For the development of DAS, the architecture that is chosen is three-tier architecture. It support three well-defined and separate processes, each running on a different platform; client tier, application server tier and data server tier.

DAS is designed to run in a local area network, which is in any computer in Guan Seng Stationary Sdn. Bhd.

4.4 Chosen Platform, Web Server, Database and Tools

These are the tools that are chosen for the development of DAS:

a) Windows 2000

b) Microsoft SQL Server

c) Visual Basic.NET

d) Internet Information Server (IIS)

e) Microsoft Scheduler

f) HTML

g) Microsoft Photo Editor

a) Windows 2000

For DAS, Windows is chosen as the development platform. Microsoft's Windows 2000 is built to work with a series of microprocessors from the Intel Corporation that share the same or similar sets of instructions.

The main reason for choosing Microsoft's Windows 2000 as the development operating system is because most of the computers in Guan Seng Stationary Sdn.Bhd. are installed with Windows 2000. Therefore, the implementation of the new system can be done easily and effectively.

Besides that, Windows 2000 are more popular and easier to use compare to other operating system.

b) Microsoft SQL Server 2000

Nevertheless, as SQL Server also incorporates a world-class feature set for distributed client-server computing, therefore it is still chosen as database management system as it is strongly believed that customers who use SQL Server will enjoy benefits in these key areas:

i) Reliable distributed data and transactions

ii) Centralized control of distributed servers

iii) Very high performance and scalability

iv) Support for very large databases

Advantages of SQL Server 2000:

i. Scalability

SQL Server provides powerful support for large database and complex queries. It is scalable from laptop to multiprocessor clusters to accommodate terabytes of data and thousands of users.

ii. Internet, Intranet and Commerce

SQL Server is very important in Internet, Intranet and electronic commerce strategy due to its cutting-edge features and seamless integration with Microsoft Windows NT and Microsoft BackOffice. Furthermore, the Web Assistant enhances the SQL Server Assistant to easily generate HTML and WML files from SQL Server data. It also supports Internet database integration and allows the users to automate the publishing of database

information in the HTML documents, built active web sites and conduct the processes on the Internet.

iii. Desktop, Mobile and Distributed System

A single code base for all platforms, which from a laptop running Windows 2000 to clustered systems running Windows NT Server is provided by SQL Server. It enables employees and customers the ability to work with data reliably from everywhere.

iv. Ease of Use

Features provided by SQL Server ensure easy-to-use for database administrators in building, managing and deploying business applications. For example, the Dynamic Self-Management automates many routine tasks. Besides, the profiling and tuning tools also help to simplify the process of finding the process of finding and fixing database problems by capturing and replaying server activity.

v. Data Warehouse

The data transformation services make it easy to import, export and transform heterogeneous data using OLE Database, Open Database Connectivity (ODBC) or text-only files. In other words, automatic distributed update capability across two or more SQL is enabled. Furthermore, the repository integration and the Open Information Model help integrate and share meta-data about SQL Server database, Online Analytical Processing

(OLAP) and Data Transformation Services. Besides, referential integrity and quick operation recovery due to numerous failures are maintained.

c) Visual Basic.NET

Microsoft Visual Basic.NET is the most advanced and productive version of the Visual Basic that comprises of a few quality that make it the choice for developing DAS.

i) Powerful Windows-based Applications in Less Time

DAS can be build with less code. Using control anchoring and docking, resizable forms can be build automatically without the need for complex resize code. The in-place menu editor enables developers to visually author menus directly from the Windows Forms Designer. And, simplified localization and accessibility expand the reach of DAS rich Windows-based applications.

ii) Web-based Applications

Web solutions can be created in Visual Basic .NET using the shared Web Forms Designer and HTML Designer. Microsoft IntelliSense technology and tag completion, or the WYSIWYG editor can be use for drag-and-drop authoring to build interactive Web-based applications using the skills that already have.

iii) Seamless Deployment

Applications can be build more rapidly, and also be deploy and maintain with greater efficiency. Visual Basic .NET answers application setup and maintenance problems and makes DLL overwrites a thing of the past with side-by-side versioning, XCOPY deployment, and Web auto-download of Windows-based applications.

iv) Flexible, Simplified Data Access

Data access scenario can be easily tackle with Microsoft ADO.NET and Microsoft ActiveX® Data Objects (ADO) data access. The flexibility of ADO.NET enables data binding to any database, as well as classes, collections, and arrays, and provides true XML representation of data. Seamless access to ADO enables simple data access for connected data binding scenarios.

v) Improved Coding

Improved coding faster and more effectively. A multitude of enhancements to the code editor, including enhanced IntelliSense, smart listing of code for greater readability, squigglies, and a background compiler for real-time notification of syntax errors transform DAS into a rapid application development (RAD) coding machine. Enable flexible and simplified data access with Microsoft ADO.NET and Microsoft ActiveX Data Objects (ADO).

d) Internet Information Server (IIS)

Internet Information Server (IIS) is a group of Internet servers (including a Web or Hypertext Transfer Protocol server and a File Transfer Protocol server) with additional capabilities for Microsoft's Windows NT and Windows 2000 Server operating systems. IIS is Microsoft's entry to compete in the Internet server market that is also addressed by Apache, Sun Microsystems, O'Reilly, and others.

With IIS, Microsoft includes a set of programs for building and administering Web sites, a search engine, and support for writing Web-based applications that access databases. IIS is tightly integrated with the Windows NT and 2000 Servers, which resulting in faster Web page serving.

IIS includes security features and it is easy to install. It works closely with the Microsoft Transaction Server to access databases and provide control at the transaction level. It also works with Microsoft's Netshow in the delivery of streaming audio and video, delayed or live.

e) Microsoft Scheduler

Microsoft Scheduler will be use to schedule automatic warning mail and also automatic weekly report. The mail will be generated every week to sent to specific employees and also supervisors.

f) HTML

HTML is supported by Visual Basic.NET makes it the perfect tools for the development of DAS. HTML allows the individual elements on the web be brought together and presented as a collection. HTML provides instruction to web browser in order to control how documents are viewed and how they relate to each other.

h) Microsoft Photo Editor

Microsoft Photo Editor is tightly integrated with Windows. That makes it easy to coordinates. Besides that, it is easy to use and can be easily implement into DAS system.

4.5 Hardware requirements

- Processor (at least Pentium IV 800 MHz)
- Memory (512 MB)
- Hard disk space at least 70 MB
- Monitor
- Mouse
- Keyboard
- CD-R and CD-RW
- Scanner
- Printer
- CD-ROM drive
- Diskette

Chapter 5: System Design

Chapter 5: System Design

5.1 Introduction

System Design is a phase of the waterfall that the entire requirements for the system are translated into system characteristics. The requirements for system are regarding to the analysis that had been discussed in the previous chapter. System design includes the following issues:

- Network Design
- System Functionality Design
- User Interface Design
- Database Design

5.2Network Design

The design of the network setup is important. The DAS only allows LAN users to access the application. The remote users are unable to access the application. The connection between the user desktop and the web server is linked with the Internet facilities. The entire connection is connected with TCP/IP protocol. There are two servers, which is the primary server, and also secondary server.

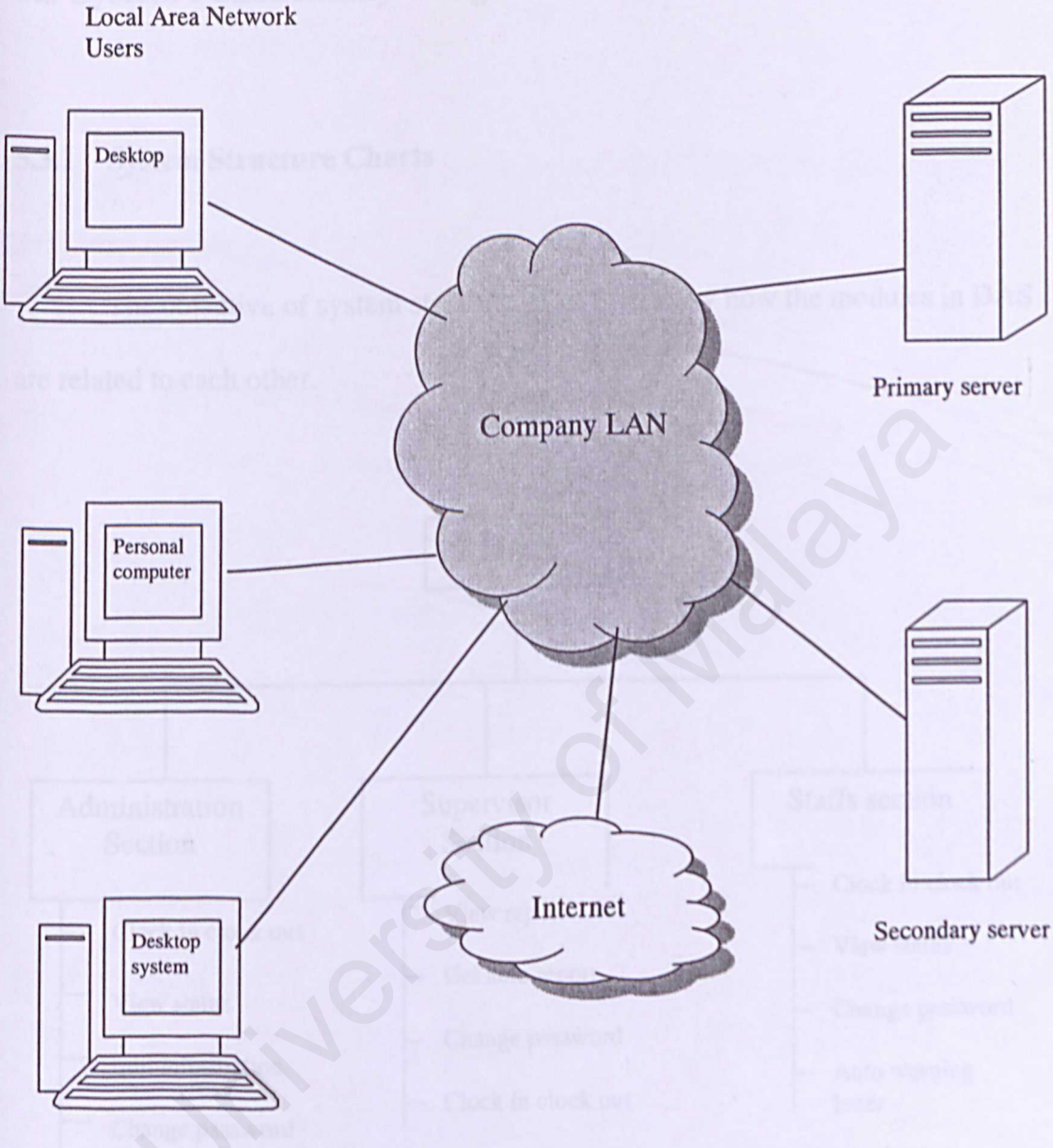


Fig 5.1: DAS Network Setup Design

5.3 System Functionality Design

5.3.1 System Structure Charts

The objective of system structure chart is to show how the modules in DAS are related to each other.

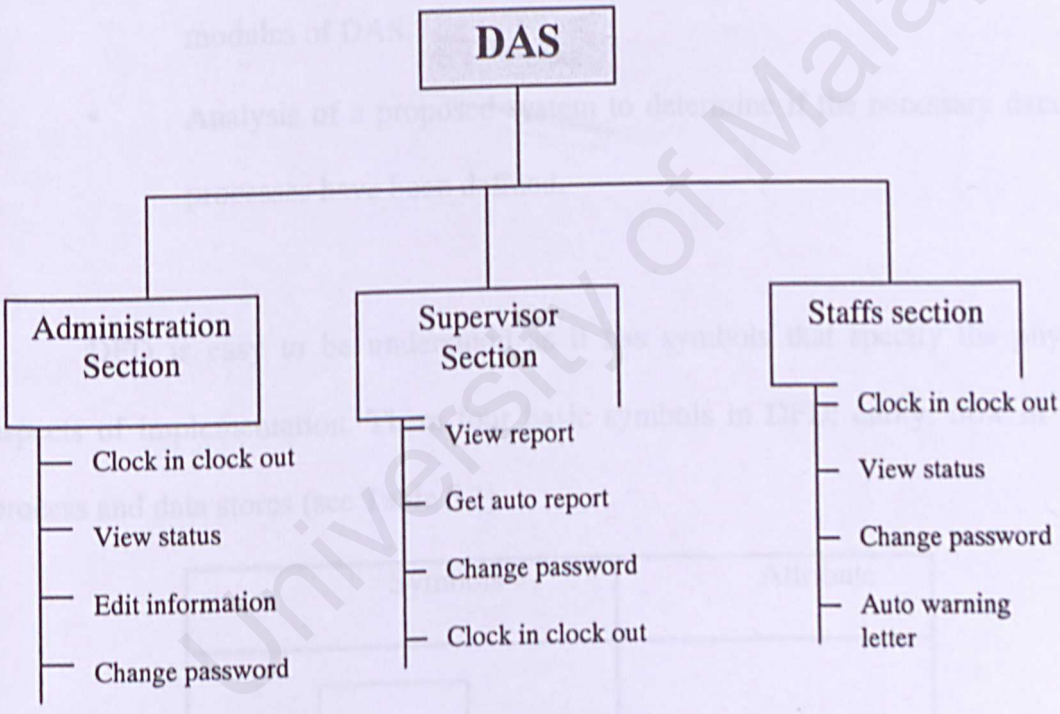


Figure 5.2: Structure Chart for DAS

DAS consists of three major parts, which are the Administration Section, the Staff Section and the Supervisor Section. Basically, the Administration Section is to let administrator edit employees' information. On the other hand, the Supervisor Section is to let supervisors view record and receive automatic monthly report.

Finally, the Staff Section lets staffs receive warning mail and to access and to use the system as the end-users.

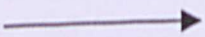
5.3.2 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is a method used to graphically characterize data processes and flows in DAS. DFD will depict the overview of the system inputs, process and outputs.

The advantages of using DFD are:

- Further understanding of the interrelatedness of modules and sub modules of DAS.
- Analysis of a proposed system to determine if the necessary data and processes have been defined.

DFD is easy to be understood as it has symbols that specify the physical aspects of implementation. There four basic symbols in DFD: entity, flow of data, process and data stores (see Table 5.1).

Symbols	Attribute
	Entity
	Flow of Data

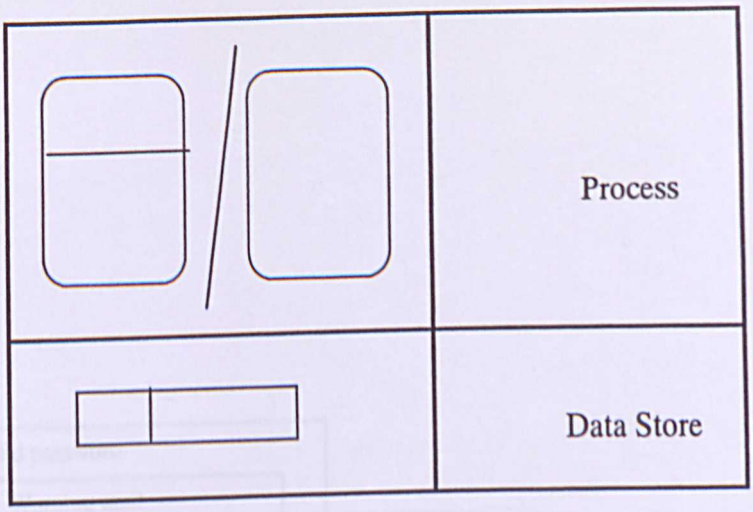


Table 5.1: DFD Symbols

The convention, which is used to design DFD are based on the work by C.Gane and T.Sarson. The data flow is conceptualized with a top-down perspective. So, the Context Level Diagram will be drawn, followed by the Diagram 0. Diagram 0 is an overview process of all the major modules in DAS that includes all the data stores, entities and process involved.

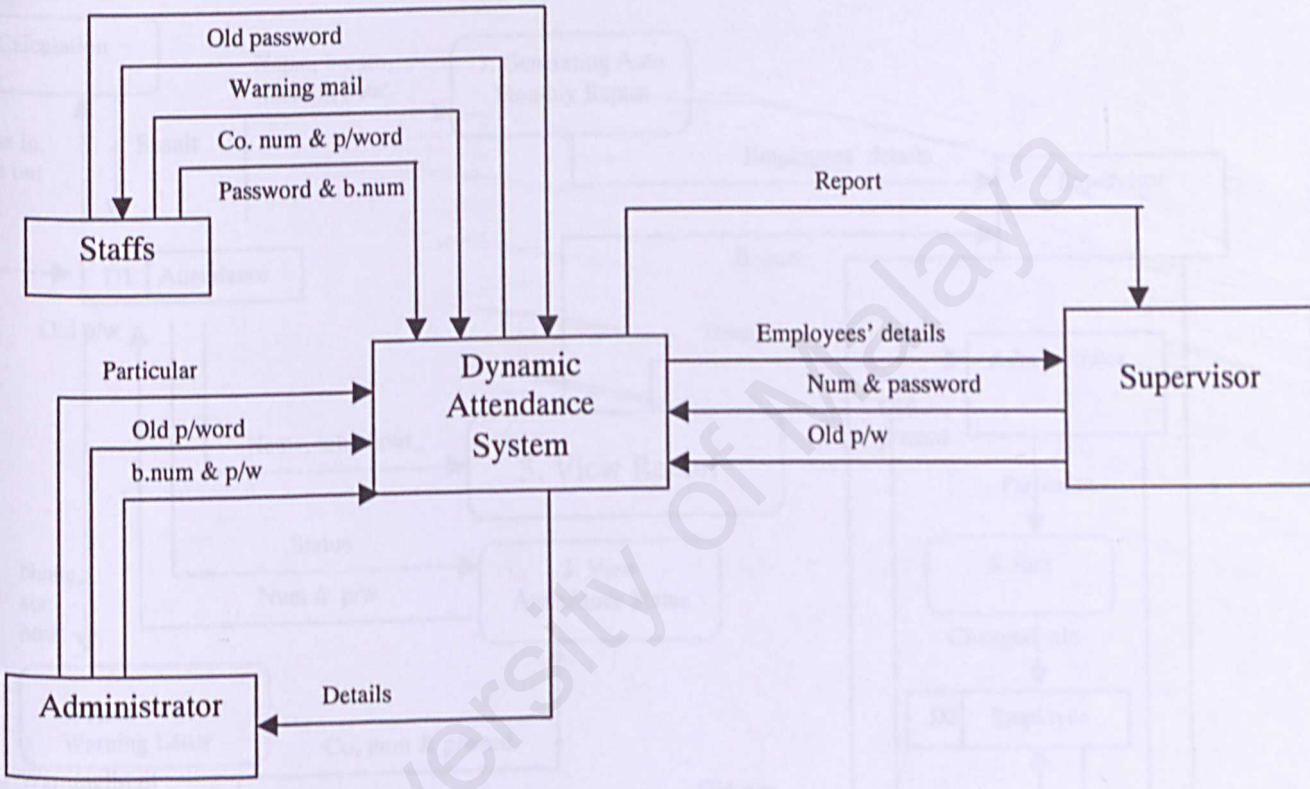


Figure 5.3: Context Level Diagram of DAS

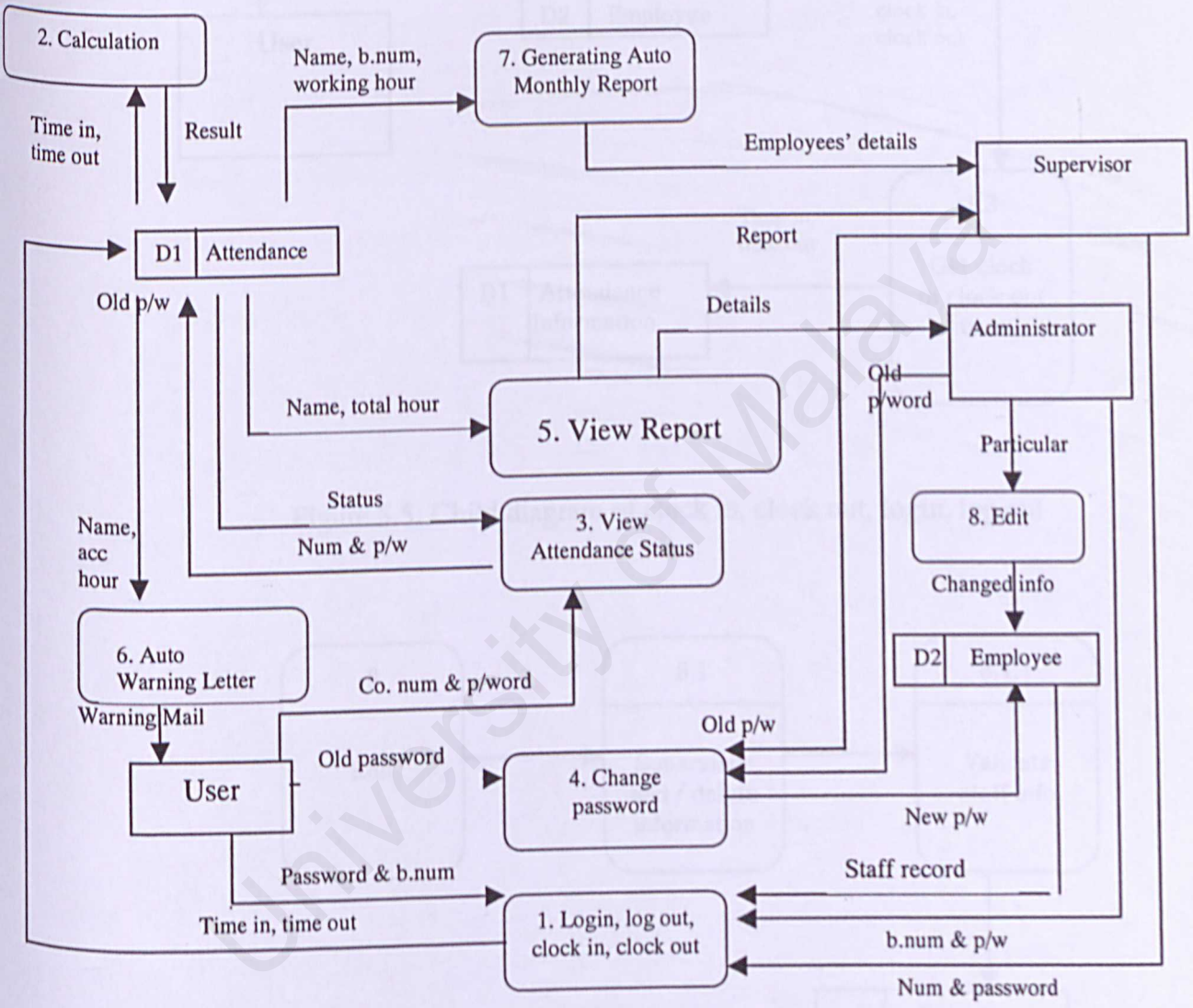


Figure 5.4: Diagram 0 of DAS

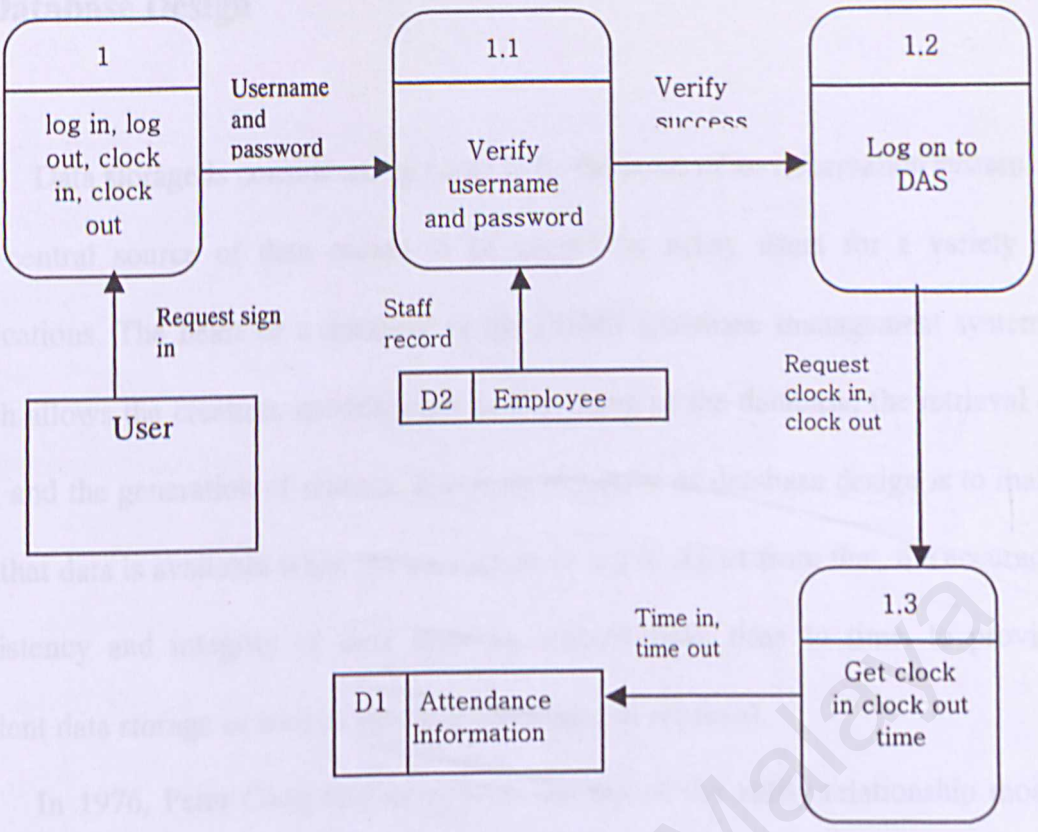


Figure 5.5: Child diagram of clock in, clock out, login, log out

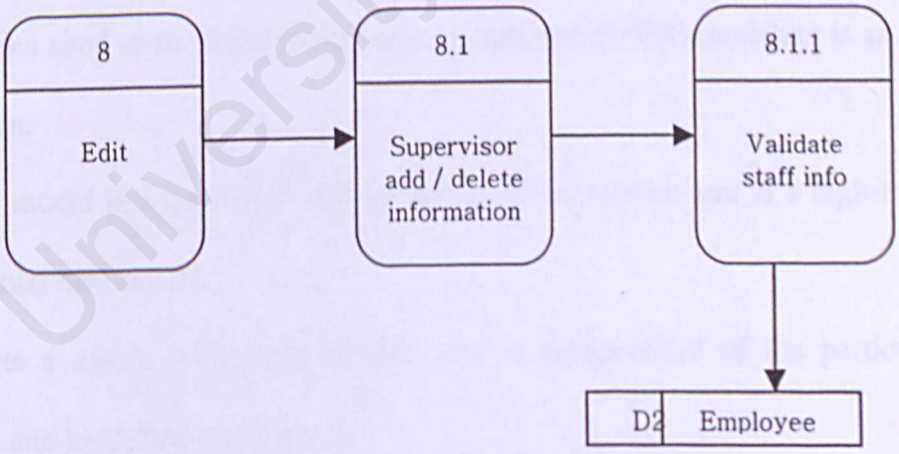


Fig 5.6: Child diagram of Edit staff information

5.4Database Design

Data storage is considered by some to be the heart of an information system. It is a central source of data meant to be shared by many users for a variety of applications. The heart of a database is the DBMS (database management system), which allows the creation, modification and updating of the database; the retrieval of data; and the generation of reports. The main objective of database design is to make sure that data is available when the user wants to use it. Apart from that, the accuracy, consistency and integrity of data must be assured from time to time, to provide efficient data storage as well as efficient updating and retrieval.

In 1976, Peter Chen had introduced the use of the entity-relationship model (E-R Model). An E-R diagram contains many entities, many different types of relations, and numerous attributes. The benefits of Entity Relationship modeling are mentioned below:

i. Databases need to be designed and entity relationship (ER) modeling is an aid to design.

ii. An ER model is a graphical representation of the system and is a high-level conceptual data model.

iii. Supports a user's perception of data and is independent of the particular DBMS and hardware platform.

5.4.1 Data Dictionary

Data dictionary or metadata can be defined as descriptions of the database structure and contents. Data dictionary defines the field, field type and descriptions of each table.

* represent primary keys

name: Attendance

Description: Daily attendance record.

	Column Name	Data Type	Length	Allow Nulls
🔑	UserId	char	10	
🔑	today	datetime	8	
	Login	nchar	10	
	clock_in	datetime	8	✓
	clock_out	datetime	8	✓
	totalToday	nvarchar	10	✓

Tab 5.2: Attendance table

Name: User

Description: Login name of the users, passwords and status

	Column Name	Data Type	Length	Allow Nulls
🔑	UserID	nvarchar	10	
	Login	nvarchar	10	
	Password	nvarchar	10	
	FirstName	nvarchar	10	
	LastName	nvarchar	20	
	DateOfBirth	nchar	10	✓
	PhoneNumber	varchar	15	
	CellNumber	nchar	15	✓
	Address	nvarchar	80	✓
	Email	nvarchar	30	
	Status	nvarchar	10	
	Leave	nvarchar	20	✓

Table 5.3: User Table

Name: grandTotal
Description: Total minutes accumulated for the month

	Column Name	Data Type	Length	Allow Nulls
🔑	UserID	nvarchar	10	
	total	nvarchar	50	✓
🔑	mth	nvarchar	10	

Table 5.4: grandTotal table

Name: work_hour
Description: Total minutes needed for the month

	Column Name	Data Type	Length	Allow Nulls
🔑	mth	nchar	20	
	MinTotal	nchar	20	✓

Table 5.5 Work_hour Table

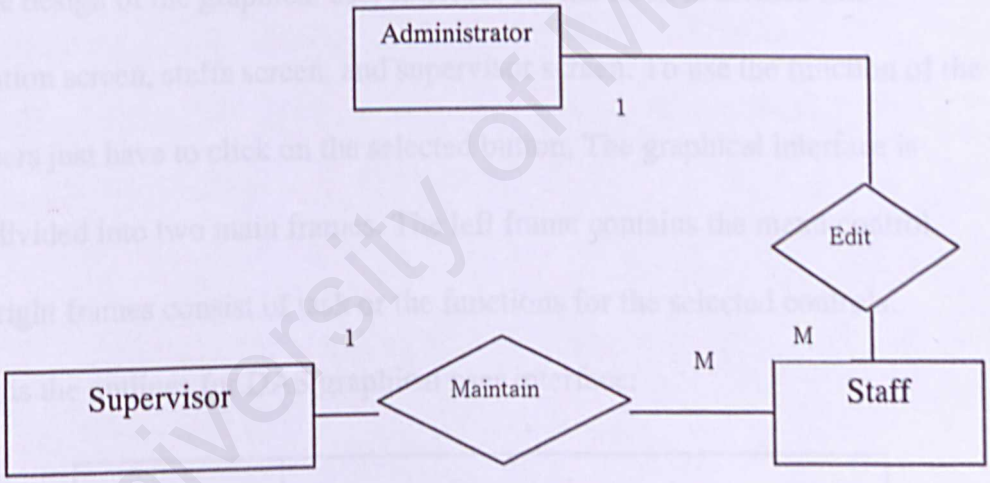


Fig 5.7: ER Diagram for DAS

5.5User Interface Design

The design of the graphical user interface for DAS is divided into administrator, supervisor, and staffs screens. The criteria for the design will be easy to understand and easy to use. Users will not need to remember any dos commands. All they have to do is just a few mouse clicks.

5.5.1 Design of screen

The design of the graphical user interface for the DAS is divided into administration screen, staffs screen, and supervisor screen. To use the function of the system, users just have to click on the selected button. The graphical interface is basically divided into two main frames. The left frame contains the menu control while the right frames consist of task or the functions for the selected controls. Following is the outlines for DAS graphical user interface:

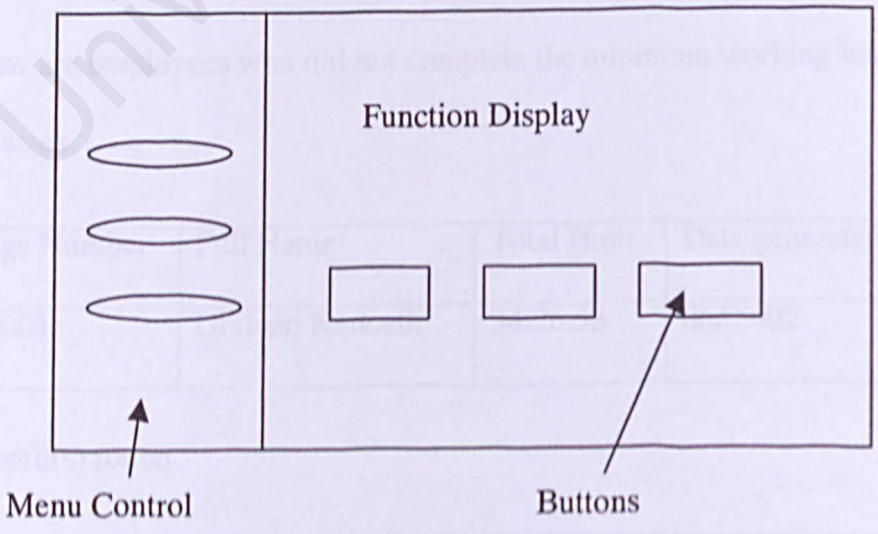


Fig 5.8: DAS interface

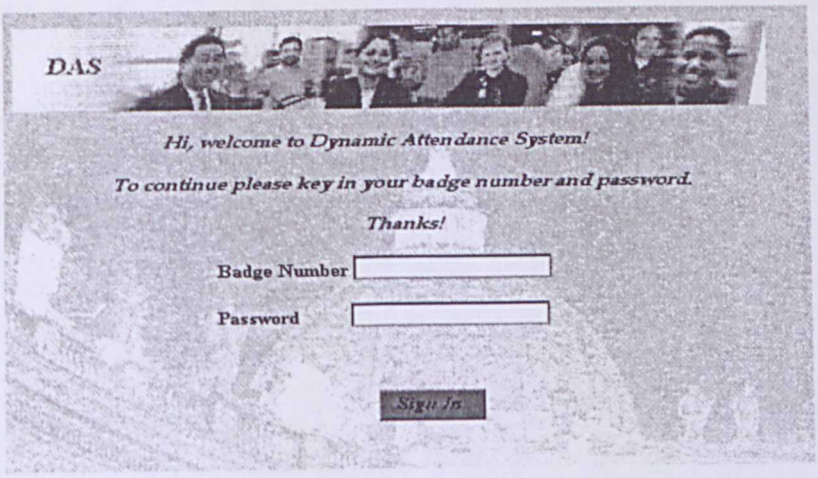


Fig 5.9 Main User interface

5.5.2 Design of output

The design of output serves the purpose of providing the information that the users need based on the criteria selected. The DAS provides the functions of generating report weekly and also based on users selection. Below is one of the designs of output.

Guan Seng Stationary Sdn. Bhd.

Below are employees who did not complete the minimum working hour for this week.

Badge Number	Full Name	Total Hour	Date generated
ST0001	Graham Kenneth	34:26:53	06/09/02

1 record(s) found

Fig 5.10: example of DAS output Design

Chapter 6: System Implementation

Chapter 6: System Implementation.

6.1 Introduction

This chapter describes the implementation of Dynamic Attendance System. System implementation included all the coding approach, style of writing codes, and how the system is being implemented.

System implementation is a process that converts the system requirements and system designs into workable program codes. The initial stage of system implementation involves setting up the development environment which involved installing proposed development tools to facilitate the system implementation.

6.2 System Coding

System implementation is a process of transforming the design specification and data models into an executable software. As mentioned in the previous chapter, the programming tool that was used to implement Dynamic Attendance System is Visual Basic .Net. In order to use it, a good understanding of the way VB .Net work, and some terminology and programming concepts associated with it is necessary. In addition, these are a few other aspects that have been considered, such as simplicity, data integrity and run-time efficiency of the written program.

a) Simplicity

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

- Avoid the use of complicated tests
- Eliminate tests on negative conditions.
- Avoid heavy netting loops or conditions.
- Use parenthesis of clarity logical or arithmetic expressions.
- Use spacing of readability symbols to clarity statement content.
- Make sure we can understand the coding if we are not the developer.

b) Data Integrity

Data integrity is important to Dynamic Attendance System since the data kept may be critical to the users, such as user information. The following rules are obey to ensure data integrity:

- Validate all input data
- Check the plausibility of important combinations of input items
- Keep the input format simple and uniform
- Roll back any incomplete database transactions.

c) Coding Efficiency

Due to the functional complexity of Dynamic Attendance System, the size of the executable program is relatively huge, and tends to consume a lot of system resources. Hence, code efficiency is critical. The situation is resolved by practicing the guidelines below:

- Simplicity arithmetic and logical expressions before committing the code.
- Carefully evaluate nested loop to determine if statements or expressions can be moved outside.
- When possible, avoid the use of multi-dimensional array.

- Avoid the use of pointers and complex lists.
- Do not use variant data types.
- Use easy integer arithmetic and Boolean expressions whenever possible.
- Create index key for every table in the database for easy searching and sorting operations.

6.2.1 Coding Approach

The coding approach used in the development of this system is the top-down and bottom-up approach. By combining with approaches at different stages of coding, testing could be done on these completed modules others are being coded.

Top down approach

This approach allows the higher-level modules to be coded first before the lower-level modules. The codes in the lower modules contain only an entry and an exit. A module with such characteristics is called a shell. The higher-level modules will reference the lower ones if they are coded and available. Reference to a shell will result in an empty action.

This action will ensure that the most important modules will be developed and tested first. It also gives a preliminary version of the system sooner.

Bottom-up approach

Oppose to the top-down approach, the bottom-up approach begins with the coding of the lower-level modules first before the higher-level modules. However, the higher

modules are just skeletons that call the lower modules. This approach is used if the criticality of lower-level modules is high and need to be completed first.

6.2.2 Coding Styles

Coding styles is an important attribute of source code. An easy to read source code makes the system easier to maintain and enhance. Elements taken into considerations while coding an easy to maintain and enhance system are internal documentation, standard naming convention and standard graphical user interface. Internal documentation is achieved by using comments while coding, providing a clear guide to programmers for future enhancement statements of purpose indicating the functions of modules and descriptive comments are embedded into source code to describe the processing functions.

A standard naming convention and also a standard usage of graphical user interface component is employed in developing the system making. Standard naming convention provide programmer with easy identification of variables while a standard in usage of graphical user interface components provides the users an environment that will not generate much surprise to them.

Usages of these standards performed as a mean towards coding consistently and standardization.

6.2.3 Coding Conventions

The main reason for using a consistent set of coding conventions is to standardize the structure and coding style of DAS is that programmer and others can easily read and understand the code. Good coding conventions result in precise, readable and

unambiguous source code that is consistent with other language conventions as intuitive as possible. Coding conventions in DAS include the following:

- Object-naming conventions

All of the objects in DAS source code have been named with a consistent prefix that make it easy to identify the style of object. For example, "txt" represents the entire text column and "cmd" is used as the prefix for all the command buttons in DAS.

- Code commenting Conventions

A code commenting convention is a brief comment statement describing the functional characteristics of the procedures. This descriptions should not describe the implementation details (show it does it) because these often changes over the time, resulting in unnecessary comment maintenance work, or worse yet, erroneous comments. On the other hand, the underscore line-continuation character is always there when creating a long string.

6.3 Debugging

Debugging is a way to identify the location and types of errors that contribute to the bugs in the program. Debugging techniques enables the programmer to trace the error with minimum time required compare to a programmer without a debugging tool. The debugger used for the development of DAS is the VB.NET debugger with the help of Microsoft Visual Studio.Net documentation.

Sometimes with this message, an experienced programmer will know the reason for this error. However, an inexperienced programmer will need to debug the program to detect the error occurs because the error message is not easily understandable. From there, VB.NET debugger plays its role. The programmer can put a break point as where the error occurs and traces the error. However, sometimes it is impossible to develop an error free program. Therefore, it is necessary to include the error routine; Try, Catch, Exception and Finally. When there is an error occurs with this message the routine will tell the server to ignore and continue with modes on the nest line. This routine will be implemented after all the testing had been done.

6.4 Using Datagrid control to display data in web form

The Datagrid control is a spreadsheet like bound control that displays a series of rows and columns representing records and fields from a database. We can use the Datagrid to create an application that allows the end user to read and write to most databases. The Datagrid control can be quickly configured at design time with little or no code when you set the Datagrid control's Datareader property at design time the control is automatically filled and its column headers are automatically set from the data source's Datareader. You can then edit the grid's columns delete, rearrange address column headers to or adjust any column's width.

At run time, the Datareader can be programmatically switched to view a different table or you can modify the query of the current database to return a different set of records here.

6.5 Data Manipulation using SqlDataAdapter object – VB.net

SqlDataAdapter is an easy to use yet extensible technology for adding database access to VB.net application. The 1st step in creating a VB.net application is to provide a way for SqlDataAdapter to locate and identify your data source. This is accomplished by means of a connection string. SqlDataAdapter uses the connection string to identify the Sql provider and to direct the provider to the data source. The provider is a component that represents the data source and express information to your application in the form of row sets. To establish a database connection, you first create an instance of the connection object. After open the connection, we have to open the Datareader to retrieve the relevant data from the database. As its name implies, the Datareader object has features that you can use, depending on your query constraints, for retrieving and displaying a set of database rows or record. The Datareader object maintains the position of each record returned by a query thus enabling you to step through results one item at a time.

6.6 Summary

This chapter describes the implementation of the system being developed. It begins with the introduction to system implementation and later discusses the phase involved in implementing the system. It is then followed by the discussion on the system coding. In system coding, the coding conventions and VB.net code modules were elaborated.

Chapter 7: System Testing

Chapter 7- System Testing

7.1 Introduction

Testing is an important process in developing a system. All of the system's newly written or modified application programs-as well as new procedural manuals, new hardware, and all system interfaces must be tested thoroughly. Testing of a system does not actually come at the end of the system development, but should be carried out during the development phase.

The purpose of testing is to ensure that the resulting component of program as well as the program as a whole fulfills the requirement specification and to eliminate faults in the program. Due to the errors that has been done during the system development or system design, faults and failures may happen even when the entire system has been developed. Therefore, the main idea of testing is to demonstrate correctness of the program, identify the errors in the system coding or the system design. The faults that are discovered during the testing procedures will be corrected.

7.2 Types of Testing

Although the testing process involved a lot of methods and testing levels, but basically there are 3 major stages of testing involved in the Dynamic Attendance System.

1) Module Testing
2) Integration Testing
3) System Testing

The figure below depicts the flow of testing stages involved:

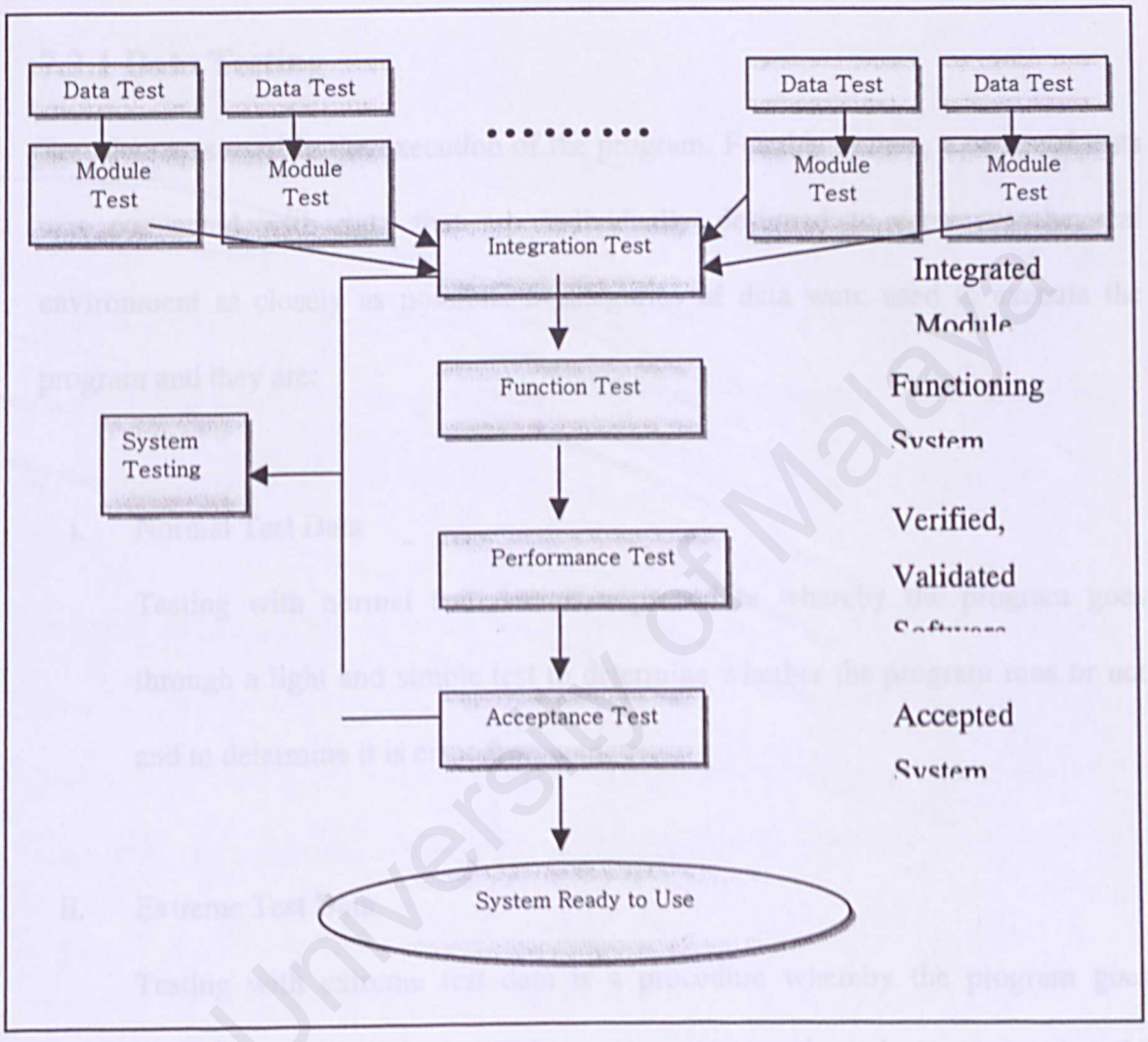


Figure:7.1 Testing Stages

7.2.1 Data Testing

Test data was used in the execution of the program. For this system, a series of tests was conducted with data that are individually designed to represent the real environment as closely as possible. 3 categories of data were used to execute the program and they are:

i. Normal Test Data

Testing with normal teat data is a procedure whereby the program goes through a light and simple test to determine whether the program runs or not and to determine it is error-free.

ii. Extreme Test Data

Testing with extreme test data is a procedure whereby the program goes through an intensive test. This test is necessary in order to determine the system's capacity and how well the system can handle huge amounts of data affecting its accuracy and efficiency in performance.

iii. Erroneous Test Data

Testing with erroneous test data is a procedure whereby the program goes through an erroneous test. Erroneous test is a test where errors are keyed in

intentionally. This test is vital to determine how the program or system can handle such errors or incorrect data and from there, the reliability and the efficiency of the system can be predicted.

7.2.2 Module Testing

Module testing is performed without other system modules. A module consists of a collection of dependent components to perform a particular task or function. Different possible test cases are applied to the module and the test results would be verified. Unusual results will be analyzed and they would help in debugging sub modules in order to produce the desired output.

The tests are dynamically done. Dynamic test require modules to be executed on a machine. To do this, white-box testing is conducted. White box testing is a test case design method that uses the control structure of the procedural design to derive test cases. It can be conducted in parallel for multiple modules.

The steps for module testing are:

i. Manually examine the code simply just form reading through it, trying to spot algorithm and syntax errors.
ii. Comparing the codes with the specification defined and also with the design is necessary to ensure all relevant cases are considered.
iii. Compile the code and eliminate remaining syntax faults.
iv. Develop test cases to show that the input is properly converted to the desired output.

Testing in this DAS system is mainly focused on most of the modules such as login module, administrator module, forum module, bulletin module, results module and quiz module. The tutorial module is not mush tested accept for its links.

The following section discusses some of the modules testing in detail:

i. Login Module

- Login as a valid user with correct login ID and password. Validated users are allowed to access the report, update, insert and view leave day.
- Login as users, administrators or supervisor with either incorrect login ID or password. The program will alert the users that either the login ID or password is incorrect.
- Login as administrators. The admin is then allowed to access the administrative services such as add, edit and delete functions.
- Login as supervisor. The supervisor is allowed to generate report and so on.

ii. Administrator Module

- Try to view all existing records in the database according to the categories. Try to execute functions like editing, deleting and adding new records to those records.
- Test on all the validation controls by inputting invalid values like an invalid email address or so on.

- Test is administrators are given special access to the editing attendance time by login in as admin and with password that enable editing and updating views.
- Test for any broken links within the module itself.

iii. Status Module

- Test if the module enables searching the database for employees' current attendance status. Calculation on time in and time out are done here.
- Test if the date and time inserted automatically for each time in and time out are correct.

iv. Bulletin Module

- Enable users to view the bulletin by its title. Test if the title matches the news posted.
- Test if the administrators are able to maintain the module by adding and deleting or editing the contents in the module.

v. Edit Module

- Test if Supervisor can edit information in this system. It is divided into two categories which is the edit user info and edit attendance info.
- Test if admin can update data. Key in various kind of character. Error message pop out to inform misuse of system.
- Test if other user can use the function.

vi. View Report Module

- Test if the supervisor can access the view report module.
- Test is the supervisor can generate report base on the criteria given.

7.2.3 Integration Testing

The integration testing is carried out after the module testing process has been done. When the individual components or modules are working in satisfactory and meeting the system objectives during the module testing, those modules are then being combined into a whole working system. Several independent modules combined into a single system may cause some unpredicted and unexpected errors that relates to the integration of these modules. Therefore, integration testing is a systematic approach for constructing the application while conducting tests to uncover errors associated with interfacing of different components or modules.

There are many approaches that can be used to do the integration testing. There are the Bottom-Up Integration, Top-Down Integration, Big-Bang Integration and Sandwich Integration. For this system, the Bottom-Up Integration has been used. By using Bottom-Up Integration, each component or module at the lowest level of the system hierarchy is tested individually at first. Then, the next components to be tested are those that call the previous components. This approach is followed repeatedly until all components or modules are included in the testing. After the integration test is completed, those errors and faults discovered are being corrected as soon as possible in order to proceed to the system-testing phase.

The figure 7.2 below shows an example of constructed component hierarchy, whereas figure 7.3 depicts the sequence of tests and their dependencies of Bottom-Up Testing.

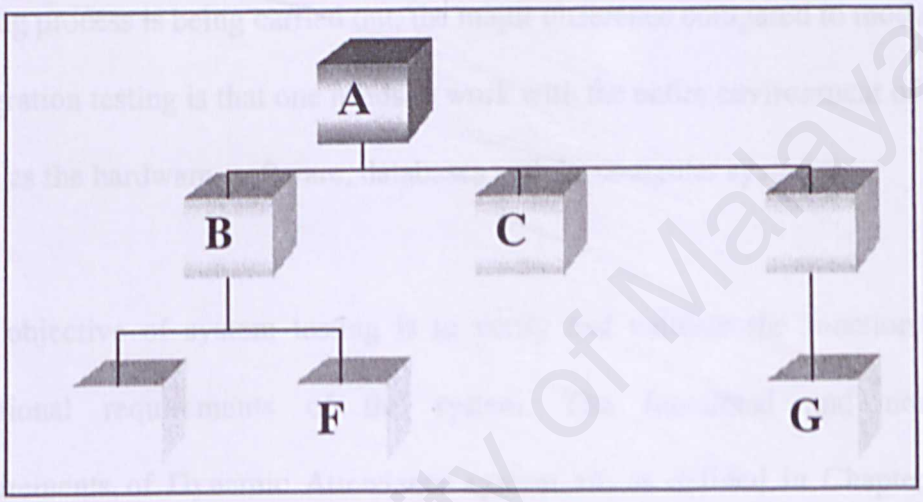


Figure:

Fig 7.2:Construsted component hierarchy

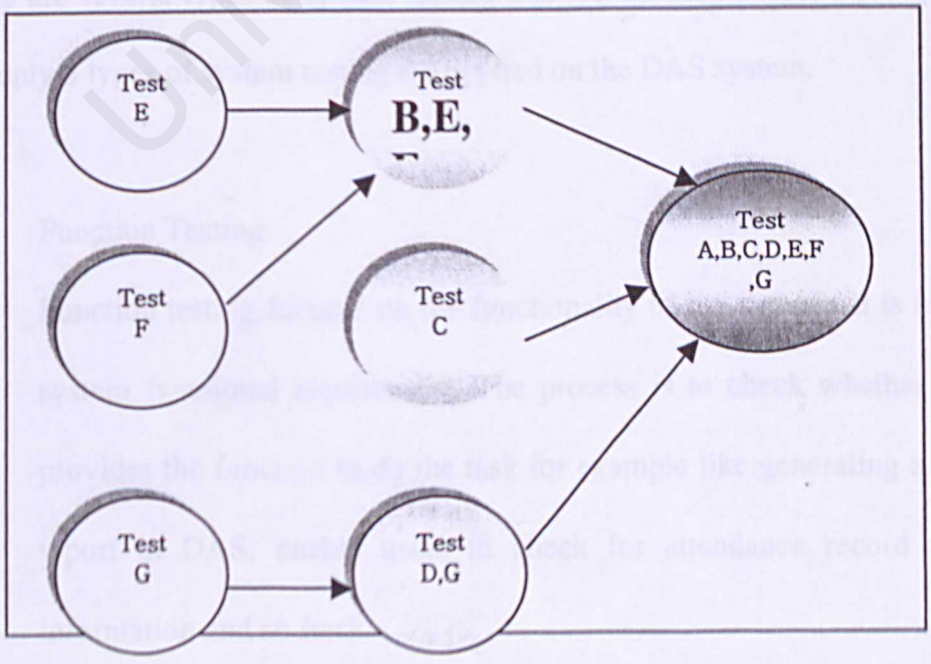


Figure7.3:Bottom up Testing

7.2.4 System Testing

After all the modules are completed, the entire system must then be validated. Carrying out the system testing process does the validation of the system. Testing the whole system is very different from module and integration testing. When the system testing process is being carried out, the major difference compared to module and integration testing is that one needs to work with the entire environment of the system such as the hardware, software, databases and the computer systems.

The objective of system testing is to verify and validate the functional and non-functional requirements of the system. The functional and non-functional requirements of Dynamic Attendance system are as defined in Chapter 5: System Design.

There are several types of system testing that can be used to test a software system. But only 3 types of system testing are applied on the DAS system.

i. Function Testing

Function testing focuses on the functionality of the system. It is based on the system functional requirement. The process is to check whether the system provides the function to do the task for example like generating a meaningful report in DAS, enable users to check for attendance record and editing information and so forth.

ii. Security Testing

The main objective of security testing is to verify that protection mechanism built into the system will protect it from improper penetration. A lot of security is applied in the DAS system to ensure the integrity of system data which includes the validations of password to enter the system, is part of the testing is carried out too; testing the login module aggressively for any possible penetration.

iii. Performance Testing

This part of the testing is carried out after the function testing process. When the system performs the function required by the requirements, the testing process then turn to test the way in which those functions are performed. Thus, the performance testing addresses the non-functional requirements. The purpose of this testing is to test the run time performances of the software within the context of an integrated system. It involves both hardware and software instruments.

7.2.5 Acceptance Testing

The final stage of testing process before DAS is being accepted by the users is the acceptance testing. Testing by users will reveal the errors and omission in the system requirements definition because the acceptance testing involves testing from the users. This will also reveal the requirement problems where the systems facilities do not really meet the user's needs or the system performances is unaccepted.

Acceptance testing for DAS is being conducted by asking the users to experience themselves with the system. After completed using the system, questionnaire is handed out to users to ask them to evaluate the system.

7.3 Chapter Summary

Chapter 7 presents the System Testing in terms of the types of testing conducted for the system. Data Test is conducted in the first stage, the followed by unit testing. After that, integration testing is carried out so that to uncover errors associated with interfacing of different components or modules. System testing is carried out after integration testing to make sure that the whole system is working with the entire environment of the system. Lastly, the end users of the DAS system perform the acceptance testing.

Next, Chapter 8 further discusses the system evaluation of DAS.

Chapter 8: System Evaluation

Chapter 8: System Evaluation

8.1 Introduction

This chapter is the final chapter that concludes the overall solution of this project. Evaluation is the ultimate phase of developing a system and an important phase before delivery the system to the end users. Evaluation was related to user environment, attitudes, information priorities and several other concerns that are to be considered carefully before effectiveness can be concluded. At all phases of the system approaches, evaluation is a process that occurs continuously, drawing on a variety of sources and information.

At the beginning of this chapter is the illustration of problem encountered during developing DAS and the solution to solve it. Meanwhile, the ways to evaluate the system has been described with detail by demonstrating by the end user.

Besides, the system strength and system constraints have been list out as detail as possible in this chapter so that any weaknesses of the system can be improved in the future enhancements. By doing this project, the author have been trained and learn a lot of knowledge and experience which are extremely well for us.

As the author develops the system, the author has exchange a lot of idea and experience with the lecturer, friends and course mates. Finally, the author has an overall conclusion for this project and this is the simplify explanation of what the author has been done in this project.

8.2 Problem and Solutions

The following are the major problem encountered from the beginning of the project through the end of the system development process.

1. Difficulties in choosing a programming language and tools.

   There are some well-known programming tools available in the market that can be use to develop a similar database management system. Choosing a suitable tool was a critical process as all tools have their strength and weaknesses. In addition the availability of the required tool for development was also a major concern.

   Solution:-

   Choose Visual Basic.Net as it is a newly released development tools that claimed to be very powerful.

2. Difficulties in writing coding

   It is cause by lack of mastery in VB.net and it is completely different from VB 6.

Solution:-

The author has make many refers to some useful reference books such as VB.net <How To Program> published by Prentice Hall, Beginning web programming using VB.net & Visual Studio.net and Professional VB.NET by Wrox Press Ltd. Besides, the author also refers to Microsoft Visual Studio.net documentation in VB.net. The author also make some reference to the web site to get useful information. Some of the web site that are mostly visited are www.experts-exchange.com, www.microsoft.com, and Google search.

3. Difficulties in evaluating the system

The author faced many problem in finding the system constraint and system evaluation. The lack of ideas is due to the fact that this is the first time the author develop a system.

Solution:-

Rather than thinking by herself, the author has demonstrated the system to the end user. The author gets many ideas and solutions of the system constraint and limitation.

4. Difficulties in designing a suitable user interface.

Designing a pleasant looking and attractive user interface is time consuming. Besides, problem is encountered when dealing with adjusting positions in the design view.

Solution:-

Refer to the internet for information.

8.3 Evaluation by end user

As DAS is proposed managed the dynamic attendance timing, the final stage of system development which is system testing becomes critical and it needs feedbacks from all respective users in judging the correctness of those functionalities, precise data flow as well as user friendliness of the system's interfaces

Due to the difficulties encountered in conducting DAS, course mates, friends and staffs of certain company are chosen to evaluate the system. The following results, compliments and comments were obtained.

1. positive comments
    a) user friendly
    b) system flow smooth and logical
    c) standard user interface and consistent
2. negative comments
    a) system function should be improved
    b) memory size of user interface is big

8.4 System Strength

DAS has demonstrated the following strength

1. user friendliness

DAS is specially designed on the principle for easy usage. As such, graphical user interface have been integrated into the system. The inclusion of GUI has contributed vastly to aid users. Users can easily capture the overview of the system without even referring to the User Manual. The user interface is designed in consistent manner in order to ease the user' perception and shorten the learning curve especially to novice users. No surprises.

2. authorization and authentication

DAS only allow authenticate users to access the system. Correct user name and password should be provided for access into DAS. An invalid login message will be displayed if a user tries to use the application without logging in. different privilege are given to users based on their status. This is to ensure that only authorized user can perform that specific functions.

3. informative message

DAS provides error messages when a user attempts to perform illegal actions. Besides, it also provides messages after a certain tasks is completed. The main purpose of this is to inform user of their situation.

4. Consistency

The screen design is consistent throughout the whole system. The menus are always displayed at the same position although the user switched from one module to another. Users can easily seek for a particular option that they require in the system.

5. Relatively Fast Response Time

Web site can be downloaded in quite a short time. Thus save time.

6. Automatic report generation

Email notification to supervisor informing them about their employees misbehave.

8.5 Identified Achieved Objectives

The system is observed to successfully provide the following functions and criteria:

i. Inform employees about their attendance status.

ii. Employees can view their remaining leave days.

iii. Administrator can update, delete and insert employees' information

iv. Administrator also can update, insert and delete attendance information.

v. Supervisor can generate report base on the criteria they choose.

vi. Can change password

vii. Make sure that this system's data is safe by using encryption technique.

viii. Send email (to inform supervisor about employees' attendance status.)

ix. Display web site in the following format:

   a. Plain text

   b. Html

   c. Jpeg

   d. Bmp

8.6 System Constraint and future enhancement

As mentioned before, DAS is still not very fine to work at its full efficiency. Some refining work needs to be done to the system to increase its usability and reliability. The aspects to be refine and some suggestions to upgrade the system are as below:

- Stricter data type checking

  Check the input of user strictly using JavaScript to maintain the consistency of data stored and avoid error.

- Better security

  Access to the system can be stricter to avoid any undesirable effect.

- Administrator management

  Tool should be added to the system to enable the administrator manage the site well.

8.7 Knowledge and Experience Gained

From a student with basic vb6 and database knowledge, who at first did not know anything about web application, the author is able to develop a fully working web based system using the latest technology in the market; VB.NET. With the additional hard work of learning from scratch and self-learning the VB.NET syntaxes and

semantics which are totally different from the traditional VB6 with only helps from books and online notes, the knowledge gained were precious and valuable. A handful of new experience and knowledge were gained and they are:

i. Querying for information in the online databases, and web resources were made easier and more convenient, especially the project's contents itself is all about getting the right and precise information one needs. The loads of information found are intelligently digested and has helped a lot in both the academically part and technical parts of the DAS System. In short the developer has been a whole lot smarter in getting the information she wants compared before she initially undertaken this DAS project.

ii. Knowledge of web application like the roles of web servers, application servers, SQL Servers and how web pages are transmitted from one destination to another destination was obtained.

iii. New knowledge gained of VB.NET technology especially with the exploration of the new language ASP.NET and CSS which the developer found to be interesting and exciting especially the ASP.NET language which proves as it says in the market to be powerful and useful in many technical terms.

iv. New knowledge gained of SQL Server 2000.

v. Improved knowledge of VbScript, Cascading Style Sheets (CSS), HTML (especially usage of tables for aligning) and Dynamic HTML (DHTML).

vi. Improved knowledge of using graphical tools SqlDataAdapterbe Photoshop 7.0. All these graphical tools are used in images editing, images creation, text manipulation as well as design of the page layout.

vii. Acknowledgement of the useful notepad, which is found to be helping a lot in most of the programming side.

viii. Understand the use of learning call functions, naming the variables smartly in earlier programming classes as they eases the codes presentations and readings.

ix. Lastly the most valuable experience gained was how to solve problems when sometimes certain modules or ideas doesn't work and it seemed like almost the end of the world as all solutions and ideas have been tried out and there were no one to help.

8.8 Chapter Summary

The system is the final chapter that concludes the overall system. This chapter included all the problem and solutions occurred during developing the system, system strength, system limitation, future enhancement, knowledge and experience gained from the project and finally the conclusion of the overall project.

Meanwhile this chapter shows the way of evaluation of system by end user. Comments and suggestion from the end user had been put into consideration and should be improved in future enhancement.

After this chapter is the appendix of the project. This parts acts as important references for the entire chapters. Appendix guide the user on how to use the system with User Manual.

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