



Perpustakaan SKTM

SALES FORCE AUTOMATION (SFA)

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ABSTRACT

This project focuses on the development of sales application in the market, named 'Sales Force Automation' or for short 'SFA', which also acts as a tool to create and manage marketing campaigns with costs and performance tracking capabilities. It also can define as a Customer Relationship Management system.

Sales Force Automation (SFA) is an application service provider that focuses on providing and hosting applications related exclusively to business functions. It allows the company to forecast revenues accurately, possesses a clear, reliable understanding of near-term future events, and can focus their resources accordingly.

Microsoft Visual Studio.NET – ASP.NET, is to develop this application. Sales Force Automation database will store in Microsoft SQL Server 2000, and others tools or software are used to design SFA. They are Adobe Photoshop 7.0, Macromedia Flash MX and Swish 2.0.

In conclusion, my project will help the users to developing and implementing business strategies and supporting technologies that close the gaps between an organization's current and potential performance in customer acquisition, growth, and retention.

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CHAPTER 1: INTRODUCTION

1.1 PROJECT INTRODUCTION

Sales automation software is a type of program that automates business tasks such as inventory control, sales processing, and tracking of customer interactions, as well as analyzing sales forecasts and performance. Businesses may have a custom version developed specifically for their needs, or choose from among the increasing number of sales automation software products, such as Interact Commerce's ACT! 2000 (Interact Commerce Corporation) and Goldmine Software's Goldmine. Sales automation software is sometimes called *sales force automation* (SFA) software, and sometimes called customer relations management (CRM) software.

Effective Customer Relationship Management (CRM) is about building powerful and durable personal relationships. It is about learning from your customers and using this information to provide them with efficient service that caters to their needs. Companies must acquire the knowledge, resources and tools necessary to match customers with appropriate products and services.

We need to empower everyone involved with easy access to knowledge. Information on products, competitors, industry and customer must be readily available on demand for service to be dispatched speedily. Cumbersome tasks like information search and administrative work should be reduced so that employees can focus their specialties on more important matters on hand and 'do what they do best'.

1.3 A complete and closed-loop customer management system involves people from Sales, Marketing and Service. Communication and collaboration between these business units and customers has to be optimized. From the marketing viewpoint, contact profiles needs to be personalized so that marketing campaigns can be accurately targeted. People in the Service sector must be fed with current information so that they can effectively address customer problems and issues. Hence, companies need to implement front-office systems that can leverage on a unified customer knowledgebase.

The Pharmaceutical House System (Pharmacy House System) is a CRM system focused on Sales Force Enablement. It has a central knowledge base of customers and their sales. The amount of information revealed depends on the security access awarded to them.

This specific pharmaceutical application is provided for sales representatives, district manager and administrator. For the sales representatives, they are able to keep track and analyse their daily activity such as sales, productivity and etc. While district manager and administrator are responsible for keeping track the entire performances of their sales representatives. Besides that, they are responsible for keeping track of their latest information such as approval the new members, company and etc.

1.2 PROJECT MOTIVATION

The main motivation to encourage me to develop a Sales Force Automation system is users can immediately boost the profitability of their organization by increasing revenues and reducing operational costs.

This can be achieved if the sales pipeline is completely transparent and continually updated in real time; everyone in organization – including field sales, manufacturing, purchasing, and corporate executives – possesses a clear, reliable understanding of near-term future events, and can focus their resources accordingly.

Realizing that the power of the Web is paramount for success in today's business environments, many companies are frantically web-enabling their network-based software. Taking advantage of the latest Web technologies to build up a Web based system.

There is a problem that always faced especially for a huge company, sales teams do not know precisely what the others are working on. So, a complete visibility into sales process enables each member of sales team can collaborate to transform sales prospects into profitable customers.

Seize all sales opportunities. Mismanagement of the sales process will lose lots of opportunities. If every lead is immediately recorded, automatically routed to the right person, and tracked through the pipeline in real time, no opportunities are ever missed, and no competitive challenge goes unnoticed.

1.3 PROJECT OBJECTIVE

Before starting system development, demonstration of project objective is necessary.

The core objectives of the project are as below:

- Forecast sales with greater accuracy and consistency
- Standardize and Shorten the Sales Cycles
- Empower everyone involved with easy access to relevant knowledge
- Optimize communication and collaboration between business units such as people from sales, marketing, service and customers
- Enable costs and performance tracking capabilities
- Manage sales process more efficiently by applying workflow automation technology to route, notify and escalate sales information and critical customers issues

1.4 PROJECT SCOPE

The SFA system can be divided into four modules, which are Contact and Information Management, Administrator Workdesk, Sales Analysis and SWOT Analysis. Each module has very close relationship to provide perfect services to company and sales term.

1.4.1 CONTACT AND INFORMATION MANAGEMENT

- Develop a web-based management system to manage sales representative's daily activities.
- Develop an easy and efficiency system to manage sales representative's expense claims.

- Develop an information management system to provide information of products, customers and the company customers belong to.

1.4.2 ADMINISTRATOR WORKDESK

- Develop a user setup system for administrator to add user, edit or delete user and assign role to the user.
- Develop an Approve-Reject Section for manager to approve or reject once the information have been added or updated by sales representatives and expense claims of sales representatives.
- Develop Newsletter management for administrator.

1.4.3 SALES ANALYSIS

- Develop a tool for helping manager to manage, improve and enhance company sales.
- Develop reports section for keeping track sales and sales representatives performance.
- Develop information section for providing useful information to Manager in business planning.
- Develop reports section for listing which products are most market demand

1.4.4 SWOT ANALYSIS

- Develop information management to manage product information and competitor information.
- Develop information management for making suitable and powerful business planning.
- Develop planning tools to assists manager to confront any competitive.

1.5 EXPECTED OUTCOME

The summarization of the expected outcome of SFA:

- Simple and user friendly system.
- Effective & efficient way to store and achieve relevant information.
- creates awareness amongst the company employees
- Review sales analyses in a graphical view.
- Shorten the Sales Cycles and enhance the sales productivity.

1.6 PROJECT SCHEDULE

Task Name	ID	Start	Finish	2002												2003
				Jan	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
Preliminary Study and Planning	1	6/3/2002	6/20/2002	■												
Literature Study	2	6/21/2002	7/17/2002		■											
System Analysis	3	7/19/2002	8/12/2002			■										
System Design	4	8/13/2002	9/11/2002				■									
Prototype	5	9/12/2002	9/30/2002					■								
Development and Coding	6	10/1/2002	11/29/2002						■							
Unit Testing	7	11/22/2002	12/4/2002								■					
System Testing	8	12/5/2002	12/18/2002										■			
Documentation	9	12/20/2002	12/31/2002												■	
Implementation and Maintenance	10	1/2/2003	1/13/2003													■

Figure 1.1: Project Schedule

CHAPTER 2: REVIEW OF LITERATURE

2.1 ANALYSIS STUDIES OF EXISTING SYSTEM

2.1.1 CASE STUDY 1: ACT! 2000 (Interact Commerce Corporation)

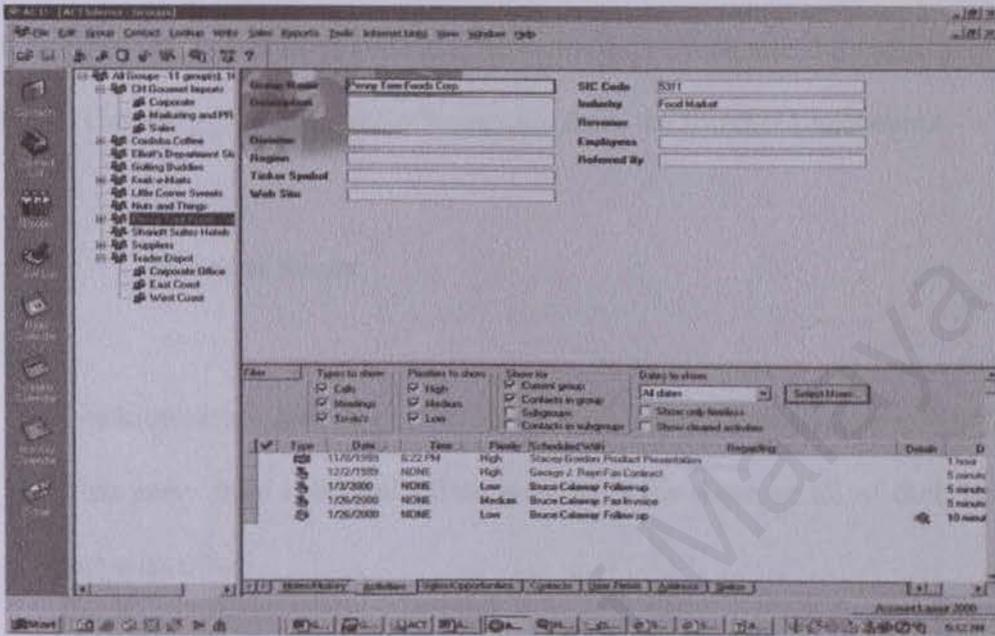


Figure 2.1 Interface of ACT! 2000

ACT! 2000 is Sales automation software that automates business tasks such as inventory control, sales processing, and tracking of customer interactions, as well as analyzing sales forecasts and performance. Businesses may have a custom version developed specifically for their needs, or choose from among the increasing number of sales automation software products.

Dale Carnegie Training, the leader in business training solutions, can help users move closer to their sales goals. Dale Carnegie Sales Advantage, a proprietary selling process, defines the eleven stages in the Sales Development Cycle. Users can access the Dale Carnegie Training web site from within ACT! to learn more about the Sales Development Cycle.

Users can link data with ACT! databases on Handheld Personal Computers (HPCs) running Windows CE version 1.0 or 2.0 (640x240 screen). If users use a Palm Computing device, users can link data between their Palm and their desktop ACT! database using the ACT! PalmPilot Link. Users can install the ACT! PalmPilot Link from the ACT! CD or download it from the ACT! Web site. To access the ACT! Web site, choose <http://www.Actsoftware.com> from the Internet Links menu.

2.1.1.1 Result of Study

Strength:

- Synchronization feature is commonly used when a group of people who are often away from a central office want to share some or all of their contact data with other.
- Users may modify one or more of the report, label, or envelope templates.
- Side Act! offers an alternative that may help users better organize and track their miscellaneous activities and to-do items
- Users also can see all the activities that they have scheduled with all contacts in the group in a single location.
- Another ACT! 2000 features is spell checker so users can automatically check the spelling in their documents.

Weakness:

- ACT! provided limited and unfeasible Lookup functions.
- ACT! provided limited functionality for business planning and sales analysis
- Restriction of data integration that limited database type for exporting or importing to or from others database's data

2.1.2 CASE STUDY 2: GOLDMINE

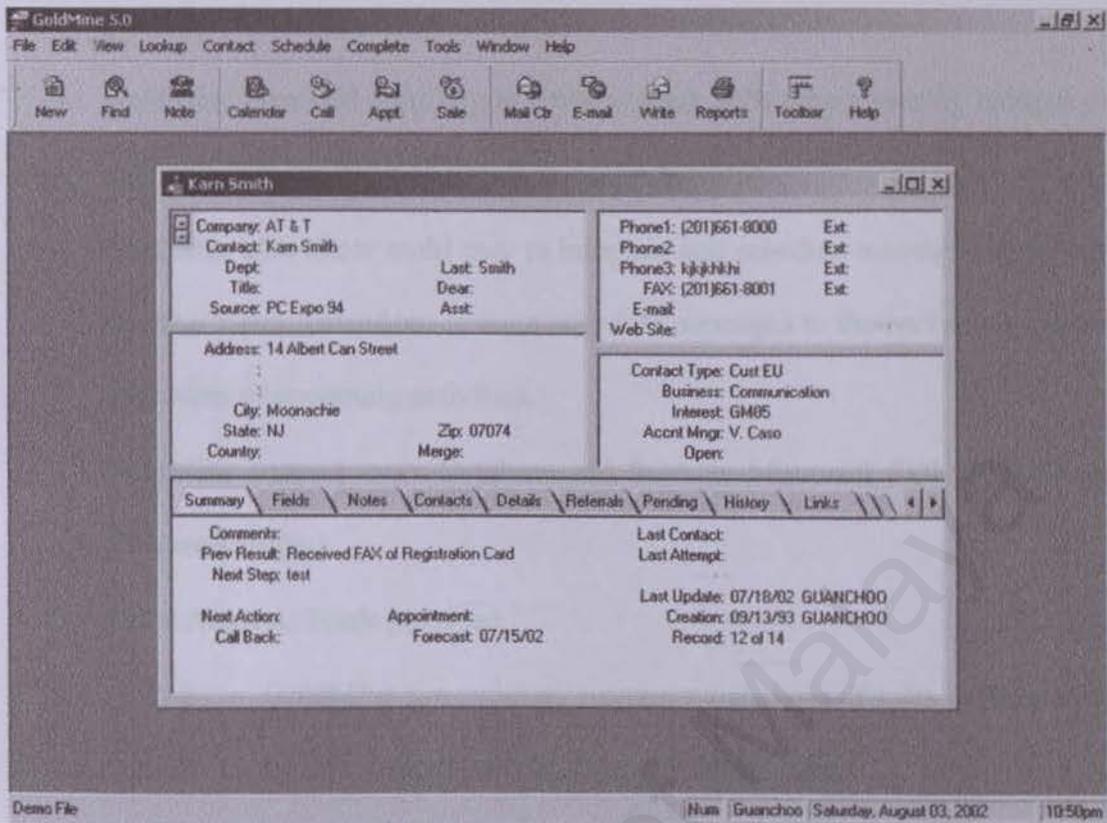


Figure 2.2 Interface of GoldMine

GoldMine is a powerful tool designed to automate and manage business activities. Users can build and maintain business relationships; manage time; and achieve goals more easily than ever before.

Users can set their activities as private by using the GoldMine's dynamic and customizable graphical calendar that it display to drag-and-drop when scheduling, prioritize with color-coding, and plan multi-day events. .

2.1.2.1 Result of Study

Strength:

- GoldMine maintains a database of information on contacts, prospective clients and current customers.

- GoldMine provided synchronization wizard for user to synchronize with their PDA.
- GoldMine provided a facility to communicate with others user by using a e-mail or telephone call from contacts in the database.
- GoldMine also allow multi user to integrate and schedule messages to appear on other users' calendars, or even schedule messages to themselves as timely reminders of upcoming activities.
- GoldMine support more Database fail Such as Microsoft SQL Server and Microsoft Access.
- The 4 Analysis Tools provided:
 - i. GoldMine can generate a summary analysis of sales performance by one or more individuals or by sales teams.
 - ii. The Statistical Analysis of Completed Activities dialog box displays completed activity information of an individual user, a group of users, or on a system-wide basis.
 - iii. Using GoldMine, user can generate an analysis of forecasted sales activities in the database.
 - iv. GoldMine's Graphical Analysis generates summary graphs of user activity data based on a variety of criteria.

Weaknesses:

- Functionality too complicated.
- Fulfill different user's need is difficult because customization is difficult.
- Scarcity as a windows based system in business application.

2.2 SOFTWARE ARCHITECTURE

At this time, there are many software architecture namely mainframe architecture, client-server architecture, file sharing architecture, two-tier architecture, three-tier architecture, and windows DNA (Windows Distributed interNet architecture).

2.2.1 MAINFRAME ARCHIECTURE

In mainframe software architectures, all intelligence is within the central host computer. Users interact with the host through a terminal that captures keystrokes and sends that information to the host. User can interact with the host using PCs, and UNIX workstations and it is not tied to a hardware platform. A setback with this architecture is it does not support graphical user interface or able to access multiple database. In the last few years, mainframes have found a new use as a server in distributed client/server architectures.

2.2.1.1 CLIENT-SERVER ARCHITECTURE

Client-server architecture is based on a simple premise: Different computers perform different tasks, and each computer can be optimized for a particular task. Client-server computing is an extension of the modular programming idea. Client-server architecture recognizes that a large piece of applications can be divided and be executed in a few different computers.

Therefore one more powerful computer can be the 'server' where database and other related severs are stored. While the other computer and any operating system supported will be called 'client' where the application program is stored and

executed there. The computers that perform the server function usually have more memory and larger, faster disk drives than the client computers they serve.

The client-server architecture works when the client will directly connect to the server computer and the results will then be transferred back to the client computer. It has proven to be successful in network computing.

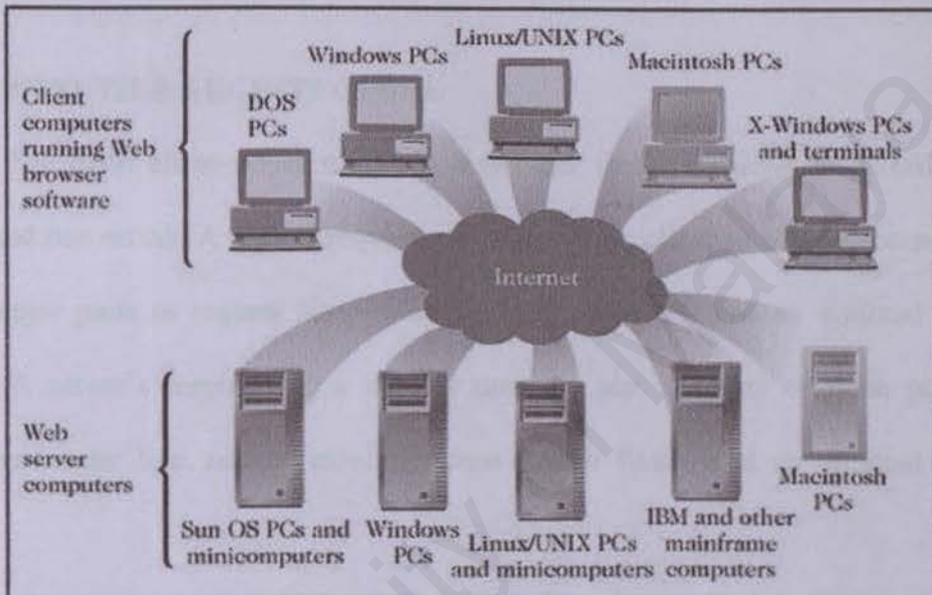


Figure 2.3. Client-server architecture

Web pages containing many objects can be slow to appear in the client's Web browser because each page element requires a separate request and response.

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

2.2.1.2 FILE SHARING ARCHITECTURE

The original PC networks were based on file sharing architectures, where the server downloads files from the shared location to the desktop environment. File sharing architecture is centralized on a server to download files to several PCs or

upload files from several PCs to the server. The requested user job is then run (including logic and data) in the desktop environment.

Features of this architecture include: File sharing architectures work if shared usage is low, update contention is low, and the volume of data to be transferred is low. The setback is the shared usage and the volume of data to be transferred is low to ensure that it is successful.

2.2.1.3 TWO-TIER ARCHITECTURE

The basic client-server model is a two-tier model because it has only one client and one server. A typical request message from a client to a server consists of three major parts (a request line, optional request headers, and an optional entity body). A server's response to a request message also consists of three parts (a response header line, one or more response header fields, and an optional entity body).

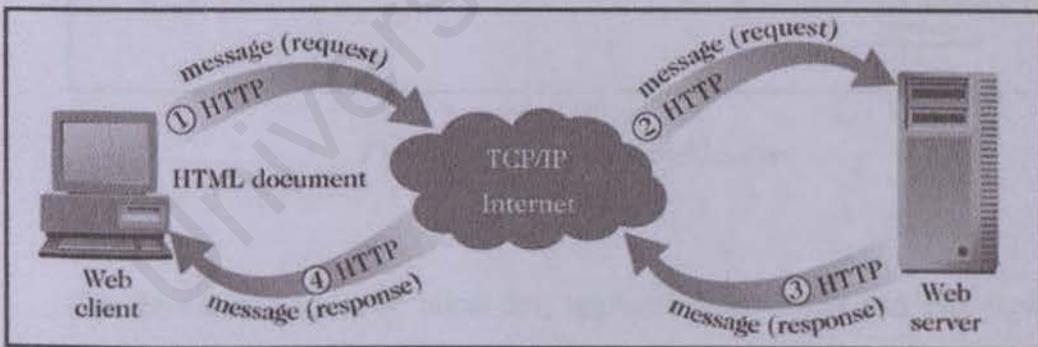


Figure 2.4 Two-tier architecture

By two tier architectures, the user system interface is usually located in the user's desktop environment and the database management services are usually in a server that is a more powerful machine that services many clients.

2.2.1.4 THREE-TIER ARCHITECTURE

The three tier architecture emerged to overcome the limitations of the two tier architecture. In the three tier architecture, a middle tier was added between the user system interface client environment and the database management server environment. There are a variety of ways of implementing this middle tier, such as transaction processing monitors, message servers, or application servers.

The third tier usually includes software applications that supply information to the Web server. It is a special type of client/server architecture consisting of three well-defined and separate processes, each running on a different platform.

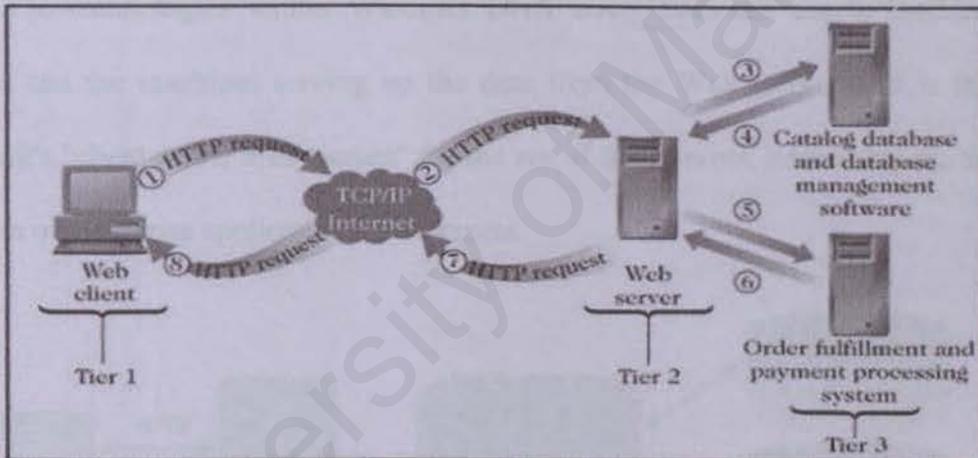


Figure 2.5 Three-tier architecture

The three tiers consist of: client-tier, application-server-tier and data-server-tier. Higher-order architectures (those with more than three tiers), are called 'n-tier' architectures. The three tier client/server architecture has been shown to improve performance for groups with a large number of users (in the thousands) and improves flexibility when compared to the two tier approach. Flexibility in partitioning can be as simple as "dragging and dropping" application code modules onto different computers in some three tier architectures. A limitation with three tier architectures is

that the development environment is reportedly more difficult to use than the visually-oriented development of two tier applications.

2.2.1.5 WINDOWS DNA ARCHITECTURE

Microsoft Windows Distributed interNet Applications (Windows DNA) is an architecture that enables developers to integrate Web-based and client/server applications in a single, unified architecture. Windows DNA is the name given to the combination of traditional n-tier architecture with the intrinsic Windows 2000 services, including COM+, MSMQ, and Active Directory.

The technologies within Windows DNA cover both the user's machines (clients) and the machines serving up the data from the Web (servers). It is thus Microsoft's "client-server architecture" for the era of the Internet, addressing the full spectrum of enterprise application development.

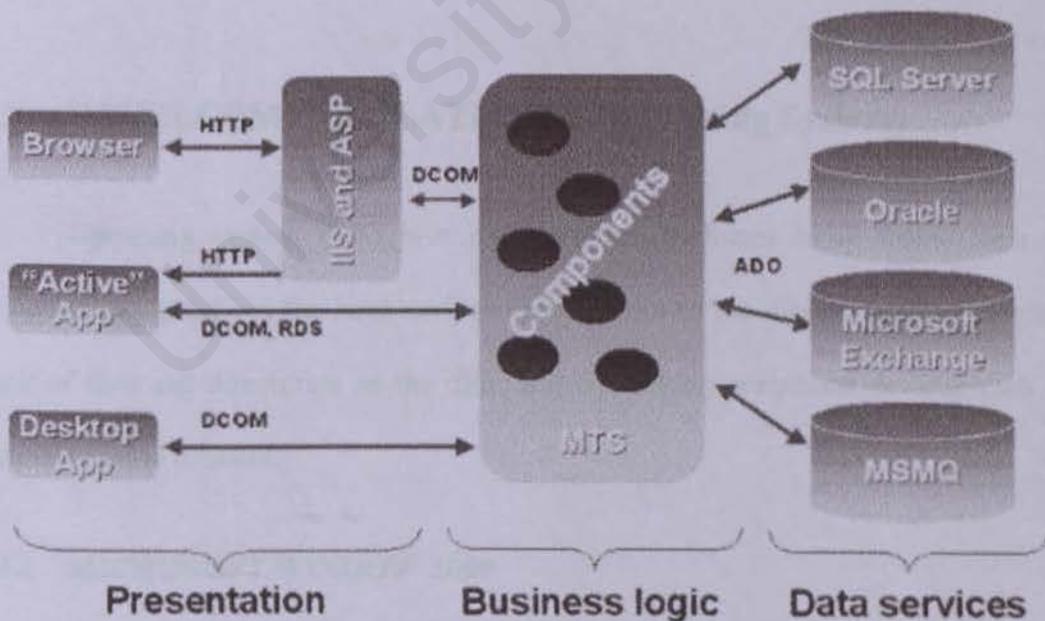


Figure 2.6 Windows DNA architecture

COM+ is the evolution of Component Object Model (COM) and Microsoft Transaction Server (MTS). It is a run-time core that enables an application execution environment that allows developers choose the services for their applications (COM components) - the services such as transactions, security, queuing etc. So it actually provides a high performance application-hosting environment that's very easy to manage.

Because Windows DNA is based on COM and open Internet standards, developers can use any language or tool to create compatible applications. COM provides a modern, language-independent object model that provides a standard way for applications to interoperate at all tiers of the architecture. Through COM, developers can extend any part of the application via pluggable software components that can be written in C++, Visual Basic®, Java, or other languages. Because of this open approach, Windows DNA supports a broad range of development tools today, including tools from Microsoft, Borland, Powersoft, and many other vendors.

2.3 DEVELOPMENT PLATFORM (Operating System)

Operating system (OS) is a platform that performs basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

2.3.1 MICROSOFT WINDOW 2000

Windows 2000 is a multipurpose operating system with integrated support for client-server and peer-peer networks. The Windows 2000 family of products has been designed to increase reliability, deliver higher levels of systems availability, and

provide for scalability from a small network to a large enterprise network. Windows 2000 incorporates technologies that reduce the total cost of ownership by allowing organizations to increase the value of their existing investment while lowering overall computing costs. In addition, windows 2000 incorporates comprehensive Internet and application support, building on the success of Windows NT server 4.0 as an Internet-aware, application-enabled server operating system.

2.3.2 LINUX

With a host of performance enhancements that will benefit Web sites and Internet sites of all sizes, Linux has become extremely popular over the last couple years. Linux also has a variety of supporting tools and the number is increasing because Linux has become more famous days after days because it is free.

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

2.3.4 UNIX

UNIX is a popular multi-user, multitasking operating system developed at Bell Labs in the early 1970s. Created by just a handful of programmers, UNIX was designed to be a small, flexible system used exclusively by programmers. UNIX has many unique features. Like other operating system, the UNIX system is a control program for computers. It also has a family of utility programs and a set of tools that allows users to connect and user uses these utilities to build system and application.

Due to its portability, flexibility, and power, UNIX has become the leading operating system for workstations. However, UNIX is more difficult to learn and isn't as widely supported as Microsoft Windows 2000. Historically, it has been less popular in the personal computer market.

2.4 DEVELOPMENT SERVER

A Web server is a program that, serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. Two leading Web servers are Apache, the most widely-installed Web server, and Microsoft's Internet Information Server (IIS). And also iPlanet Enterprise Server will become more popular in future.

2.4.1 MICROSOFT INTERNET INFORMATION SERVER

IIS (Internet Information Server) 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 comes bundled with Microsoft's Windows NT Server and 2000 Server operating systems. IIS contains many new features along with performance and reliability enhancements. 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. Microsoft points out that IIS is tightly integrated

with the Windows NT and 2000 Servers in a number of ways, resulting in faster Web page serving.

IIS is very user friendly because it is easy to configure and can be used alone as a Web Server. IIS also guarantees the same security, networking, and administration and user functionality because it inherits all Window NT features. IIS also can help administer secure Websites, and to develop and deploy server-intensive Web applications. Other than that, IIS can support a variety of applications such as Virtual Server, Connection to ODBC database, Common Gateway Interface (CGI), Active Server Pages (ASP) and Secure Socket Layer.

2.4.2 APACHE WEB SERVER

Apache Web Server is the famous and popular web server since 1995 until now mainly because of it's free license fee. Because it was developed from existing NCSA code plus various patches, it was called *a patchy server* - hence the name *Apache Server*.

Apache runs on many operating systems and the hardware that supports them. The original version of Apache was written for UNIX, but there are now versions that run under OS/2, Windows and other platforms.

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.

2.4.3 IPLANET ENTERPRISE SERVER

A joint venture with Netscape Communications, the iPlanet suite competes with similar offerings from Microsoft (and its Internet Information Server - IIS) and Apache, which provides the most widely-installed Web server.

iPlanet includes e-commerce services, portal services, communication services, Web and application services, integration services, and user management services. Commerce services provide enterprises with the ability to deploy secure selling, and bill presentment and payment. Portal services allow enterprises to authenticate employees, suppliers, and customers who wish to access applications, content, and data on a customized portal using a browser and a dial-up Internet connection. Communication services enable Internet Service Providers (ISPs), telephone companies, and enterprises to provide messaging, calendar, and e-mail services using a single phone number.

Web and application services provide users access to applications, databases, and Web pages. iPlanet is aligned with Sun Microsystems' Sun Open Net Environment (ONE), its vision of services on demand using Web-based applications. iPlanet also allows companies to communicate with each other using Extensible Markup Language (XML), XSL Transformations (XSLT), HTTP, Simple Object Access Protocol (SOAP), and Lightweight Directory Access Protocol (LDAP).

2.5 DEVELOPMENT DATABASE SERVER

Database Server is a place to store structured collection of data. It allows user to add, access, and process data stored in a computer database, a database server is

needed. There are several database servers available currently: Microsoft SQL Server 2000, Oracle, PostgreSQL and MySQL

2.5.1 MICROSOFT SQL SERVER 2000

SQL Server is Microsoft's DBMS. It's highly scalable and user can use it to develop applications for everything from small networks to thousands of users. It is designed to meet requirement of a distributed client-server environment.

The SQL Server driver enables application to access data in Microsoft SQL Server database through the Open Database Connectivity (ODBC) interface. Structured Query Language (SQL) is used to access data in a SQL server database. All the client workstations communicate with SQL Server across a star network with TCP/IP protocol.

SQL Server 2000 extends the performance, reliability, quality, and ease-of-use of Microsoft SQL Server version 7.0. Microsoft SQL Server 2000 includes several new features that make it an excellent database platform for large-scale online transactional processing (OLTP), data warehousing, and e-commerce applications.

The OLAP Services feature available in SQL Server 7.0 is now called SQL Server 2000 Analysis Services. The term OLAP Services has been replaced with the term Analysis Services. Analysis Services also includes a new data mining component.

2.5.2 ORACLE

Based in Redwood, California, Oracle Corporation is the largest software company whose primary business is database products. Historically, Oracle has targeted high-end workstations and minicomputers as the server platforms to run its database systems. Its relational database was the first to support the SQL language, which has since become the industry standard.

Oracle server is a multi-user relational database management system (DBMS) that runs on numerous operating systems. Oracle8, the world's most powerful object-relational database is the heart of the open, standards-based Network Computing Architecture. Network Computing Architecture allows IT organizations to spend less time struggling with interoperability issues and more time focusing on deploying solutions.

Standards-based network architectures make it possible to introduce objects into mainstream enterprise environment. Oracle8's development environment allows users to ease into object-relational functionality while providing the industrial strength properties required by network-based applications.

Network based architecture involve multiple hardware and software platforms and oracle8 delivers on all the major platforms, including UNIX and NT. Enterprise that explore the competitive advantages of network computing will soon discover that Oracle8's data management, security, reliability, and ease of use, is uniquely designed to meet the new demands of the network era. For mainframe system, parallel server's environments, or desktops, Oracle8 is the database of choice.

2.5.3 MYSQL

MySQL is an open source relational database management system (RDBMS) that uses Structured Query Language (SQL), the most popular language for adding, accessing, and processing data in a database. Open Source means that it is possible for anyone to use and modify. Anybody can download MySQL from the Internet and use it without paying anything. Anybody can study the source code and change it to fit their needs.

MySQL is noted mainly for its speed, reliability, and flexibility. Most agree, however, that it works best when managing content and not executing transactions.

The mySQL relational database system was first released in January, 1998. It is fully multi-threaded using kernel threads, provides application program interfaces (APIs) for C, C++, Eiffel, Java, Perl, PHP, Python, and Tcl, allows for many column types, and offers full operator and function support in the SELECT and WHERE parts of queries.

The development team working on future releases of mySQL plan to unveil mySQL 4.0 in mid-2001. To increase speed and flexibility, MySQL stores data in separate tables rather than putting all the data in one big storeroom. User can define relations to link the tables, this will make it possible to combine data from several tables on request.

Its features will include a new table definition file format, enhanced replication, and more functions for a full-text search. Later, mySQL developers hope to add fail-safe replication, a port of mySQL to BeOS, and an option to periodically flush key pages for tables with delayed keys. Over time, MySQL plans to be fully ANSI 92/ANSI 99-compliant.

MySQL is a small, compact, easy to use database server, ideal for small and medium sized applications. It is client/server implementation that consists of a server and many different client programs. It is available on a variety of UNIX platforms, Linux, Windows NT, Windows 95/98 and Windows 2000.

2.6 DEVELOPMENT DATA ACCESS TECHNOLOGY

A few of the Microsoft Data access strategy and technology is reviewed and considered to enable communication and access to database.

2.6.1 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.

2.6.2 ACTIVEX DATA OBJECT (ADO)

ADO is an application program interface from Microsoft that lets a programmer writing Windows applications get access to a relational or non-relational

database from both Microsoft and other database providers. 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.

Like Microsoft's other system interfaces, ADO is an object-oriented programming interface. It is also part of an overall data access strategy from Microsoft called Universal Data Access.

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

2.6.3 OLE DB

OLE DB is Microsoft's strategic low-level application program interface (API) for access to different data sources. 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.

The OLE DB architecture provides for components such as direct data access interfaces, query engines, cursor engines, optimizers, business rules and transaction managers. OLE DB includes not only the Structured Query Language (SQL)

capabilities of the Microsoft-sponsored standard data interface Open Database Connectivity (ODBC) but also includes access to data other than SQL data.

As a design from Microsoft's Component Object Model (COM), OLE DB is a set of methods (in earlier days, these might have been called *routines*) for reading and writing data. The objects in OLE DB consists mainly of a data source object, a session object, a command object, and a row set object.

2.6.4 UNIVERSAL DATA ACCESS (UDA)

UDA is Microsoft's model or framework for a single uniform application program interface to different software makers' databases, both relational and non relational. 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.

UDA consists mainly of the high-level interface, ActiveX Data Objects (ADO) and the lower-level services called OLE DB. IBM, Oracle, and other companies have provided database bridges that interface with OLE DB.

2.7 DEVELOPMENT LANGUAGE

The high progression of computer language form third generation to four generation and until now, it become a popular knowledge to all although not an information technology person. Below are most powerful and famous computer languages for developing a web base system:

2.7.1 ACTIVE SERVER PAGES (ASP)

ASP is a technology by Microsoft is a great tool for creating dynamic web pages. It is a server-side scripting technology. It works by providing users the functionality of a programming language that will generate HTML for the web page dynamically.

ASP combined HTML, scripting language such as VBScript, JScript or Perl and component to create powerful internet applications. It can also create dynamic and interactive web pages that include Active-X component and Java Applet as well.

When a browser requests an ASP page, the Web server generates a page with HTML code and sends it back to the browser.

ASP provides users to access data easily. User can simply display data from an ODBC-compliant database, or use ASP to make decisions about what to display on a Web page.

Another important ASP feature is the ability to use cookies to store and retrieve information. The Request object has a Cookie collection, and user can use this in data processing.

Although ASP might be a dynamic web language, but the fact that it is not platform independent made it lose out to JSP.

2.7.2 ASP.NET

Active Server Page.NET, or ASP.NET, is Microsoft's latest version of its popular dynamic Web programming technology, ASP.NET however, is much more than a simple upgrade from classic ASP: A new programming model and plethora of brand-new tools are just two of the many new features of ASP.NET.

A Microsoft server-side Web technology, ASP.NET takes an object-oriented programming approach to Web page execution. Every element in an ASP.NET page is treated as an object and run on the server. An ASP.NET page gets compiled into an intermediate language by a .NET Common Language Runtime-compliant compiler. Then a JIT compiler turns the intermediate code to native machine code, and that machine code is eventually run on the processor.

The new features in ASP.NET make designing dynamic Web pages quicker and easier than ever before. For example, ASP.NET offers developers a number of powerful Web Controls, which are HTML-like tags that provide useful functionality, such as displaying a calendar, showing a random banner advertisement, and displaying an HTML table whose rows and columns contain data from a database. These Web Controls allow developers to provide rich, W3C-compliant HTML with a minimal amount of coding.

2.7.3 JAVA SERVER PAGES (JSP)

JSP is an invention by Sun Microsystems. Although it is invented by Sun Microsystems, any vendors can implement JSP in their own system. JSP allows Web developers and designers to rapidly develop and easily maintain, information-rich, and able to support dynamic Web pages that leverage existing business systems.

JSP is comparable to Microsoft's Active Server Page (ASP) technology. Whereas a Java Server Page calls a Java program that is executed by the Web server, an Active Server Page contains a script that is interpreted by a script interpreter (such as VBScript or JScript) before the page is sent to the user.

JSPs have dynamic scripting capability that works in tandem with HTML code, separating the page logic from the static elements -- the actual design and

display of the page -- to help make the HTML more functional (i.e. dynamic database queries).

A JSP is translated into Java servlet before being run and it processes HTTP requests and generates responses like any servlet. However, JSP technology provides a more convenient way to code a servlet. Translation occurs the first time the application is run. A JSP translator is triggered by the .jsp file name extension in a URL. JSPs are fully interoperable with servlets. You can include output from a servlet or forward the output to a servlet, and a servlet can include output from a JSP or forward output to a JSP.

JSPs are not restricted to any specific platform or server. It was originally created as an alternative to Microsoft's ASPs (Active Server Pages). Recently, however, Microsoft has countered JSP technology with its own ASP.NET, part of the .NET initiative.

2.7.4 JAVASCRIPT

Java Script is a technology by Sun MicroSystem. Java Script is an object-based scripting language designed to add programmatic capabilities and cross platform of events, objects and methods to web pages.

JavaScript can interact with HTML source code, enabling 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*.

Script languages generally take longer to process than compiled languages, but are very useful for shorter programs.

JavaScript uses some of the same ideas found in Java, the compiled object-oriented programming derived from C++. JavaScript code can be imbedded in HTML pages and interpreted by the Web browser (or client). JavaScript can also be run at the server as in Microsoft's Active Server Pages before the page is sent to the requestor. Both Microsoft and Netscape browsers support JavaScript, but sometimes in slightly different ways.

2.7.5 HYPERTEXT PREPROCESSOR (PHP)

PHP was developed by Apache and created sometime in 1994 by Rasmus Lerdorf. During mid 1997, PHP development entered the hands of other contributors. Two of them, Zeev Suraski and Andi Gutmans, rewrote the parser from scratch to create PHP version 3 (PHP3). Today, PHP is shipped standard with a number of Web servers, including RedHat Linux.

PHP is a 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 can perform any task any CGI program can do, but its strength lies in its compatibility with many types of databases. Also, PHP can talk across networks using IMAP, SNMP, NNTP, POP3, or HTTP. It also supports WDDX complex data exchange between virtually all Web programming languages.

2.7.6 COLDFUSION

ColdFusion is a Macromedia product and created by Allaire Corporation of Cambridge, Mass. that includes a server and a development toolset designed to integrate databases and Web pages. Cold Fusion web pages include tags written in Cold Fusion Markup Language (CFML) that simplify integration with databases.

Coding for ColdFusion pages is much more straightforward and intelligible than JavaScript, VBScript, C++ or Java, even while providing high levels of functionality. The tags themselves conform to the basic HTML syntax of tag name followed by tag attributes, and are enclosed in the familiar HTML brackets (<>). Most tags are two-sided, and can be combined with each other and with HTML elements to create custom tags for use in ColdFusion applications.

2.8 DEVELOPMENT AUTHORIZING TOOLS

With the assisting of authoring tools, the process of system development will become easier and faster.

2.8.1 MICROSOFT VISUAL STUDIO.NET

Visual Studio .NET is a complete set of development tools for building ASP Web applications, XML Web services, desktop applications, and mobile applications. Visual Basic .NET, Visual C++ .NET, and Visual C# .NET all use the same integrated development environment (IDE), which allows to share tools and facilitates in the creation of mixed-language solutions. In addition, these languages leverage the functionality of the .NET Framework, which provides access to key technologies that simplify the development of ASP Web applications and XML Web services. Features of Visual Studio include:

- Language Enhancement

Microsoft Visual Basic, Microsoft C++, and Microsoft JScript have all been updated to meet your development needs. Additionally, a new language, Microsoft C#, has been introduced. These languages leverage the functionality of the .NET Framework, which provides access to key technologies that simplify the development of ASP Web applications and XML Web services.

- Web Forms

Web Forms are an ASP.NET technology that you use to create programmable Web pages. Web Forms render themselves as browser-compatible HTML and script, which allows any browser on any platform to view the pages. Using Web Forms, you create Web pages by dragging and dropping controls onto the designer and then adding code, similar to the way that you create Visual Basic forms.

- XML Web Services

XML Web services are applications that can receive requests and data using XML over HTTP. XML Web services are not tied to a particular component technology or object-calling convention and can therefore be accessed by any language, component model, or operating system. In Visual Studio .NET, you can quickly create and include XML Web services using Visual Basic, Visual C#, JScript, Managed Extensions for C++, or ATL Server.

- XML Support

Extensible Markup Language (XML) provides a method for describing structured data. XML is a subset of SGML that is optimized for delivery over the Web. The World Wide Web Consortium (W3C) defines XML standards so that structured data will be uniform and independent of applications. Visual Studio .NET fully supports XML, providing the XML Designer to make it easier to edit XML and create XML schemas.

2.8.2 MACROMEDIA DREAMWEAVER

Macromedia Dreamweaver gives developers the productivity of a visual web page layout tool, the control of an HTML text editor and support for new web technologies, all in one software package.

Developers can use it to create web sites visually, with confidence that HTML being generated is concise and always editable. It includes advanced features that take advantage of the latest innovations on the web, such as dynamic HTML and CSS, while still ensuring that web pages work well in a variety of web browsers. All

of the code generated by it is carefully created to work on as many platforms and browsers as possible.

Others features include easy integration of Active X components, Java applets, Plug-ins for improved web page interactivity. It also integrates seamlessly with other components of Macromedia, such as Flash Movies, Shockwave, and Fireworks, which are essential for the development of interactive web pages.

2.8.3 MACROMEDIA FLASH MX

Macromedia Flash MX is the latest professional standard authoring tool for producing high-impact Web experiences. Whether you are creating animated logos, Web site navigation controls, long-form animations, entire Flash Web sites, or Web applications, you'll find the power and flexibility of Flash ideal for your own creativity.

New features in Flash MX enhance the approachability, creativity, and power of Flash. Designers who require a higher level of control and integration with industry-standard design tools now have an unparalleled creative application for creating media-rich content.

Powerful new features build on this creativity, giving application developers access to new capabilities that make Flash MX a robust and exciting application development environment. Developers can work with advanced scripting and debugging tools, built-in code reference, and predefined components to rapidly deploy rich Web applications.

2.8.4 ADOBE PHOTOSHOP

Adobe Photoshop is used as drawing, painting and designing purposes. Users can retouch an image, apply special effects, swap details between photos, introduce text and logos, adjust color balance, and even add color to a grayscale scan. All these functions are included under a set of user-friendly editing tools in Adobe Photoshop. It contains graphical icons to represent every functions of each button. Besides that, it also provides many shortcut keys that is easier and save time for users and for those who do not like to use mouse.

CHAPTER 3: METHODOLOGY

3.1 SYSTEM DEVELOPMENT LIFE CYCLE

System (software) development generally takes the form of a life cycle. We refer to this life cycle as the system development life cycle (SDLC). All systems go through the same generic stages in their lifetime. The stages are shown in the figure 3.1.

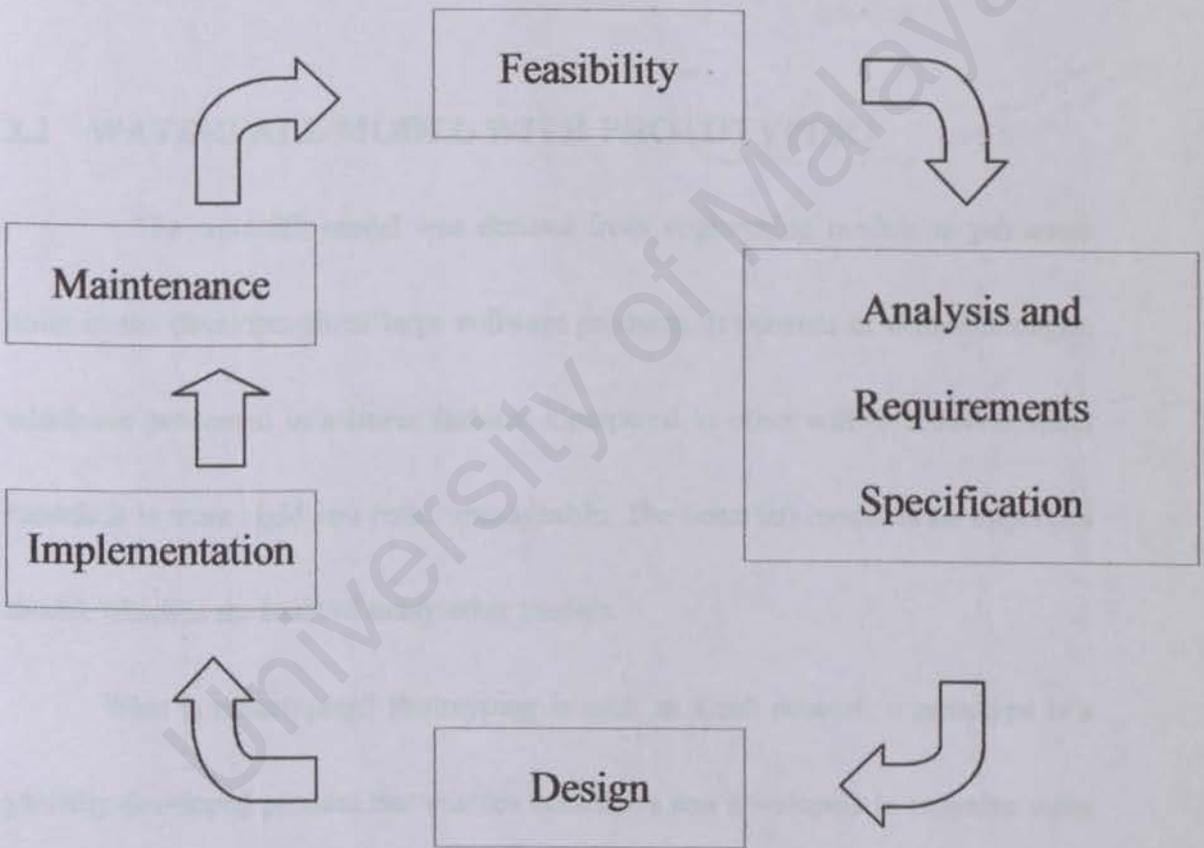


Figure 3.1: System development life cycle (SDLC) stages

The software engineering process consists of a set of steps that encompass methods, tools, and procedures. These steps are often referred to as software engineering paradigms or software life cycle models. A model chosen by the developers is based on the nature of the project and applications.

In this chapter, I will emphasize on Waterfall mode with prototyping, which to be used in my project development process.

3.2 WATERFALL MODEL WITH PROTOTYPING

The waterfall model was derived from engineering models to put some order in the development of large software products. It consists of different stages, which are processed in a linear fashion. Compared to other software development models it is more rigid and better manageable. The waterfall model is an important model, which is the basis of many other models.

What is prototyping? Prototyping is such as a sub process: a prototype is a partially developed product that enables customers and developers to examine some aspect of the proposed system and decide if it is suitable or appropriate for the finished product.

3.2.1 CORRESPONDENCE OF PROPOSED METHODOLOGY WITH SYSTEM

Waterfall model with prototyping is an engineering model designed to be applied to the development of software to produce high- quality software, and follow a software development process so we can understand, control, and improve that products for customers. There are usually six stages in this model of software development:

1. Requirements Analysis and definition

In this stage the requirements of the "to be developed software" are established. These are usually the services it will provide, its constraints and the goals of the software. Once these are established they have to be defined in such a way that they are usable in the next stage. This stage is often prelude by a feasibility study or a feasibility study is included in this stage.

2. System Design

This stage also involves outlining system functional by having feasibility studies or case studies on current system, determining and specifying hardware or software architecture and verifying system design.

8. Operation and Maintenance

Most software products include this stage of the development. It involves correcting errors that have gone undetected before, improvement and other forms of support.

This stage is part of the life cycle of a software product, and not of the strict development, although improvements and fixes can still be considered as "development".

3.2.2 PROTOTYPING

Often, the user interface is built and tested as a prototype, so the users understand what the new system will like, and designers get a better sense of how the users like to interact with the system. Besides, prototyping is very useful for verification and validation.

- **Verification**

It ensures that each function works correctly, checks the quality of the implementation and checks that a deliverable is complete (contains all requires information, follows standards).

- **Validation**

It ensures that the system has implemented all of the requirements, so that each system function can be tracked back to a particular requirement in the specification.

And makes sure that the deliverables satisfy requirements specified in the previous stage or an earlier stage, and that the business case is met.

3.2.3 STRENGTHS OF WATERFALL MODEL WITH PROTOTYPING

Waterfall model with prototyping is extension from waterfall model. It is one of most popular in system development environment. This is because it provided many benefit to developer. Below are strengths of this model.

- **Stages by stages**

Each process will implement in the stage by stage way. It also easy to understood

- **Systematic and sequential**

Each have been defined to avoid confusing to customer even developer.

- **Easy to identify project milestones**

This is because each stage can separate with others stage.

- **Well wide used method**

In system development environment, most system was developed by using this model.

- **Backtracking (feedback) and iteration**

The package has circulation factors so it allows changes in previous phase even through we are not in the current phase.

- **Low Project risks**

Most developers are familiar and have more experience in this type of methodology, so the project risk will become low.

- **Advantages of prototyping**

It can ensure the system meets the performance goals or constraints. Beside that, it also can ensure the system is practical and flexible. It also can ensure the system fulfill the users' requirement.

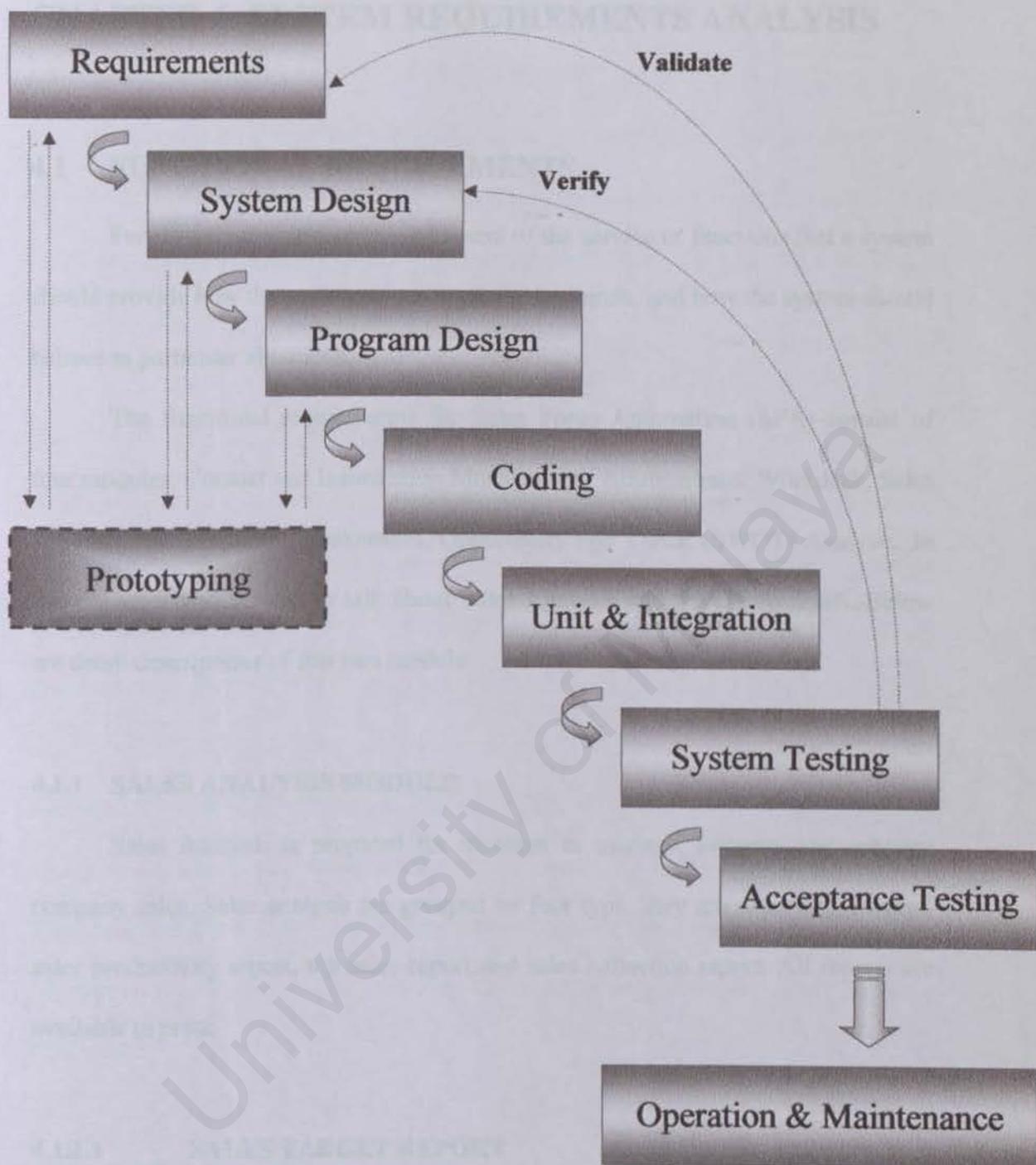


Figure 3.2: Waterfall Model with Prototyping

CHAPTER 4: SYSTEM REQUIREMENTS ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Functional requirement is a statement of the service or functions that a system should provide how the system reacts to particular inputs, and how the system should behave in particular situations.

The functional requirements for Sales Force Automation (SFA) consist of four modules: Contact and Information Management, Administrator Workdesk, Sales Analysis and Strengths, Weaknesses, Opportunity and Threat (SWOT) Analysis. In this report, it will discuss or talk about Sales Analysis and SWOT Analysis. Below are detail descriptions of this two module.

4.1.1 SALES ANALYSIS MODULE

Sales Analysis is prepared for manager to manage, improve and enhance company sales. Sales analysis are grouped by four type, they are sales target report, sales productivity report, top sales report and sales collection report. All reports are available to print.

4.1.1.1 SALES TARGET REPORT

It also provides an easier way to manager to keep track sales and sales representatives performance. It calculates all the sales per month or according to selected date. It provides a list to compare the actual sales with target sales which are entered. It also presents percentage of achieved sales. It gives a clearly accomplishing for each sales representative and be of assistance to improve their performance.

4.1.1.2 SALES PRODUCTIVITY REPORT

It offers detail information or sales records to manager. It also helps manager in making business analysis and planning. It class to three type, sales representative, customer and product. It provides a multi-dimension table and graph. User can select or drag the field to the table or graph.

4.1.1.3 TOP SALES REPORT

According to the total of sales and product, system demonstrate ranking for sales representative, product and customer. It can be a signification to encourage sales representative to improve their sales. Besides that, it also present obviously which product is high demand and popular in market.

4.1.1.4 SALES COLLECTION REPORT

This report presents the actual sales and percentages of collection (credit holder). This functionality is very useful for future business management and planning. Manager can make a decision according to the collection have been return to avoid suffer loss.

4.1.2 SWOT ANALYSIS MODULE

It prepare a change to sales representatives give their opinions and idea also any product extension information and competitor information. This is helping manager to make suitable and powerful business planning. It also assists manager to confront any competitive.

4.1.2.1 PRODUCT STRENGTHS AND WEAKNESSES

It offers a column to sales representatives to give their opinions about the product strengths and weaknesses after comparing with other products. After that, he or she also provides space to propose their suggestion or strategy to improve that product sale. Besides that, it helps manager to improve product organization.

4.1.2.2 COMPETITOR STRENGTHS AND WEAKNESSES

It is similar with Product Strengths and Weaknesses. Sales representative can use this feasibility to discuss about strengths and weaknesses of competitor. Thus, sales representative also can give some suggestion or strategies to face and struggle with their competitors.

4.1.2.3 OPPORTUNITY AND THREATS

It is similar with Product Strength and Weaknesses. Sales representative have a chance to give their suggestion or idea according to the markets and sales environment. That idea can become an opportunity or threat to company or product.

4.1.1.4 ADVERSE DRUG REPORT

This report is supported by customers who are buying or selling the product. Some products maybe have some hidden adverse effecting that it will reveal when taking the product in long term or that product are not suitable the some people. So, this module is providing a space to record adverse drug reports or complaints. From this report, it can avoid an accident.

4.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirement is essential definition of the system properties and constraints under which a system must operate. It is a description of other features, characteristics, and constraints that define a satisfactory system.

Mostly system users might expect certain degree of non-functional requirement.

Some of the non-functional requirements for SFA are:

4.2.1 USER FRIENDLINESS

For a system to be popularized, it must be easily understood by the users. The users need not to know what happen behind the system but through the system's user interface, users are supposed to get whatever they want easily.

Here are some 'scheme's provided to measure whether a system is user friendly or else:

- Consistent, in terms of screen design and error messages displayed.
- Accommodation of any level of user. In the case of EMG for Algebra, it must be user friendly to all target users, the students, teachers as well as the parents.
- Appropriate error handling with associated error messages.
- High degree of understandability and avoid too much of memorization of events and commands for the users.

4.2.2 EFFICIENCY

A system is said to fulfill the efficiency requirement when its process or procedure can be called, accessed and functioning well to produce outcomes or output at a pace or speed acceptable by the users. Furthermore, all that has to happen in an unlimited of times after the system implementation whenever the users need it. The outcomes

of the same process or procedure with the same input must be similar every time being called.

4.2.3 SHORT LOADING TIME AND RESPOND TIME

Normally, everyone likes the system to respond fast. Thus a system must be able to provide short loading time and respond time (more critical if the system is online). Slow loading and respond time might cause the users to wait and discourage them from using the system again. However, the system's performance sometimes depends on the hardware used.

4.2.4 RELIABILITY AND ACCURATE

A system must be able to produce accurate results and can be trusted by the users. This is most critical for the military, medical, financial, banking and scientific research systems. However, it is also very important in a computer aided learning system and also the educational games system.

4.2.5 MODULARITY

Modularity means the system is broken into small modules so that distinct functions of objects could be isolated from one to another other. This will make the system testing and maintenance process easier because the processes can be done portion by portion and not involving the whole system.

4.2.6 MAINTAINABILITY

This may be defined qualitatively as the ease with which software can be understood, corrected, adapted and enhanced.

4.2.7 EXPANDABILITY

Expandability is discussed based on the degree to which system architecture, data or procedure design can be extended and enhanced after the system is implemented.

4.2.8 CORRECTNESS

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

4.2.9 FUNCTIONALITY

The functionalities stressed here are the searching and retrieving capability, which is very important in any web applications 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

4.2.10 SECURITY

There is an understanding that emphasis has been placed on a secure system when dealing with personal and financial information of users. System will ensure that sensitive information will be handled in a safe and professional manner. In addition, various levels of functionality will be provided according to the user's status

4.3 TECHNIQUES USED TO DEFINE REQUIREMENTS

Effective and appropriate techniques must be used to define and elicit user's requirements. Many approaches to find information on Sales Force Automation had been utilized. Information gathering technique is necessary to employ the fact

finding technique in order to establish understanding of the state and future requirements. Information findings sources are generally divided into three type, they are Internet Research, Newsgroups Published and Group Member Discussion.

4.3.1 NEWSGROUPS PUBLISHED

Most developer newsgroups such as from Microsoft site were very useful especially when wanting to receive information shared out by other developers regarding to their findings and problems faced. The real notion of newsgroup is to basically understand what other developers around the world are doing and the information has been very useful in developing this system.

4.3.2 INTERNET RESEARCH

The Internet played a major role in succeeding this information finding process because there is a vast variety of information and research. So, there is easy to get the definition and information of Sales Force Automation until the most up-to-date Sales Force Automation development. The latest technologies trend and development skills are available online.

4.3.3 GROUP MEMBER DISCUSSION

Group member discussion was very helpful and useful way when facing with on-the-spot problem. It was better that waiting a few days for the newsgroup or forum to response. Besides that, discussion with supervisor is a vital key to the success of the system.

4.4 CHOSEN PLATFORM, WEB SERVER, DATABASE AND TOOLS

4.4.1 DEVELOPMENT PLATFORM - Microsoft Windows 2000 Professional

Why choose this operating system?

- Lower total cost of ownership
- Networking and communication services
- Easier to use and manage
- Industrial-strength reliability and highest level of security
- Integrated administration tools

4.4.2 DATABASE MANAGEMENT SYSTEM - Microsoft SQL Server 2000

Why choose this database server?

- SQL Server provides powerful and scalable support for large database and complex queries.
- Features provided by SQL Server ensure easy-to-use for database administrators in building, managing and deploying business applications.
- 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.

4.4.3 DEVELOPMENT DATA ACCESS TECHNOLOGY – ADO

Why choose this Data Access Technology?

ADO is more general and can be used to access all sorts of different types of data. ADO also provides consistent access to data for creating a front-end database client or middle-tier business object.

4.4.4 DEVELOPMENT WEB SERVER- Microsoft Internet Information

Services

Why choose this Web Server?

- Internet Information Services (IIS) is the Windows component that makes it easy to publish information and bring business applications to the Web.
- IIS makes it easy for you to create a strong platform for network applications and communications.

4.4.5 DEVELOPMENT LANGUAGE – ASP.NET

Why choose this Language?

- Better Language Support
- Programmable Controls
- Event Driven Programming
- XML Based Components
- User Authentication, with Accounts and Roles
- Higher Scalability
- Increased Performance - Compiled Code
- Easier Configuration and Deployment

CHAPTER 5 – SYSTEM DESIGN

5.1 INTRODUCTION

System Design is the creative process of transforming the problem into a solution; the description of solution is also called design. System design in an Information Technology environment context would not be a complete success if there does not exist an understanding between the thinking complexities of the developer during the development of a system. This thinking complexity processes involve identifying goals, alternatives of strategic steps during processes such as design, making decisions and solving problems.

System Design also 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:

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

5.2 OVERVIEW OF SYSTEM ARCHITECTURE

The system architecture is based on the traditional client-server architecture. Basically, the software system is broken down into 3 tiers; the Presentation -tier, business-tier and database-tier.

The Presentation-tier deals with the presentation of the system to the end user. This part is web-enabled and is developed using ASP.NET. Development in this section involves work in Web design, Web authoring and web programming. The business-tier does the processing behind the scenes. This part applies the business rules and formatting to the data that is to be sent to the presentation layer. The database-tier accesses the database to read or write data. This tier deals with all the connectivity with the database.

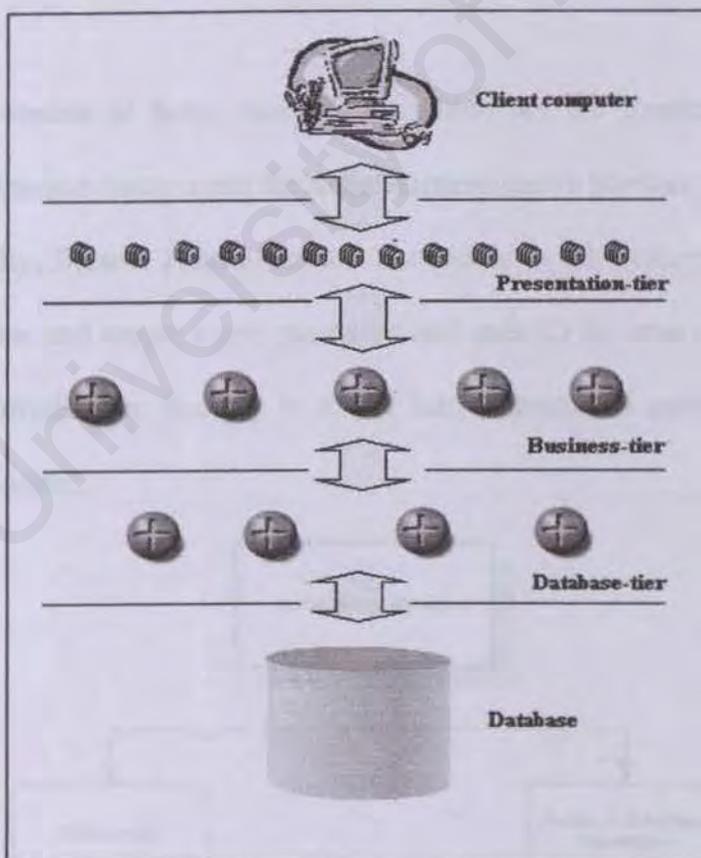


Figure 5.1 System Architecture

5.3 SYSTEM FUNCTIONALITY DESIGN

5.3.1 SYSTEM STRUCTURE CHARTS

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

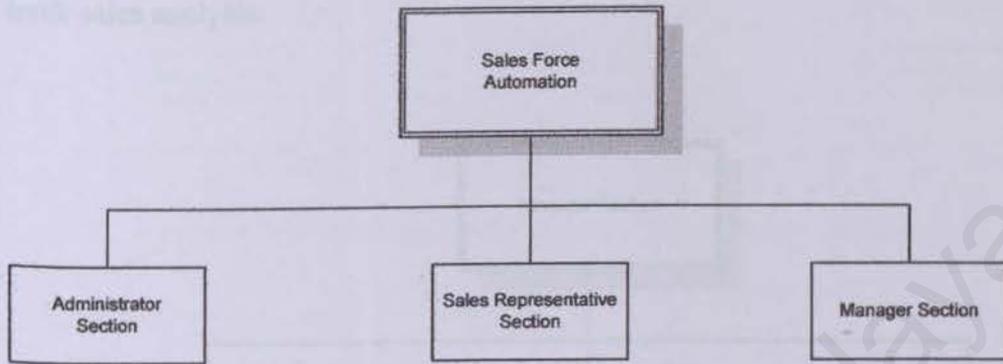


Figure 5.2: Structure Chart for SFA

SFA consists of three major parts, which are the System Administration Section, the Manager Section and the Sales Representative Section.

Basically, System Administration Section is to let System administrator to setup a new user and create a new password and user ID for new user. On the other hand, the Administrator Section is to let administrator to publish and manage company newsletter.

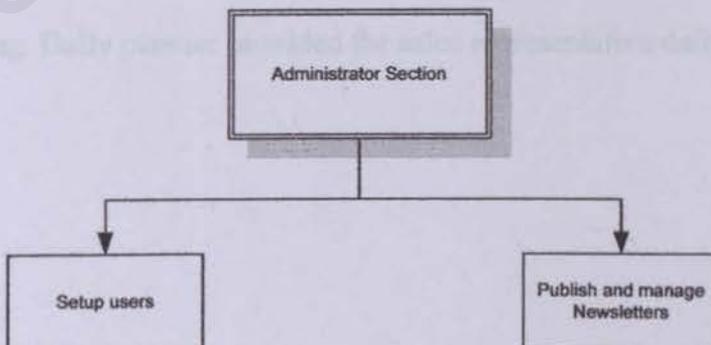


Figure 5.3: Structure Chart for System Administration Section

For Manager Section, It let manager to approve or reject expense claims and any changed information. Besides that, Manager Section is to give some comments about strength, weakness, opportunity and threat (SWOT). Manager also can keep track sales analysis.

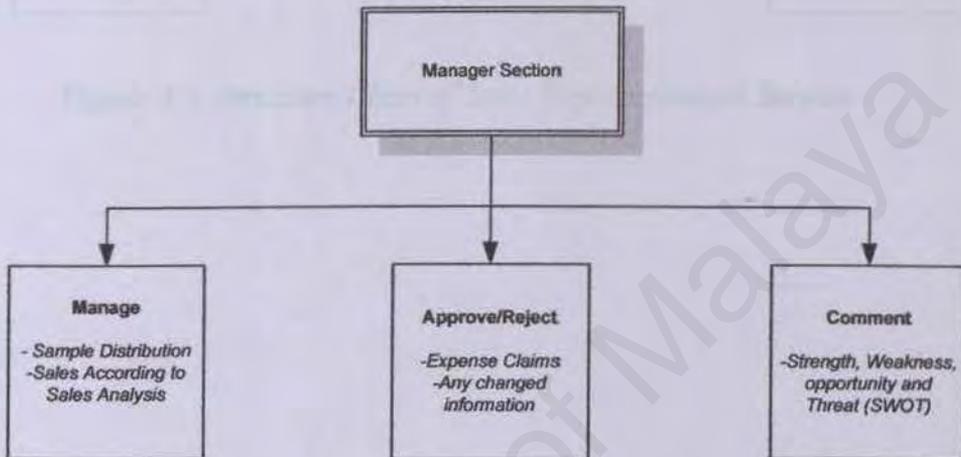


Figure 5.4: Structure Chart for Manager Section

In Sales Representative Section, sales representative can submit their contact or non-contact, sales report and expense claims. Sales Representative section also let sales representative to give comment or suggestion about customer, product, and company information, SWOT information. It also let sales representatives to report the adverse drug. Daily planner provided for sales representative daily activities.

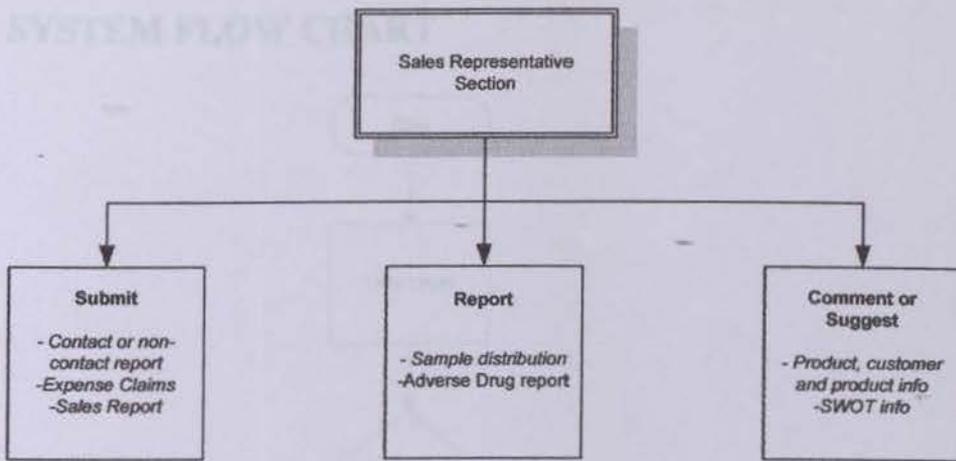


Figure 5.5: Structure Chart of Sales Representatives Section

5.3.2 SYSTEM FLOW CHART

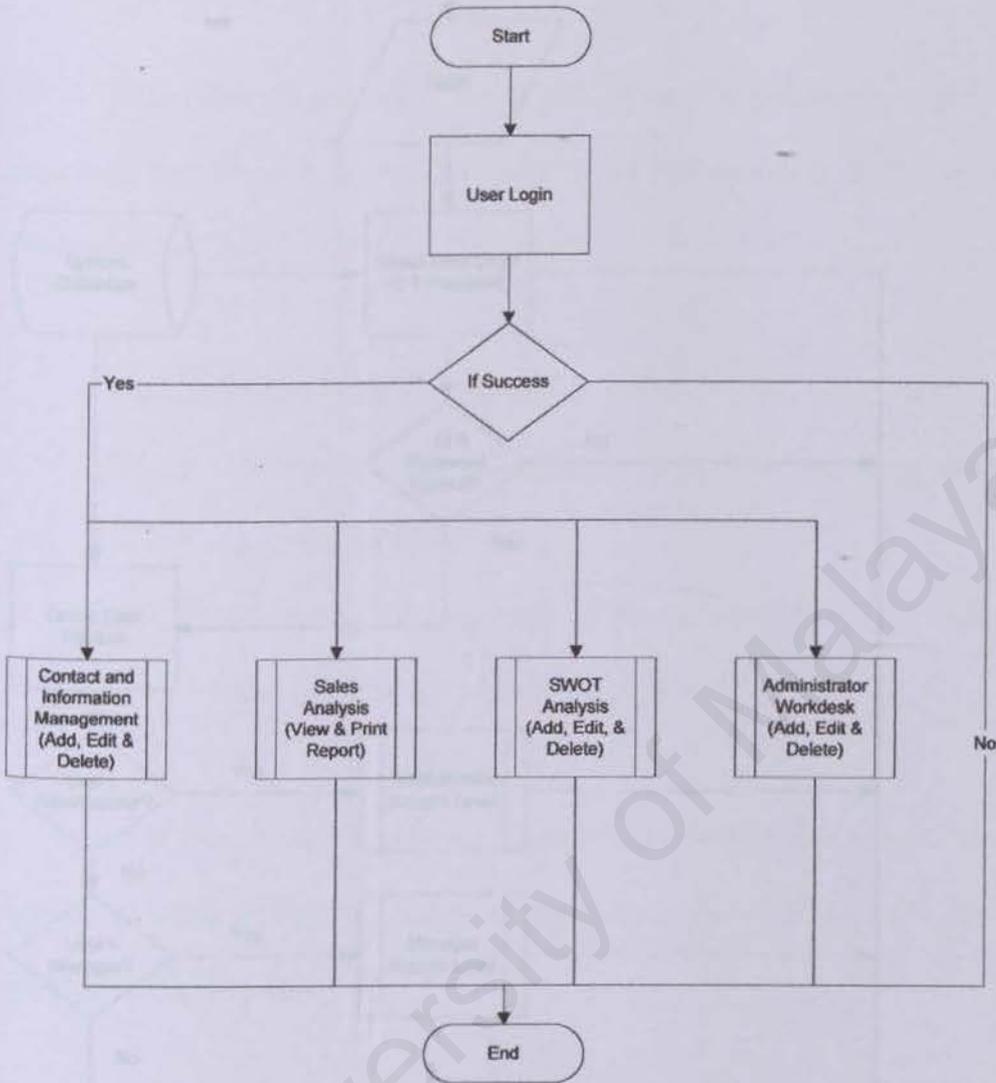


Figure 5.6: System Flow Chart

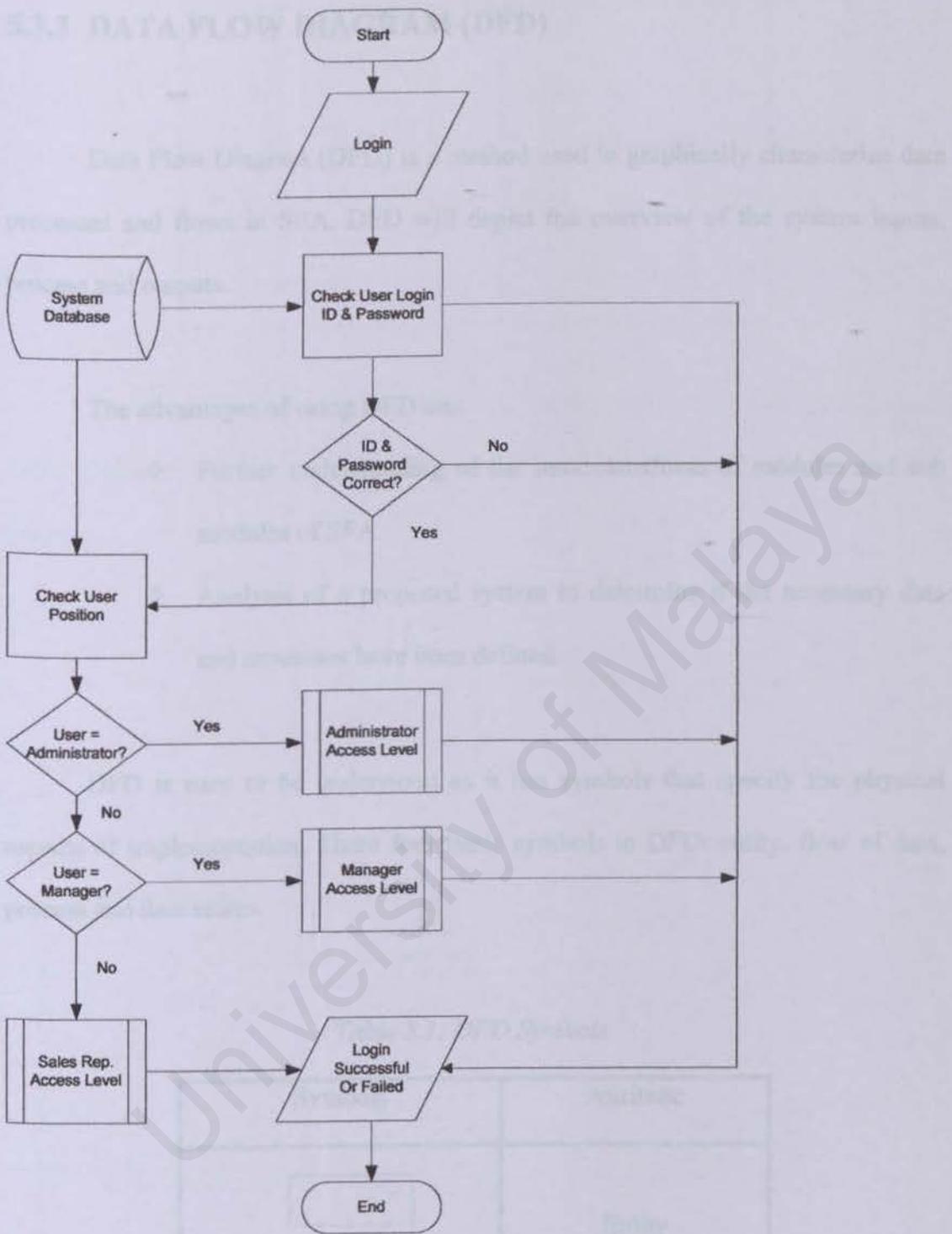


Figure 5.7: System Login Flow Chart

5.3.3 DATA FLOW DIAGRAM (DFD)

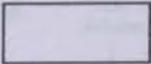
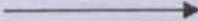
Data Flow Diagram (DFD) is a method used to graphically characterize data processes and flows in SFA. DFD will depict the overview of the system inputs, process and outputs.

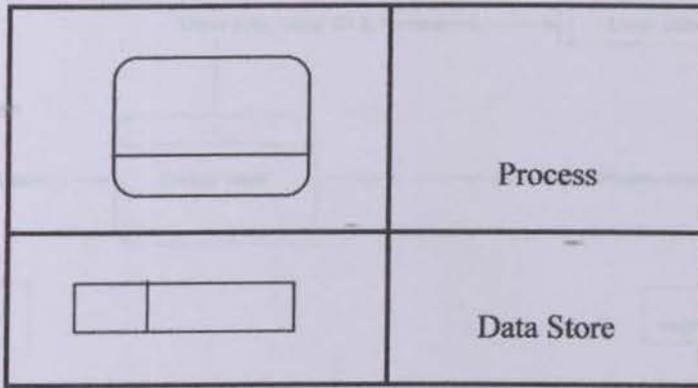
The advantages of using DFD are:

- ❖ Further understanding of the interrelatedness of modules and sub modules of SFA.
- ❖ 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.

Table 5.1: DFD Symbols

Symbols	Attribute
	Entity
	Flow of Data



The data flow is conceptualized with a top-down perspective. So, the Context Level Diagram will be drawn, followed by the Zero Diagram and First Level diagram.

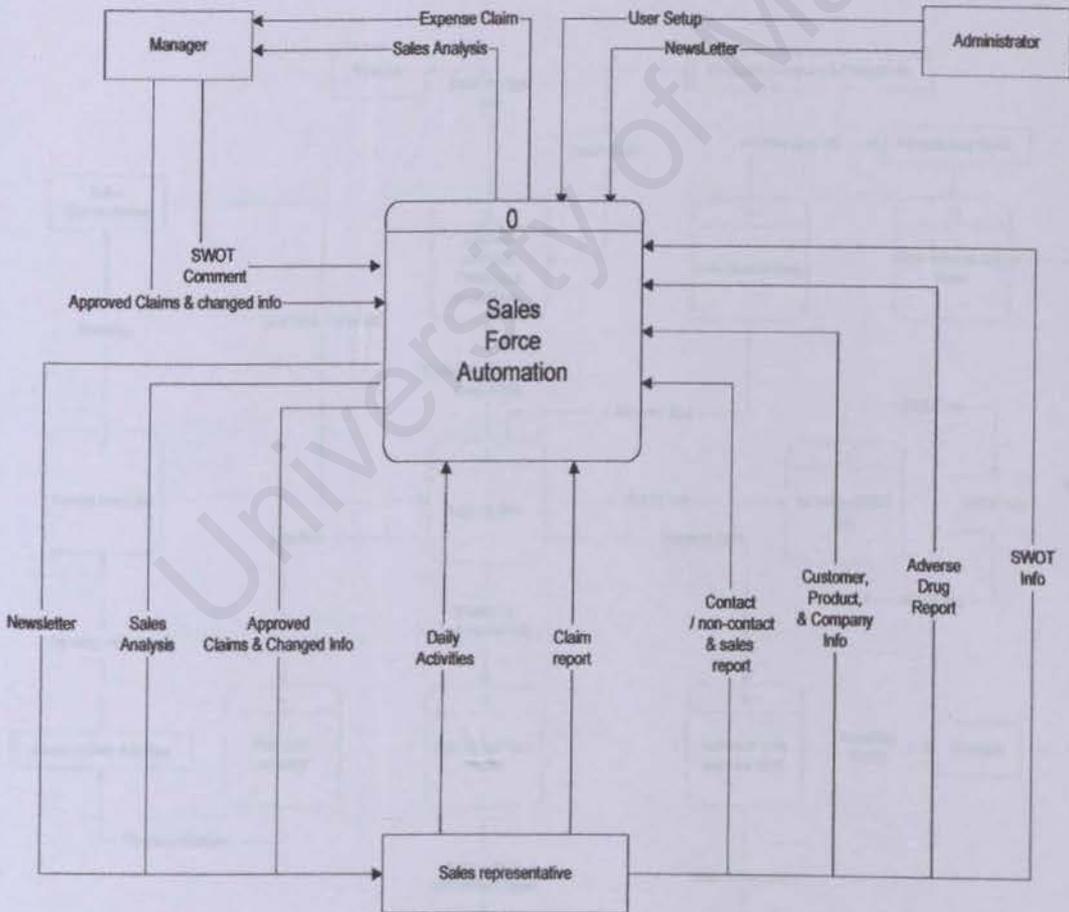


Figure 5.8: Context Level Diagram of SFA

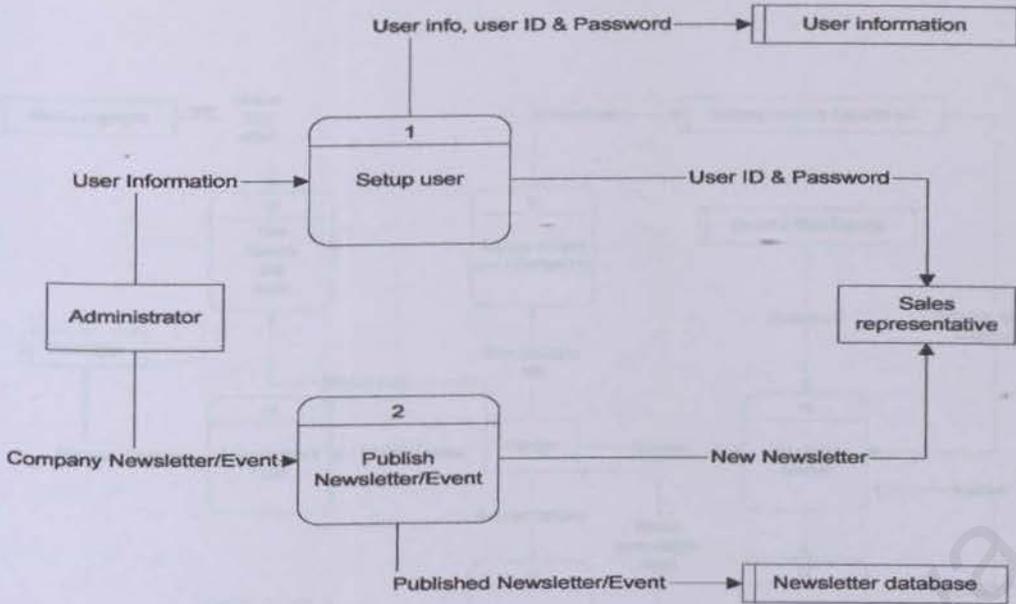


Figure 5.9: Zero Level Diagram of Administrator Section

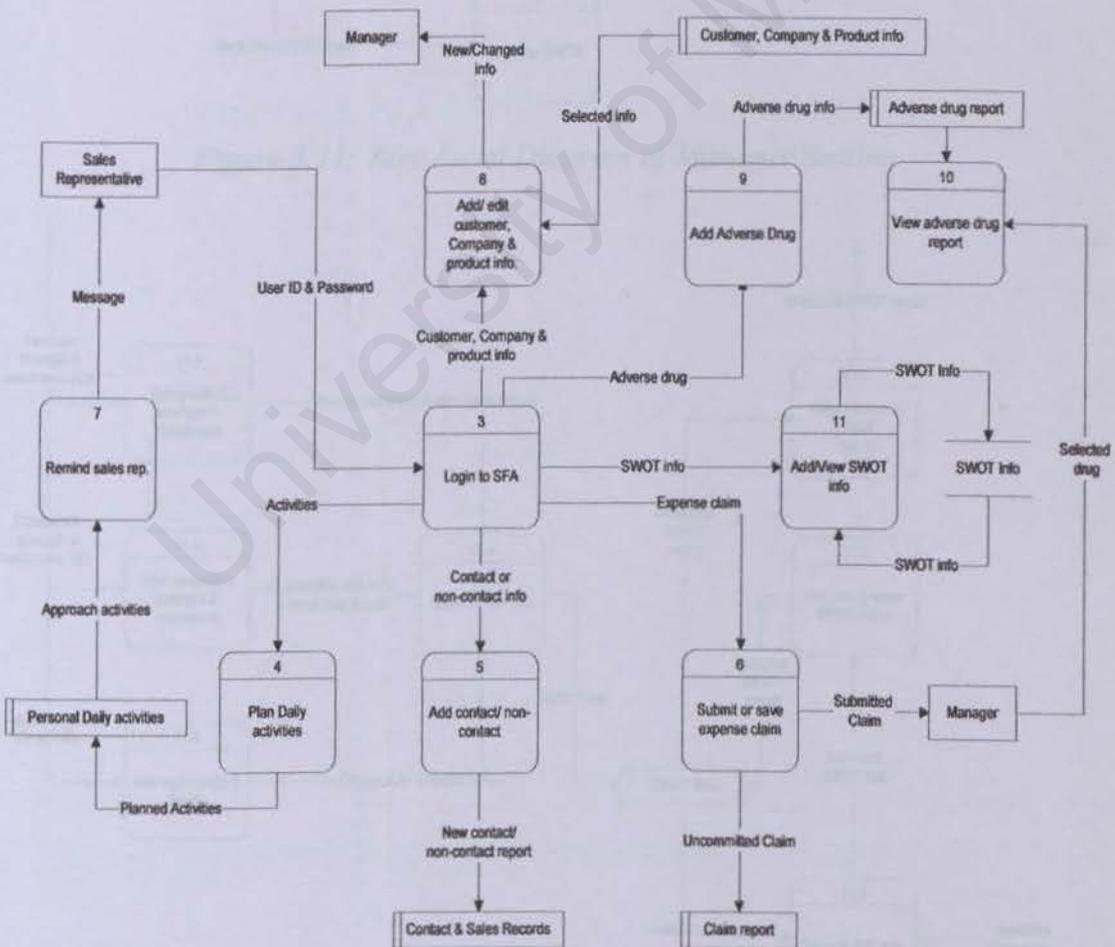


Figure 5.10: Zero Level Diagram of Sales Representative Section

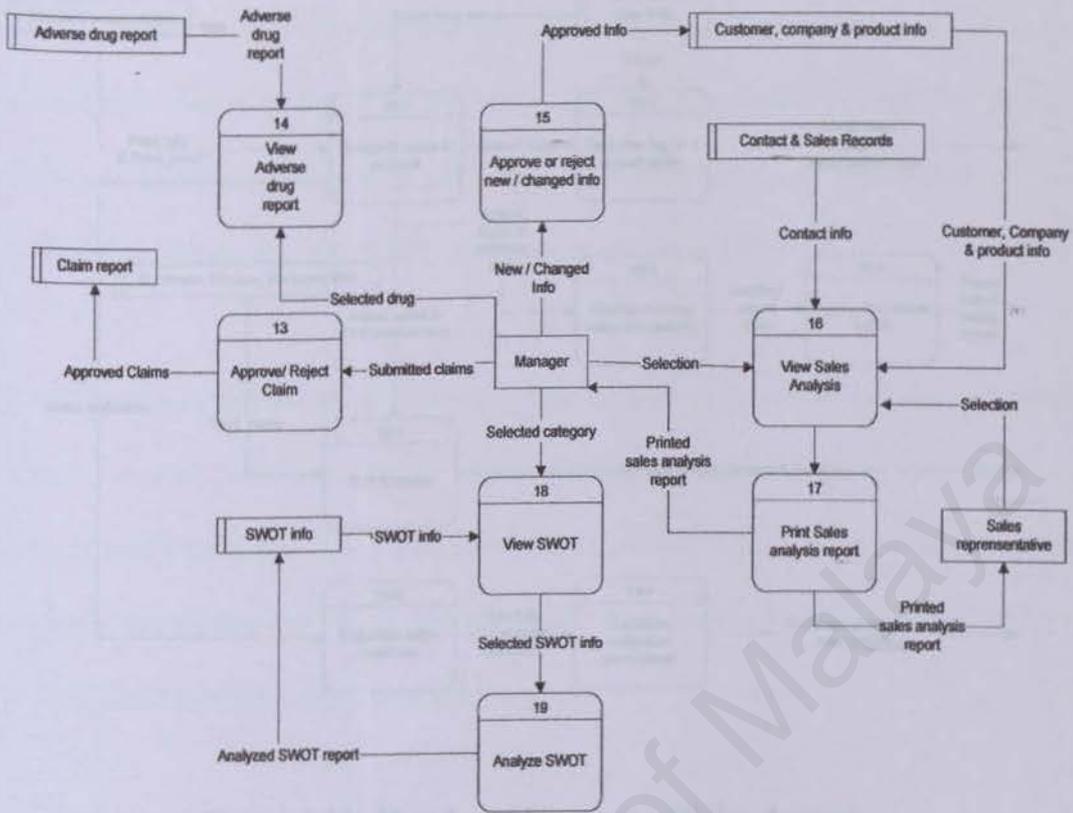


Figure 5.11: Zero Level Diagram of Manager Section

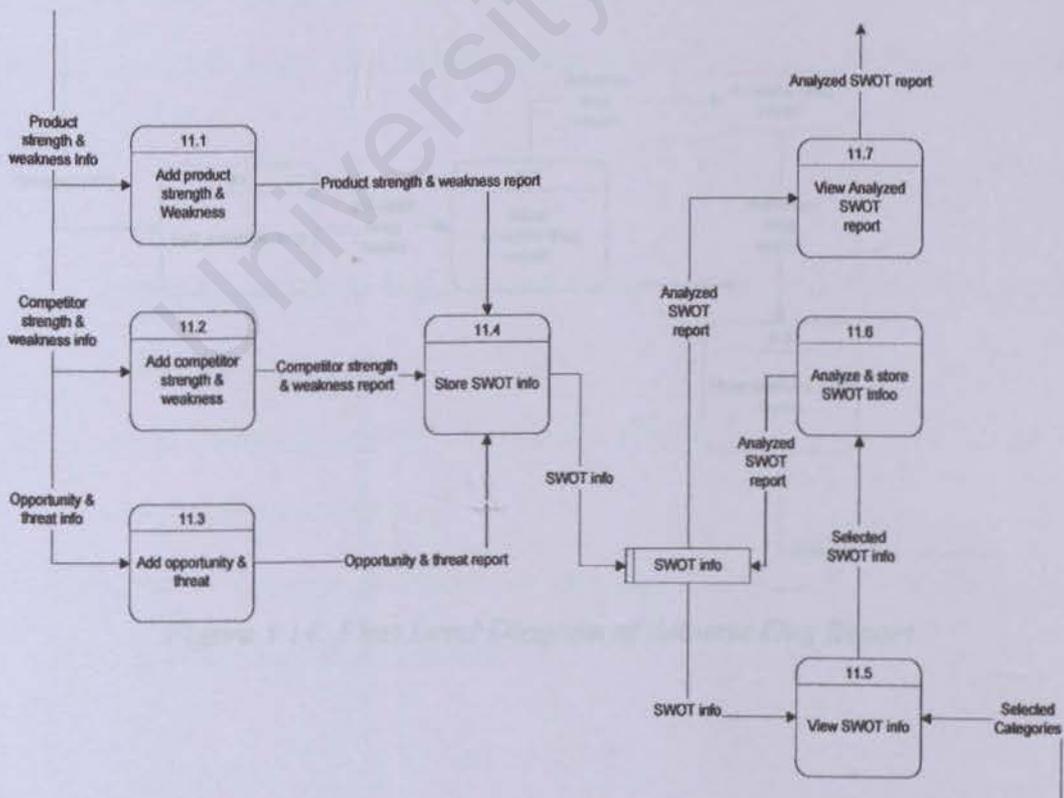


Figure 5.12: First Level Diagram of SWOT Analysis

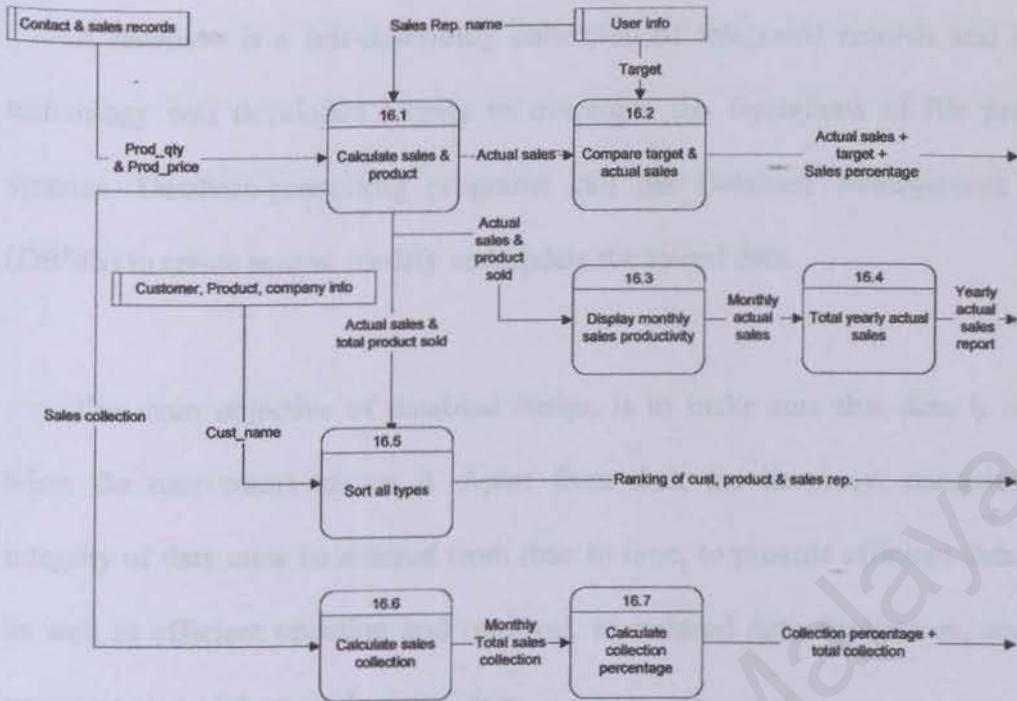


Figure 5.13: First Level Diagram of Sales Analysis

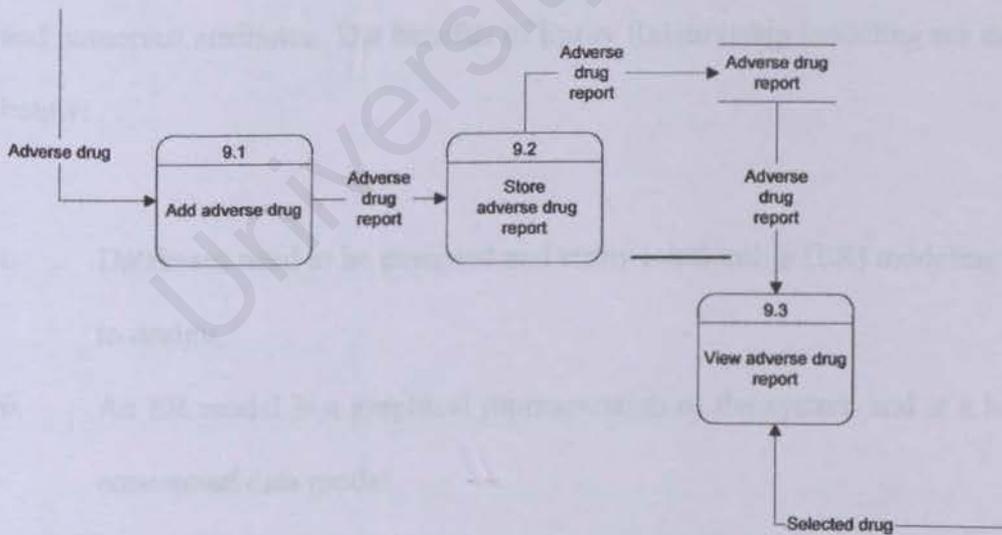


Figure 5.14: First Level Diagram of Adverse Drug Report

5.4 DATABASE DESIGN

A database is a self-describing collection of integrated records and database technology was developed largely to overcome the limitations of file processing systems. Database-processing programs call the Database Management System (DBMS) to create access, modify and update the stored data.

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, to reduced data duplication, and easier representation of the users' perspectives.

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

A database is self-describing: it contains, in addition to the user's source data, a description of its own structure. This description is called a data dictionary (also called a metadata). Data dictionary defines the field, field type and descriptions of each table.

Database Name: SFA

Table Name: AvsD_Detail

Primary key: AvsD_prod_ID

Description: Adverse Drug detail

Table 5.2: Table of adverse drug detail

Field Name	Type	Length	Description
ADR_ID	int	4	Report ID
ADR_prod_id	nvarchar	16	Product ID
ADR_cust_id	nvarchar	16	Customer ID
ADR_title	nvarchar	50	Report Title
ADR_Dscp	nvarchar	1000	Report Description
ADR_sr_id	nvarchar	16	Sales Rep. ID
ADR_SR_date	smalldatetime	4	Input Date
ADR_status	bit	1	Report status

Table Name: SnWProd_Detail

Primary key: SnWProd_ID

Description: Products Strengths and Weaknesses Detail

Table 5.3: Table of Product Strength and Weakness detail

Field Name	Type	Length	Description
SnWProd_ID	int	4	Product Strength & Weakness ID
SnwProd_pid	nvarchar	16	Product ID
SnWProd_SR_id	nvarchar	16	Sales Rep. ID
SnWprod_title	nvarchar	50	Title
SnWProd_SR_Strength	nvarchar	1000	Strength Description
SnWProd_SR_Weak	nvarchar	1000	Weakness Description
SnWProd_date	smalldatetime	4	Input Date

SnWProd_checked	bit	1	Comment Status
SnWprod_mng_name	nvarchar	50	Manager Name
SnWProd_mng_cmt	nvarchar	1000	Manager Comment
SnWProd_mng_date	smalldatetime	4	Manager Comment Date
SnWprod_status	bit	1	Edit Status

Table Name: Ont_detail

Primary key: Ont_ID

Description: Opportunity and Threat detail

Table 5.4: Table of opportunity and threat detail

Field Name	Type	Length	Description
Ont_id	Int	4	Opportunity & Threat ID
Ont_sr_id	nvarchar	16	Sales Rep. ID
Ont_title	nvarchar	50	Title
Ont_opportunity	nvarchar	1000	Opportunity Description
Ont_threat	nvarchar	1000	Threat Description
Ont_date	smalldatetime	4	Input date
Ont_checked	Bit	1	Comment Status
Ont_mng_name	nvarchar	50	Manager Name
Ont_mng_cmt	nvarchar	1000	Manager Comment
Ont_mng_date	smalldatetime	4	Manager Comment Date
ont_status	Bit	1	Edit Status

Table Name: Cptr_Detail

Primary key: Cptr_ID

Description: Competitor Strength and Weakness detail

Table 5.5: Table of Competitor Strength and Weakness detail

Field Name	Type	Length	Description
Cptr_ID	int	4	Competitor Strength & Weakness ID
Cptr_name	nvarchar	50	Competitor Name
Cptr_comp	nvarchar	100	Competitor Company Name
Cptr_srid	nvarchar	16	Sales Rep. ID
Cptr_title	nvarchar	50	Title
Cptr_strength	nvarchar	1000	Strength Description

Cptr_weak	nvarchar	1000	Weakness Description
Cptr_date	smalldatetime	4	Input Date
Cptr_checked	bit	1	Comment Status
Cptr_mng_name	nvarchar	50	Manager Name
Cptr_mng_cmt	nvarchar	1000	Manager Comment Description
Cptr_mng_date	smalldatetime	4	Manager Comment Date
cptr_status	bit	1	Edit Status

Table Name: Sales_Detail

Primary key: Order_ID, Order_Line

Description: Sales Order Detail

Table 5.6: Table of Sales Order detail

Field Name	Type	Length	Description
Order_ID	nvarchar	16	Sales Order ID
Order_Line	int	4	Order Line
Prod_id	nvarchar	16	Product ID
Prod_name	nvarchar	50	Product Name
Prod_qty	int	4	Product Quantity
prod_price	float	8	Product Price
Order_amt	float	8	Amount
Order_date	smalldatetime	4	Order Date

Table Name: Sales_Summary

Primary key: Order_ID

Description: Sales Order Summary

Table 5.7: Table of Sales Order summary

Field Name	Type	Length	Description
Order_ID	Nvarchar	16	Order ID
cust_ID	Nvarchar	16	Customer ID
Order_total	Float	8	Total Sales
Order_collection	Float	8	Sales Collection
SR_ID	Nvarchar	16	Sales Rep. ID
Order_date	smalldatetime	4	Order Date
Con_Rpt_ID	Int	4	Contact Report ID

Table Name: SalesList

Primary key: Order_ID, Order_line

Description: Temporary table for Sales Order

Table 5.8: Table of Saleslist

Field Name	Type	Length	Description
order_id	Nvarchar	16	Sales Order ID
Order_line	Int	4	Order Line
Prod_id	Nvarchar	16	Product ID
prod_name	Nvarchar	50	Product Name
prod_qty	Int	4	Product Quantity
prod_price	Float	8	Product Price
Order_amt	Float	8	Amount
order_date	smalldatetime	4	Order Date

Table Name: Target_History

Primary key: Order_ID

Description: Storing Sales Rep. Sales Target

Table 5.9: Table of Target History

Field Name	Type	Length	Description
Target_sr_id	nvarchar	16	Sales Rep. ID
Target_line	int	4	Target Line
Target_value	float	8	Sales Target
Target Date	smalldatetime	4	Target Date

5.4.2 RELATIONSHIPS

There are three types of established inter-table relationships which are one: one (1:1), one: many (1: N) and many: many (M: N). The relationship between Sales Detail table and Sales Summary table is illustrated in the relationship diagram in Figure 4.4. That diagram is similar with table are shown above.

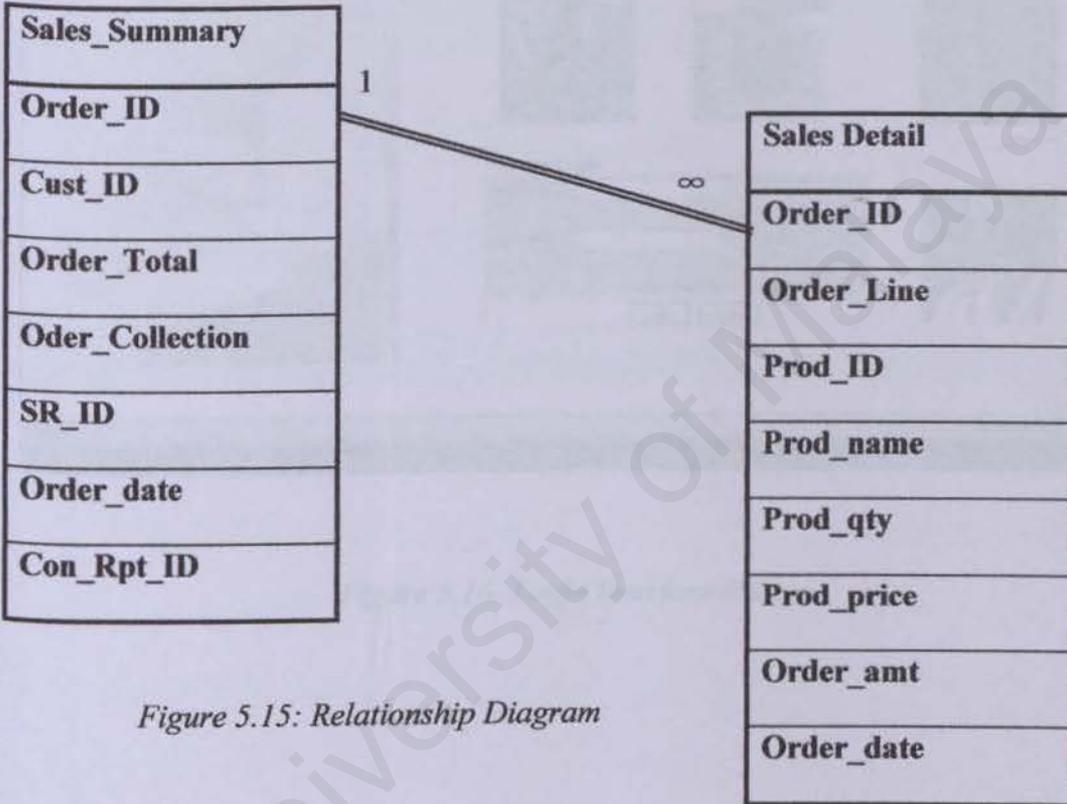


Figure 5.15: Relationship Diagram

5.5 USER INTERFACE DESIGN

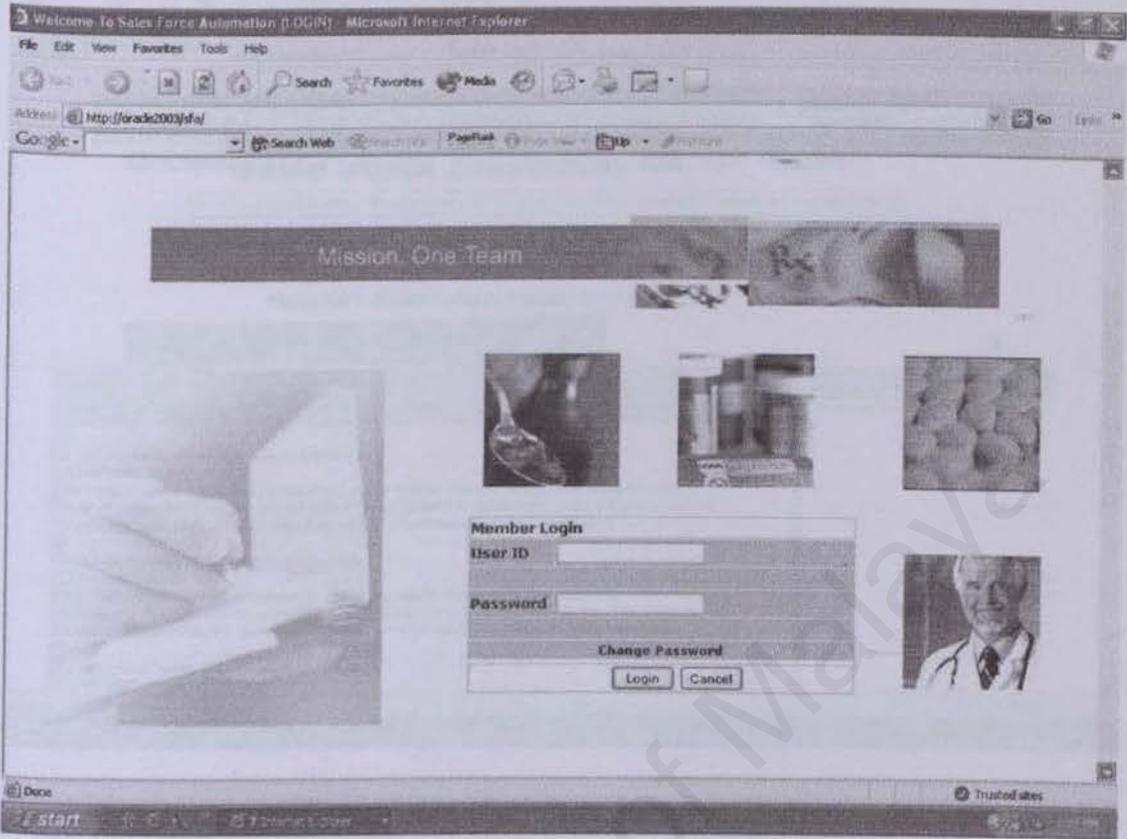


Figure 5.16: Login Interface Design

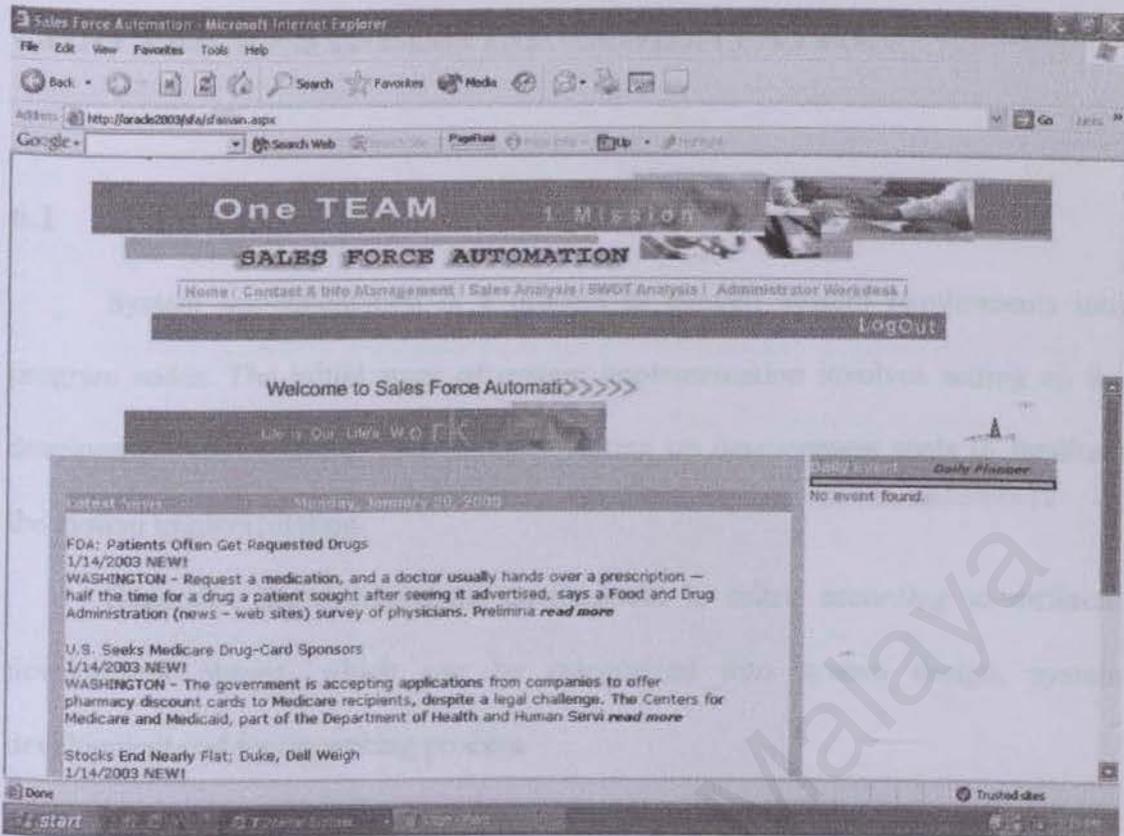


Figure 5.17: Main Page Interface Design

CHAPTER 6 - SYSTEM IMPLEMENTATION

6.1 INTRODUCTION

System implementation is a process to convert system requirements into program codes. The initial stage of system implementation involves setting up the development environment. This includes setting up development tools to facilitate the system implementation.

Generally, the development environment is suited according to different development phases, which can be categorized into system design, system development and report writing process.

6.1.1 SYSTEM DESIGN

Although system design is clearly stated in chapter 5, nevertheless, during the initial stage of system development, a number of considerations and adjustments were done to the initial system design in order to match the actual needs and requirements.

6.1.2 SYSTEM DEVELOPMENT

The basic tools used for the system development are:

- i. Microsoft SQL Server 2000 (Enterprise Manager)
- ii. Microsoft SQL Server 2000 (Analysis Manager)
- iii. Microsoft Window 2000 Server (Operating System)
- iv. Microsoft Visual Studio .NET
- v. Adobe Photoshop 7.0 (Image creation Tool)

- vi. Macromedia Dreamweaver MX (Editor and interface creation tool)
- vii. Microsoft Internet Explorer 6.0 (Web browser)

6.1.3 REPORT WRITING

All the problems encountered, together with solutions found throughout the processes (from system implementation until system evaluation) were recorded as well as result from system testing and system integration.

6.2 SYSTEM CODING – CODING APPROACH, STYLE AND SCRIPTING LANGUAGE

6.3 DATABASE IMPLEMENTATION

6.2.1.1 Microsoft SQL Server (Enterprise Manager)

The SFA database is stored in a Server which the database Server (Microsoft SQL Server 2000) was installed. All data creation, updates or data retrieval will be connected directly to the database server through ADO.NET.

The SFA database includes tables to keep and store all user's, company's, product's and customer's information. Besides that, SFA database also stock up all activities. Through SFA, sales representatives can create, edit and delete any records directly into or from the SFA database.

SFA database also includes Store Procedures to execute all system processes at the database server like calculation. It makes system faster and always in best performance.

Data Transmission Service (DTS), which is part of Microsoft SQL Server 2000. DTS is a set of components used to import, export, and transform data and the tools let you use the component. It also provides DTS package to allow the developer to view critical information about each process that ran in each task and package. A package named Update has been created to reprocess all cubes and dimension in OLAP. It also allow user to create or set schedule to execute that package called Job which provide by SQL Server Agent.

6.2.1.2 Microsoft SQL Server 2000 (Analysis Manager)

Analyzing and understanding your data are the roles of SQL Server 2000's enhanced OLAP and new data-mining components. Renamed *Analysis Services* in SQL Server 2000, online analytical processing (OLAP) services have been enhanced to provide greater capability and scalability. Enhancements such as distributed partitioned cubes, indexed views, dimension enhancements, real-time OLAP, and security enhancements. Besides that, OLAP also allows quick and easy access to shared multidimensional information.

For SFA, new database has been created at Analysis Manager, named SFA to analysis data in SFA database at Enterprise Manager. Three Cubes and six shared dimension created for easy access to the multidimensional information.

6.2.2 PROGRAM IMPLEMENTATION

6.2.2.1 Coding Approach

Top-down approach is chosen to break the big modules of SFA into functions and procedures. All these small modules or functions are built and developed separately.

6.2.2.2 Coding Style

ASP.NET is used to develop the entire SFA, to increase the coding readability and to help in future enhancements; a page is formed by small pieces of files through the use of "code behind". This is very important as it reduces workload of system developers and help developers easy to handler error. It also makes program or coding structure more orderliness. Besides, it also enables system to be developed in shortest time as it allows few developers to work on separate modules at the same time.

- ASP.NET Page

An ASP.NET page is formed by small pieces of files. *Figure 6.1* indicated an ASP page (DatePicker.aspx). Code behind is using to simplifies work done during correction or updates on pages.

- The Use Of Code Behind In ASP.NET Page

This is one of the parts that adding from ASP. *Figure 6.2* is an ASP.NET file for a class named DatePicker. This class is use to display a calendar and allow users to select the date from that calendar.

By using Code Behind, it makes developers easy to develop web applications and checking for any errors (Debug). Besides that, it provided a good environment for developers like Visual Basic environment.

```
<%@ Page Language="vb" AutoEventWireup="false" Codebehind="DatePicker.aspx.vb"
Inherits="SFA.DatePicker" %>
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
  <HEAD>
    <title>DatePicker</title>
    <meta name="GENERATOR" content="Microsoft Visual Studio.NET 7.0">
```

```

<meta name="CODE_LANGUAGE" content="Visual Basic 7.0">
<meta name="vs_defaultClientScript" content="JavaScript">
<meta
name="vs_targetSchema"
content="http://schemas.microsoft.com/intellisense/ie5">
</HEAD>
<body>
<form id="Form1" method="post" runat="server">
<P align="center">
<asp:Calendar
id="Calendar1"
runat="server"
BorderWidth="1px" BackColor="#FFFFCC" Width="218px" DayNameFormat="FirstLetter"
ForeColor="#663399" Height="234px" Font-Size="8pt" Font-Names="Verdana"
BorderColor="#FFCC66" ShowGridLines="True">
<TodayDayStyle
ForeColor="White"
BackColor="#FFCC66"></TodayDayStyle>
<SelectorStyle
BackColor="#FFCC66"></SelectorStyle>
<NextPrevStyle
Font-Size="9pt"
ForeColor="#FFFFCC"></NextPrevStyle>
<DayHeaderStyle
Height="1px"
BackColor="#FFCC66"></DayHeaderStyle>
<SelectedDayStyle
Font-Bold="True"
BackColor="#CCCCFF"></SelectedDayStyle>
<TitleStyle
Font-Size="9pt" Font-Bold="True"
ForeColor="#FFFFCC" BackColor="#990000"></TitleStyle>
<OtherMonthDayStyle
ForeColor="#CC9966"></OtherMonthDayStyle>
</asp:Calendar></P>
<P align="center" style="FONT-WEIGHT: bold; FONT-SIZE: 10px;
COLOR: red; FONT-STYLE: normal; FONT-FAMILY: Verdana">&nbsp;</P>
</form>
</body>
</HTML>

```

Figure 6.1 : An ASP.NET Page – DatePicker.aspx

Public Class DatePicker

Inherits System.Web.UI.Page

Protected WithEvents Calendar1 As System.Web.UI.WebControls.Calendar

```
#Region " Web Form Designer Generated Code "
```

```
'This call is required by the Web Form Designer.
```

```
<System.Diagnostics.DebuggerStepThrough()> Private Sub InitializeComponent()
```

```
End Sub
```

```
Private Sub Page_Init(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles  
MyBase.Init
```

```
'CODEGEN: This method call is required by the Web Form Designer
```

```
'Do not modify it using the code editor.
```

```
InitializeComponent()
```

```
End Sub
```

```
#End Region
```

```
Private Sub Page_Load(ByVal sender As System.Object, ByVal e As System.EventArgs)  
Handles MyBase.Load
```

```
'Put user code to initialize the page here
```

```
End Sub
```

```
Private Sub Calendar1_SelectionChanged(ByVal sender As Object, ByVal e As  
System.EventArgs) Handles Calendar1.SelectionChanged
```

```
Dim script As New System.Text.StringBuilder()
```

```
script.Append("<script language='javascript'>") 'Opening script tag
```

```
script.Append(Environment.NewLine) 'Newline
```

```
script.Append("window.opener.document.all[\"") 'Reference to original window
```

```
script.Append(Request.QueryString("src")) 'Control to set value on
```

```
script.Append("].value = \"") 'Set the value
```

```
script.Append(Calendar1.SelectedDate.ToShortDateString()) 'The date
```

```
script.Append("");") 'End of line
```

```
script.Append(Environment.NewLine) 'Newline
```

```
script.Append("window.close();") 'Close this window
```

```
script.Append(Environment.NewLine) 'Newline
```

```
script.Append("</script>") 'Closing script tag
```

```
'Add the script to the page
```

```
Me.Page.Controls.Add(New LiteralControl(script.ToString()))
```

```
End Sub
```

```
End Class
```

Figure 6.2: Code Behind (DatePicker.aspx.vb)

6.2.2.1 Scripting Language and CSS(Cascading Style Sheets)

Scripting language used for SFA is JavaScript. Normally, JavaScript is using in client-side page. Example of situation using JavaScript is to validate field, prompting message box for awakening.

CSS (*Cascading Style Sheets*) is used to gain better control of the interface design. It also makes an easy way for changing or correcting the interface design.

```
A{font-family:Verdana, Arial, Helvetica, sans-serif; font-size:11px; text-decoration:none; font-weight:bold}
A:link, A:visited {text-decoration: none; color: black}
A:active {text-decoration: none; color:0C059A}
A:hover {text-decoration: none; color:Black ; BACKGROUND-COLOR:Yellow }

a.bar{font-family:Verdana, Arial, Helvetica, sans-serif; font-size:11px; text-decoration:none;font-weight:bold}
a.bar:link, a.bar::visited {text-decoration: none; color:Purple }
a.bar:hover {text-decoration: none; color:#0D05B7 ; BACKGROUND-COLOR: #336699 }

body {
    scrollbar-arrow-color:WHITE;
    scrollbar-track-color:#EFEFF9;
    scrollbar-shadow-color:white;
    scrollbar-face-color:#696969;
    scrollbar-highlight-color:white;
    scrollbar-darkshadow-color:#006633;
    scrollbar-3dlight-color:#006633;
}

.BUTTON
{
    font-weight: bold;
    font-family: Verdana;
}

BODY
{color: #000000;
  FONT-FAMILY: Verdana, Arial, Helvetica, sans-serif;
  FONT-SIZE: 10px;
  MARGIN: 2px 10px 2px 0px
}

INPUT
{
  FONT-FAMILY: Verdana, Arial, Helvetica, sans-serif;
  FONT-SIZE: 11px
}

TABLE
```

```
{
border-right: 0px;
border-top: 0px;
font-size: 13px;

border-left: 0px;
border-bottom: 0px;
font-family: Verdana, Arial, Helvetica, sans-serif;
```

```
}
A
{
COLOR: #000099
}
```

```
.LABEL
{
font-size: 12px;
font-family: Verdana, Arial, Helvetica, sans-serif;
margin-left :10px;
height: 12px;
```

```
}
.statusbar
{
font-size: 10pt;
color: navy;
font-family: Verdana;
```

```
}
.TEXTBOX
{
border-right: silver thin solid;
border-top: silver thin solid;
font-size: 12pt;
border-left: silver thin solid;
color: black;
border-bottom: silver thin solid;
font-family: Verdana;
```

```
}
.Heigth
{
height: 10px;
```

```
}
.Heigth1
{
height: 5px;
```

```
}
.header
{
font-weight :bold ;
color: Black;
height: 20px;
background-color: #ffcc66;
font-size:12px;
```

```
}
.mainheader
{height: 22px;
color: white;
```

```

background-color: darkorange;
font-size: 13px;
font-weight: bold;
}

.table_bg
{
background-color : beige;
border: 0;
border-color : White ;

border-right: 0px;
border-top: 0px;
font-size: 13px;

border-left: 0px;
border-bottom: 0px;
font-family: Verdana, Arial, Helvetica, sans-serif;
}

```

Figure 6.3: SFASyles – CSS of SFA

```

<SCRIPT language="javascript">
<!--
function pickDate(Src)
{
window.open("../DatePicker.aspx?src="+ Src, "_blank",
"height=260, width=250, left=300, top=200, " +
"location=no, menubar=no, resizable=no, " +
"scrollbars=no, titlebar=no, toolbar=no", true);
}
-->
</SCRIPT>

```

Figure 6.4: JavaScript in SFA

CHAPTER 7 – TESTING

7.1 INTRODUCTION

The main purpose of testing is to establish the presence of defects in a program and to judge whether the program is usable in real application. Even so, testing can only demonstrate and discover the presence of errors or faults. They have many types of faults like syntax faults, computation faults and algorithmic faults. It cannot show that there is no error in the program. Therefore, a more suitable approach must be chosen to reduce the possibility of errors in a program.

The approach system testing or integration testing for SFA is Bottom-up approach. When this method is used, each component at the lowest level of the system hierarchy is tested individually first. Then, the next components to be tested are those that call the previously tested ones. This approach is followed repeatedly until all the components are included in the testing and successfully tested.

7.2 TESTING PROCESS

In general, the testing process of SFA can be shown in the following figure. All the details will be further explained in subsequent sub-sections.

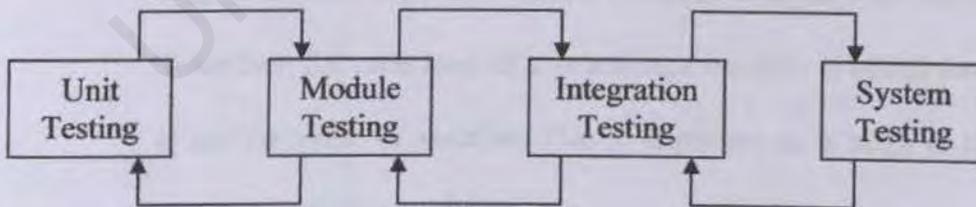


Figure 7.1: Testing Process

7.2.1 TYPES OF TESTING

7.2.1.1 Unit Testing

- Unit test is the process to test the individual component to ensure that they function properly. Each component is tested independently without the interference from other system components. Unit test is performed concurrently with the development process.

- Techniques used during the process of performing unit testing are as follows:

- Code Review or Debugging

Before the web form or page is loaded, mark the breakpoint at the code. After that, trace codes line by line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately.

- Building and Rebuilding of Class

It is efficient in discovering syntax errors. During the compilation, the compiler will detect type of errors in a program and display the error type and description of errors as well as the line number in which the error occurs.

- Watch or Quick Watch

It is efficient in getting a variable value. If the error occurs during the loop of a function, then it will be difficult to identify the actual error. Therefore, for each loop of a function, a variable is added into watch to get the value of variable. This is important as it helps to trace the program and allows the developer to identify the actual step in which an error has occurred.

7.2.1.2 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.

7.2.1.3 Integration Test

Integration test is needed when all tested modules are integrated. The main focus in integration test is to navigate the interfaces repeatedly to detect any interface mismatch problem.

Several important aspects are checked to ensure that the flow of the data in SFA is well organized and are user friendly to all the system users.

7.2.1.4 System Test

The sub-systems are integrated to make the entire system. Therefore, the main purpose in system testing is to find errors that result from unanticipated interactions between sub-systems. Besides, it is used to validate whether the system meets its functional and non-functional requirement.

Problems might occur by the time when integrating all modules from different developer to become a complete system. There are few possibilities that might lead to this mismatch of system.

- Interface mismatch

Interface mismatch problem occurs when combining the full SFA system.

This is because of different interfaces design present by different developers

(group member and I). After discussion, we combine both interface design to search out the best interface design or solution.

- Data type mismatch

This problem occurs when changing the database design such as data type of fields. The best solution we found out was updating our database design every week to avoid this problem.

Finally, a performance test is performed to compare the integrated modules with the non-functional system requirements. These requirements include security, interoperability, flexibility and reliability.

CHAPTER 8 - SYSTEM EVALUATION AND CONCLUSION

8.1 INTRODUCTION

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.

8.2 PROBLEMS ENCOUNTERED AND ITS SOLUTIONS

The big problem was facing when using the OLAP. When adding new records into the tables, if the tables were set as a shared dimension in OLAP, the cube which including the shared dimensions was affected and prompt the error message. This is because of the cube need to reprocess again to get the latest database records. The solution is using the Data Transmission Service which located at Enterprise Manager. Create a new package at local package to reprocess the cubes and dimensions. After that, create a new job in Management SQL Server Agent to execute the package following the schedule.

In the Sales Productivity sub-module, I was using the component of Microsoft Office XP (Pivot Table and Pivot Chart) to explore the record and calculate the sales more ease. When I tested that sub-module in computer which

didn't install the Microsoft Office XP, the sub-module has no function and prompts the scripting error. The solution is copying the component library (owc10.dll) to that computer and registers it.

How to register?

Type "regsvr32 <file path>" at Run and press OK.

That is not so efficient to display the records in data grid if records are above hundred or thousand. So I use crystal report which provided by Microsoft Visual Studio .NET to instead data grid. Crystal report also provides print function to print the report on screen monitor or paper.

8.3 EVALUATION BY END USER

As SFA is proposed to reduce manager workload and to make the manager process more effective, the final stage of system development which is the system testing becomes critical and it needs feedbacks from all respective users in judging the correctness of these functionalities, precise data flow as well as user friendliness of the system's interfaces.

Anyway, as the scope of SFA is large, development was conducted with the objective to cover the scope briefly, which means that the whole system was developed quickly to have the overall structure and potential of the system but the system was not refined to show its full efficiency.

The overall feedback from the end users is good and SFA expected to serve the targeted group well after refining.

8.4 SYSTEM STRENGTHS

- Easy to get all detail information

Pivot Table provided easy way to view all related information about Sales or transaction. Pivot Table is one component of Microsoft Excel. It can construct as multi-dimension table or dynamic table and also provide some useful function like sorting, calculation, etc. Ease for manager to keep track sales representatives performance. It also helps manager in business planning.

- Easy to explore and use

SFA makes user easy to understand and use the all functionality was provided by system. Besides that, user will not lose in SFA because SFA always inform the page status to user.

- Easy to generate Reports demanded

SFA will generate some powerful reports according to the selection. All reports will help manager to make their business planning and business analysis. SFA also provide print function to print the reports.

- Support high volume of users

SFA is deployed using the latest database (Microsoft SQL Server 2000), the database server, which is the most powerful database in the market. This makes it ready to cope with large amount of user in the future.

8.5 SYSTEM CONSTRAINTS AND FUTURE ENHANCEMENTS

As mentioned before, SFA still not fine enough 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:

- Strict data type checking

Check the input of user strictly to maintain the consistency of data stored and avoid error. E.g. keep away from user key in the special character like single code (')

- Graph for test statistics

The system will automatically generate a graph from the statistics of test result for clearer view and better understanding of sales representatives' performance.

- Urgent notice using E-mail

The administrator or manager will send e-mail automatically to sales representatives according to the e-mail address have been entered.

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WEB SITES

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<http://www.staffware.com>

APPENDIX – USER MANUAL

1.1 INTRODUCTION

Sales Force Automation (SFA) is a Customer Relation Management (CRM) system that helping manager to keep tracks sales representative activities and performance. This user manual is a guidance to help user to using SFA effectively to achieve the goal.

This manual is divided mainly into two modules, which are Sales Analysis part and SWOT Analysis part. Before starting the walkthrough, user will receive the user id and user password from administrator by e-mail.

1.2 USER LOGIN

1. Open a new browser (Internet Explorer)
2. Type the following address at URL to access the SFA system.
"http://<domain_name_or_ip>/sfa/". Figure 1 shown SFA login Page.
3. Enter the user id and password. If user does not login before, system will request user to change their password and user id. After user enter their user ID and password,
4. Click the Login button to use to system.

1.3 SALES ANALYSIS

Click the *Sales Analysis* at Menu Bar (Figure 2) to view the Sales Analysis sub-module (Figure 3).

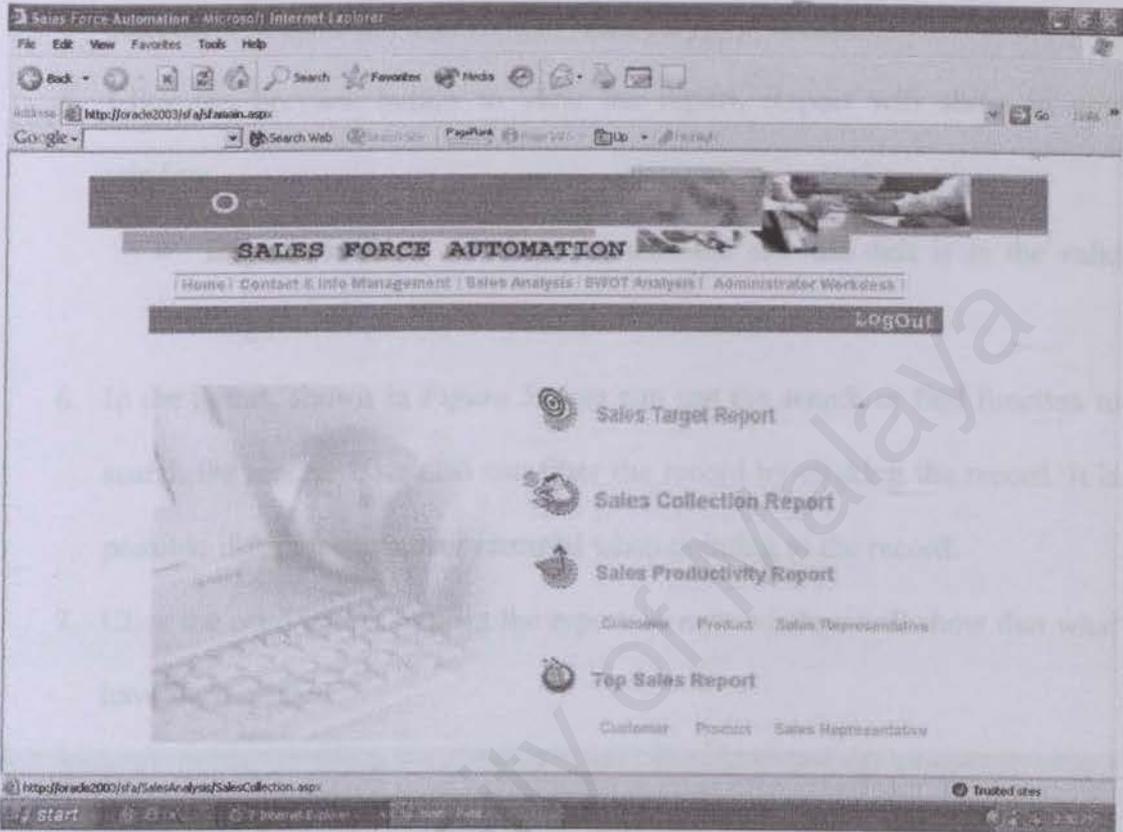


Figure 3: Sales Analysis Page

1.3.1 SALES TARGET REPORT

Click the *Sales Target Report* (Figure 3) to link to the sales target page (Figure 4)

1. Choose and Select the zone from which zone to which zone.
2. Select the date selection either by month, by quarter or by date by clicking the cycle behind the text.
3. If user chosen by month, Select the month from which month to which month and Select the year from which year to which year. It is same if user chosen by quarter.

4. If user chosen by date, the date field will appear this text “Enter Date (Click Icon)”. Click the icon (), one new window will open. Click the date at the calendar. After that the new window will close automatically and the date selected will fill to the date field in “mm/dd/yyyy” format.
5. Click the preview button to view the report. Report will show in new window.
 - **Important:** User should make sure the selected date is in the valid range. Example: 1 / 1 / 2002 to 12/12/2003.
6. In the report, shown in *Figure 5*, user can use the search or find function to search the record. User also can filter the record by clicking the record. It is possible if the mouse cursor changed when pointing to the record.
7. Click the print button to print the report. A new window will show that what have been printed.

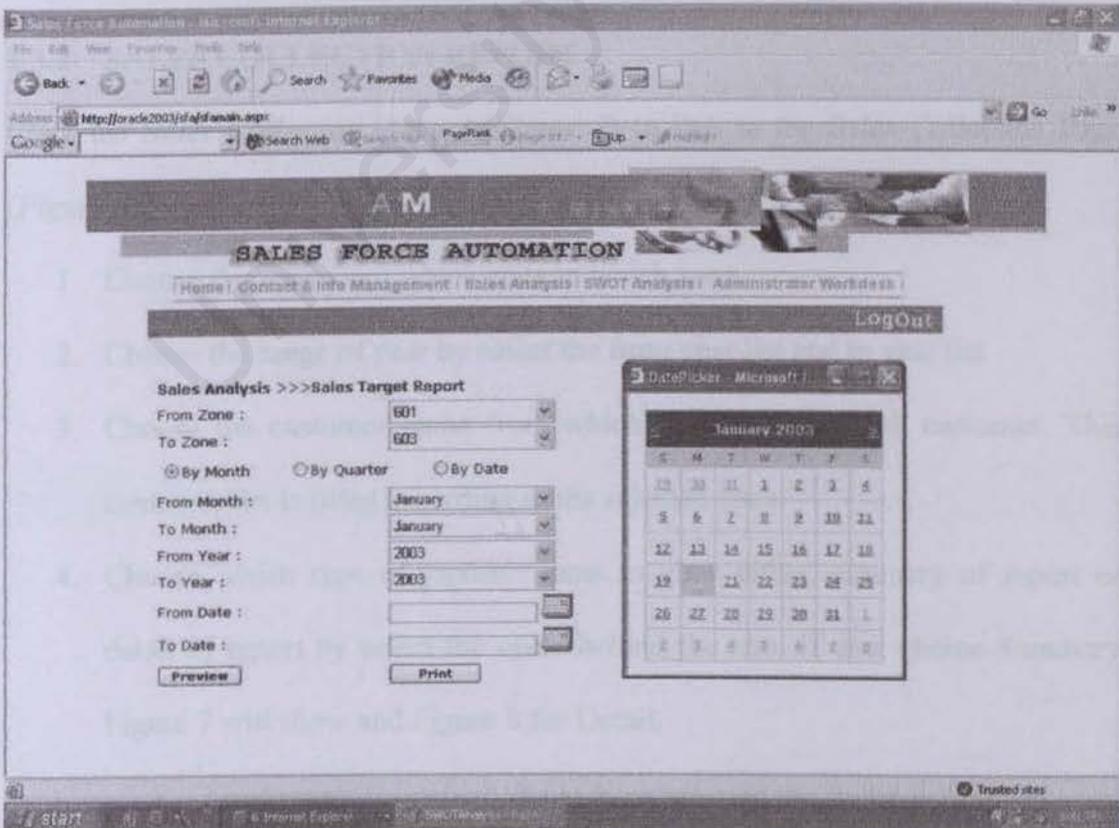


Figure 4: Sales Target Report Page

Report Title : Sales Target Report

Sales Rep. ID	Sales Rep. Name	Sales (RM)	Target (RM)	Balance (RM)	Percent (%)
Year : 2003					
Zone Number : 601					
Month : January					
AdelineTMY	Adeline Tai	18,760.00	15,000.00	3,760.00	125.07
CarysaAu	Carysa Au	33,840.00	10,000.00	23,840.00	338.40
TOC	Tio Guan Choon	19,500.00	25,000.00	-5,500.00	78.00
Total of Month :		72,100.00	50,000.00	22,100.00	
Total of Zone :		72,100.00	50,000.00	22,100.00	
Zone Number : 602					
Month : January					
AnthonyTKL	Anthony TKL	18,040.00	5,600.00	12,440.00	322.14
BelindaKoh	Belinda Koh	12,080.00	8,000.00	4,080.00	151.00
Total of Month :		30,120.00	13,600.00	16,520.00	
Total of Zone :		30,120.00	13,600.00	16,520.00	
Zone Number : 603					
Month : January					
EricTay	Eric Tay	21,480.00	5,600.00	15,880.00	383.57
Total of Month :		21,480.00	5,600.00	15,880.00	
Total of Zone :		21,480.00	5,600.00	15,880.00	
Total of Year :		123,708.00	69,200.00	54,508.00	

Figure 5: Sales Target Report Page (Crystal Report)

1.3.2 SALES COLLECTION REPORT

Click the *Sales Collection Report* (Figure 3) to link to the Sales Collection Page (Figure 6)

1. Choose the zone from which zone to which zone.
2. Choose the range of year by select the from year list and to year list
3. Choose the customer name from which customer to which customer. This customer list is filled according to the selected zone.
4. Choose which type of reports wants to view either summary of report or detail of report by select the cycle behind the text. If user choice Summary Figure 7 will show and Figure 8 for Detail.

- **Important:** By default, it has been selected the summary choice.

5. Click the preview button to view the report. Report will show in new window.
 - **Important:** User should make sure the selected year is in the valid range. Example: 2002 to 2003.
6. In the report, user can use the search or find function to search the record. User also can filter the record by clicking the record. It is possible if the mouse cursor changed when pointing to the record
7. Click the print button to print the report. A new window will show that what have been printed.

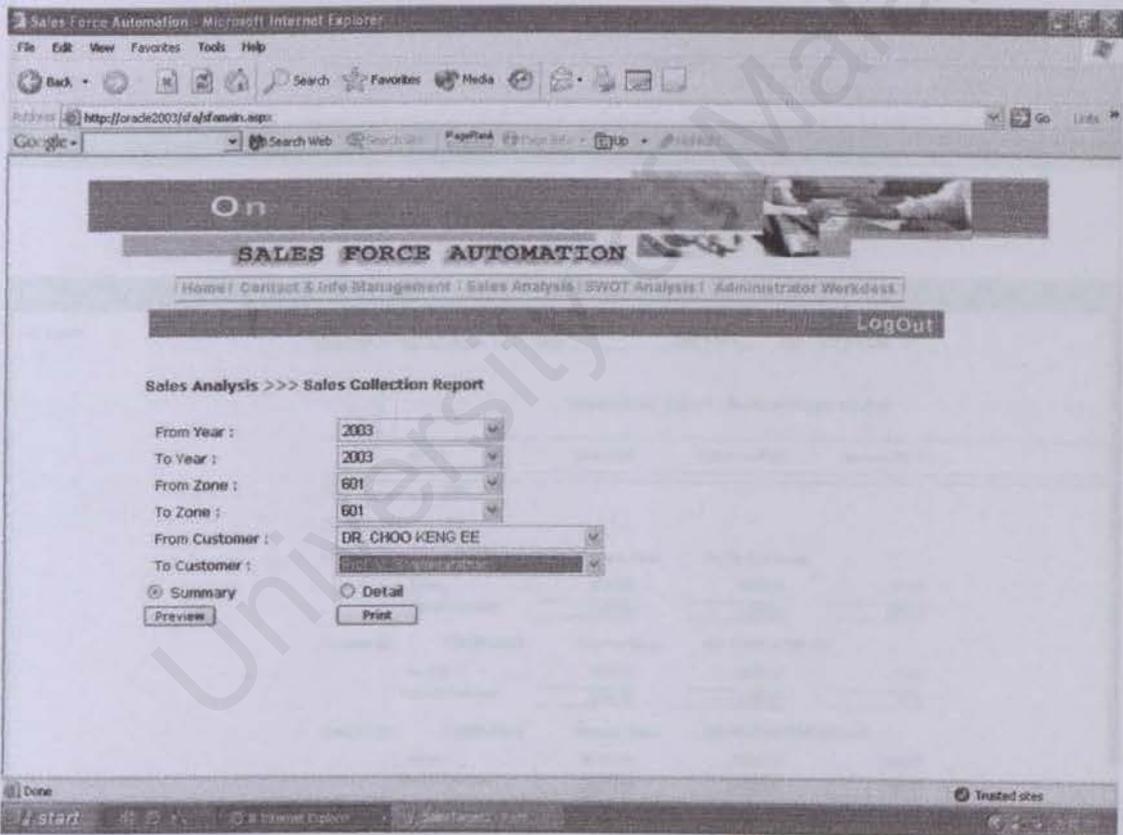


Figure 6: Sales Collection Report Page

Sales Collection (Summary) Microsoft Internet Explorer

2,003 1 of 1 100% crystal

Report Title: Sales Collection Report (Summary)

Customer ID	Customer Name	Total Sales (RM)	Total Collection (RM)	Balance (RM)	Percent (%)
Year: 2003					
Zone Number: 001					
CHK001	Dr. Ho Kai Keong	5,400.00	5,200.00	200.00	96.30
CHK01CHO	DR. CHOO KENG EE	4,900.00	4,900.00	0.00	100.00
CHK01HAH	DR. HAJI ROSEMI SALLEH	26,400.00	24,000.00	2,400.00	90.70
CTTSH01	Prof. V. Sivasubraman	25,420.00	20,000.00	5,420.00	78.68
Total of Zone :		62,140.00	54,060.00	8,080.00	
Zone Number: 002					
CPF002WON	Dr. Wong See Yin	20,310.00	20,000.00	310.00	98.47
Total of Zone :		20,310.00	20,000.00	310.00	
Zone Number: 003					
CHT03WON	MR. WONG LEH MING	13,440.00	7,000.00	6,440.00	52.08
CJSH03ABDUH	DR. ABDUL HAMID MAT SAIN	6,750.00	6,750.00	0.00	100.00
CJSH03MOHD	DR. MOHD SHUKRI OTHMAN	21,060.00	20,000.00	1,060.00	94.97
Total of Zone :		41,250.00	33,750.00	7,500.00	
Total of Year :		123,700.00	107,810.00	15,890.00	

Print Date: 1/20/2003 *** End ***

Figure 7: Sales Collection Report Page (Summary)

Sales Collection (Detail) Microsoft Internet Explorer

2,003 1 of 1 100% crystal

Report Title: Sales Collection Report (Detail)

Month	Sales (RM)	Collection (RM)	Balance (RM)
Year: 2003			
Zone Number: 001			
Customer ID: CHK001	Customer Name: Dr. Ho Kai Keong		
January	5,400.00	5,200.00	200.00
Total of Customer:	5,400.00	5,200.00	200.00
Customer ID: CHK01CHO	Customer Name: DR. CHOO KENG EE		
January	4,900.00	4,900.00	0.00
Total of Customer:	4,900.00	4,900.00	0.00
Customer ID: CHK01HAH	Customer Name: DR. HAJI ROSEMI SALLEH		
January	26,400.00	24,000.00	2,400.00
Total of Customer:	26,400.00	24,000.00	2,400.00
Customer ID: CTTSH01	Customer Name: Prof. V. Sivasubraman		
January	25,420.00	20,000.00	5,420.00
Total of Customer:	25,420.00	20,000.00	5,420.00
Total of Zone :	62,140.00	54,060.00	8,080.00
Total of Year :	62,140.00	54,060.00	8,080.00

Print Date: 1/20/2003 *** End ***

Figure 8: Sales Collection Report Page (Detail)

1.3.3 SALES PRODUCTIVITY REPORT

1.3.3.1 Customer

Click the *Customer* (below the Sales Productivity Report (*Figure 3*)) to link to the Customer page (*Figure 9*). By default, the table fills by customer id (Row) and Date (Column).

- Click the Field List icon () to open Pivot Table Field List (*Figure 9*). Then Drag items to pivot table to get multi-dimension table.
- Click  to Refresh.
- Click  to copy to the data to Microsoft Excel.
- Click  to go to help.
- Click  to sort the data.
- Click  to change the Pivot Table Setting like font, title etc.
- Click  to create Calculated Total.

***Important:** The Pivot Chart automatically changes when the Pivot Table has been changed.

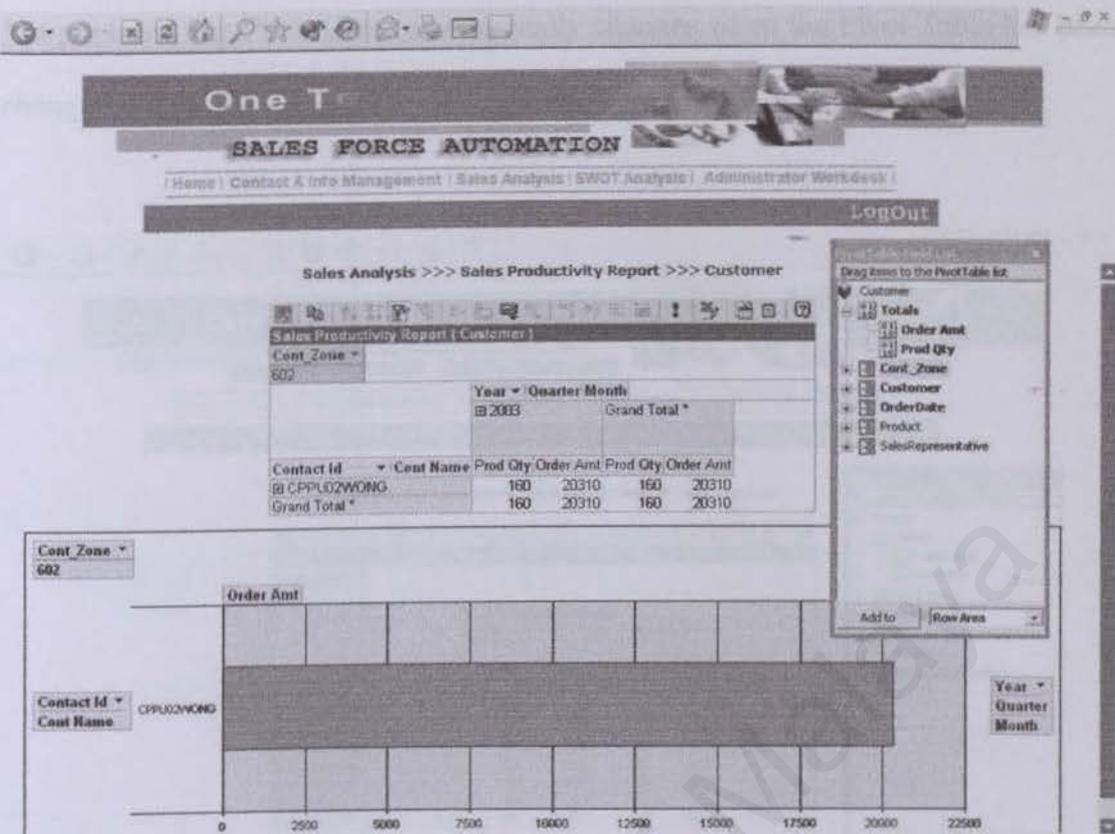


Figure 9: Sales Productivity Report Page (Customer)

1.3.3.2 Product

Click the **Product** (below the Sales Productivity Report (Figure 3)) to link to the Product page (Figure 10). By default, the table fills by Product id (Row) and Date (Column).

- Click the Field List icon () to open Pivot Table Field List (Figure 10). Then Drag items to pivot table to get multi-dimension table.
- Click  to Refresh.
- Click  to copy to the data to Microsoft Excel.
- Click  to go to help.
- Click  to sort the data.
- Click  to change the Pivot Table Setting like font, title etc.
- Click  to create Calculated Total.

***Important:** The Pivot Chart automatically changes when the Pivot Table has been changed.

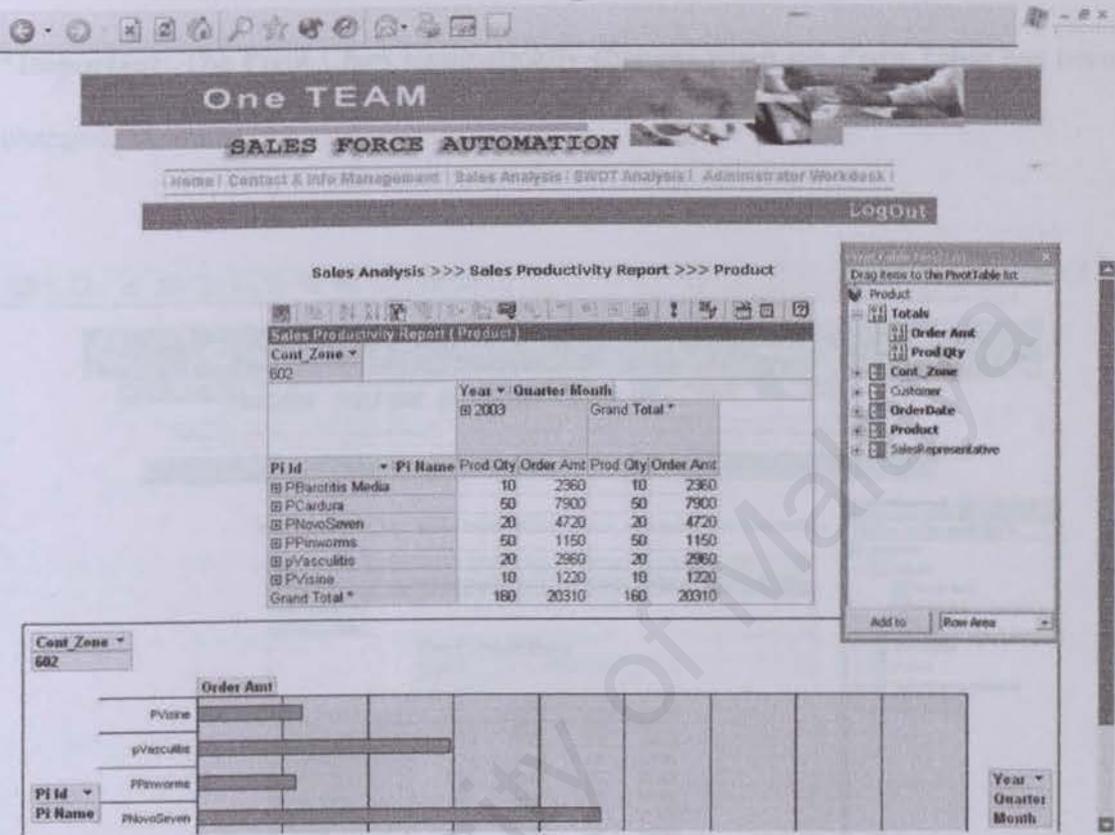


Figure 10: Sales Productivity Report Page (Product)

1.3.3.3 Sales Representative

Click the **Sales Representative** (below the Sales Productivity Report (Figure 3)) to link to the Customer page (Figure 11). By default, the table fills by customer id (Row) and Date (Column).

- Click the Field List icon () to open Pivot Table Field List (Figure 11). Then Drag items to pivot table to get multi-dimension table.
- Click  to Refresh.
- Click  to copy to the data to Microsoft Excel.
- Click  to go to help.

- Click  to sort the data.
- Click  to change the Pivot Table Setting like font, title etc.
- Click  to create Calculated Total.

***Important:** The Pivot Chart automatically changes when the Pivot Table has been changed.

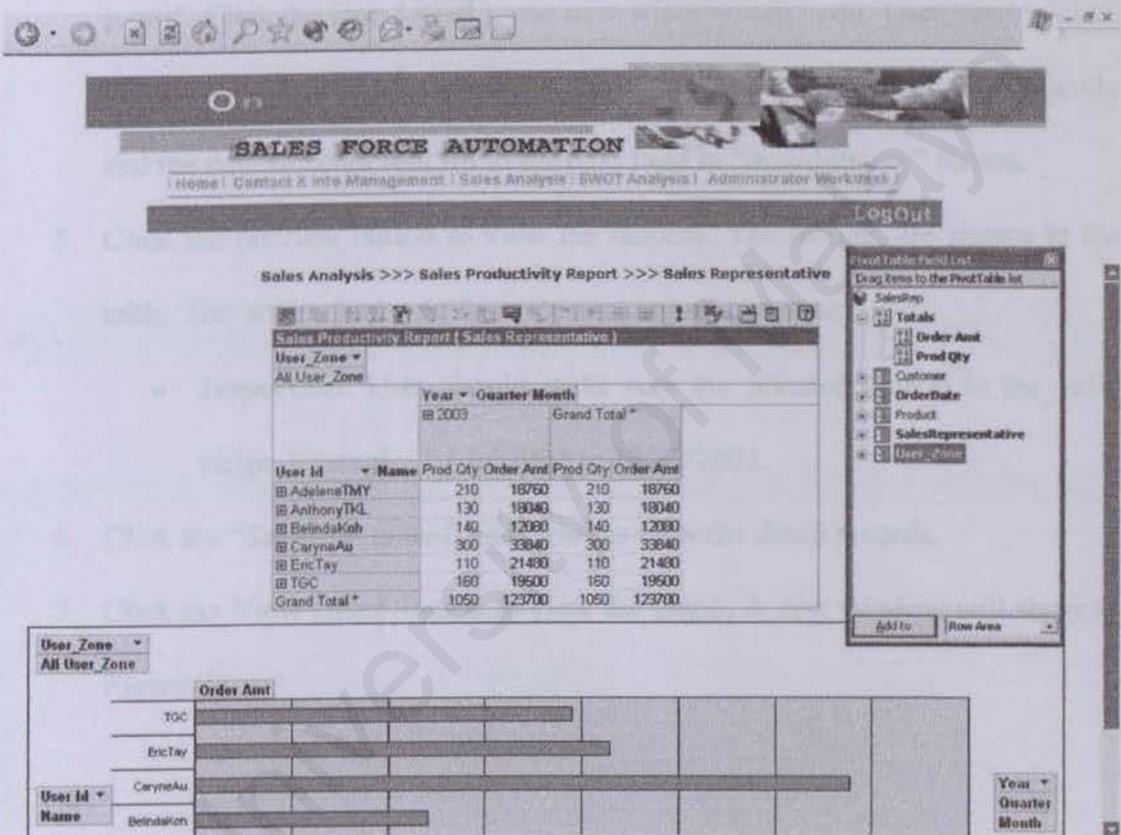


Figure 11: Sales Productivity Report Page (Sales Representative)

1.3.4 TOP SALES REPORT

1.3.4.1 Customer

Click the **Customer** (below the Top Sales Report (Figure 3)) to link to the Customer page (Figure 12).

1. Choose the zone from which zone to which zone.

2. Select the date selection either by month, by quarter or by date by clicking the cycle behind the text.
3. If user chosen by month, Select the month from which month to which month and Select the year from which year to which year. It is same if user chosen by quarter.
4. If user chosen by date, the date field will appear this text “Enter Date (Click Icon)”. Click the icon (), one new window will open. User need to click the date at the calendar. After that the new window will close automatically and the date selected will fill to the date field in “mm/dd/yyyy” format.
5. Click the preview button to view the records. The records are shown in the table. The ordered records show the ranking of customers.
 - **Important:** User should make sure the selected date is in the valid range. Example: 1 / 1 / 2002 to 12/12/2003.
6. Click the “*detail*” at table (Data Grid) to view the detail records.
7. Click the View Graph button to view the graph. A new window will show as *Figure 13*.

Figure 13: Top Sales Report Page (Customer - Graph)

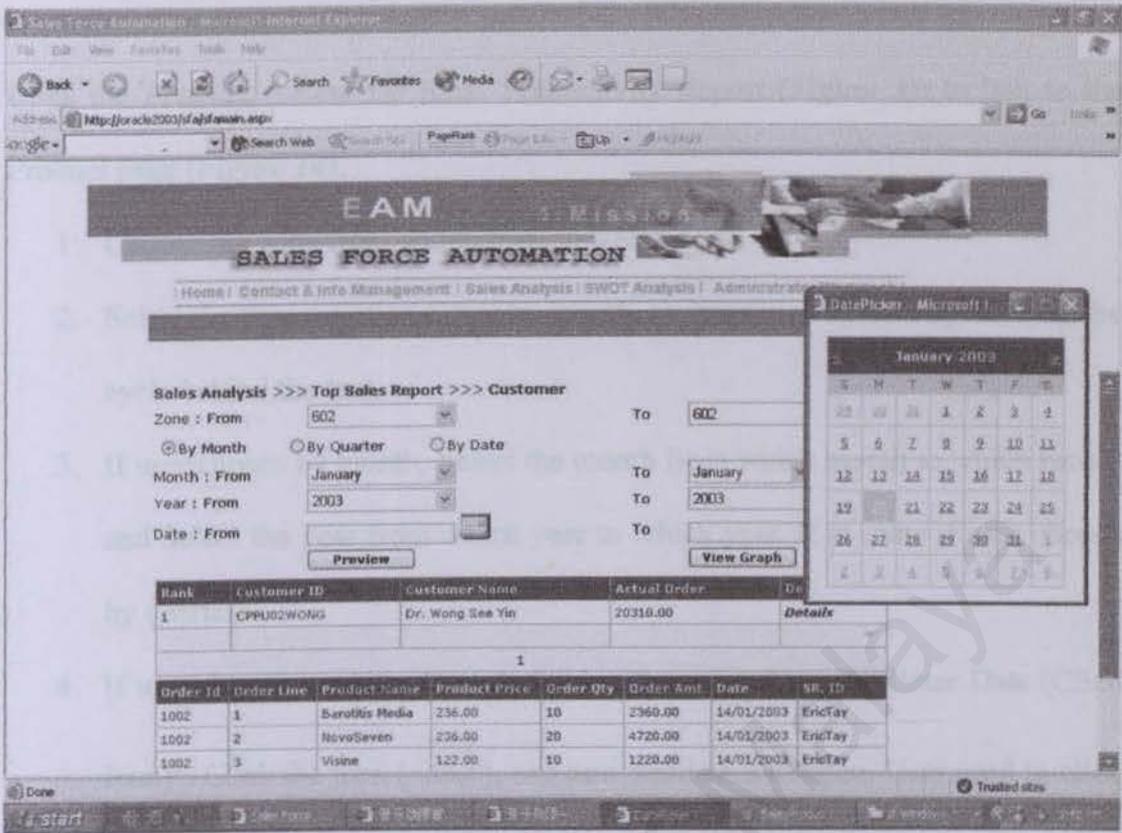


Figure 12: Top Sales Report Page (Customer)

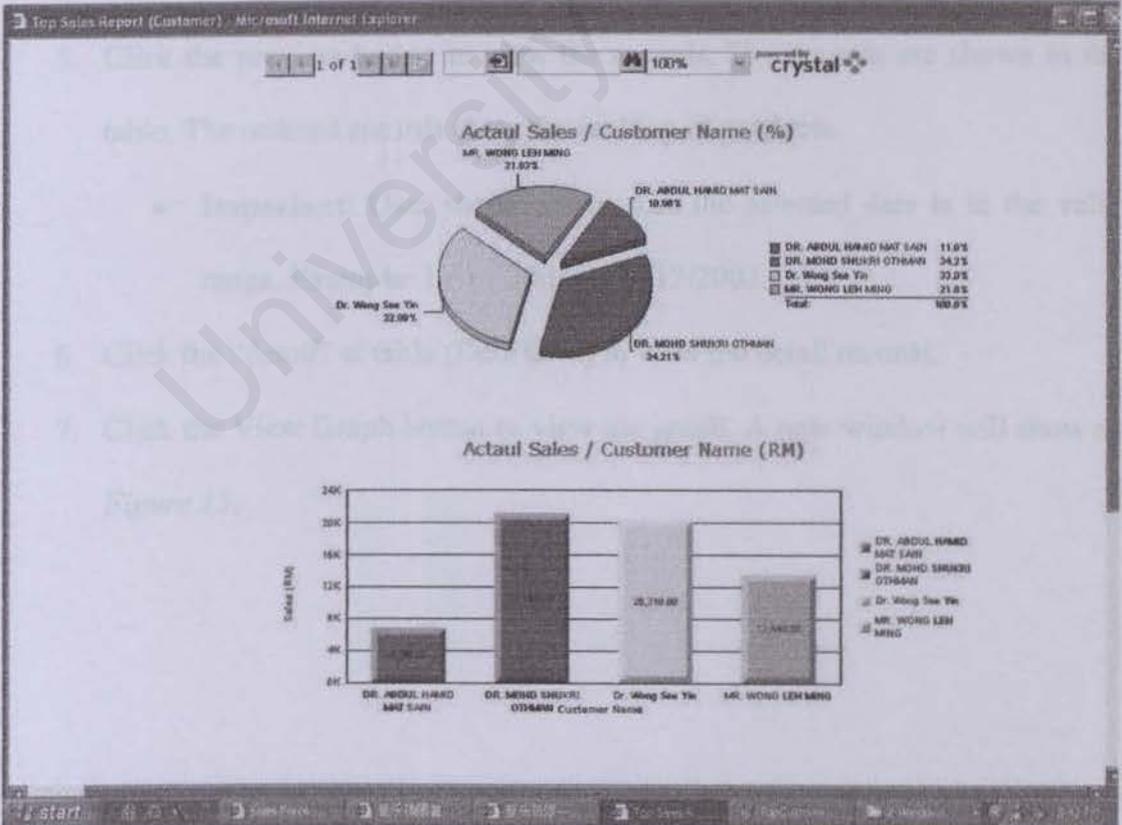


Figure 13: Top Sales Report Page (Customer - Graph)

1.3.4.2 Product

Click the **Product** (below the Sales Productivity Report (*Figure 3*)) to link to the Product page (*Figure 14*).

1. Choose the zone from which zone to which zone.
2. Select the date selection either by month, by quarter or by date by clicking the cycle behind the text.
3. If user chosen by month, Select the month from which month to which month and Select the year from which year to which year. It is same if user chosen by quarter.
4. If user chosen by date, the date field will appear this text "Enter Date (Click Icon)". Click the icon (), one new window will open. User need to click the date at the calendar. After that the new window will close automatically and the date selected will fill to the date field in "mm/dd/yyyy" format.
5. Click the preview button to view the records. The records are shown in the table. The ordered records show the ranking of products.
 - **Important:** User should make sure the selected date is in the valid range. Example: 1 / 1 / 2002 to 12/12/2003.
6. Click the "detail" at table (Data Grid) to view the detail records.
7. Click the View Graph button to view the graph. A new window will show as *Figure 15*.

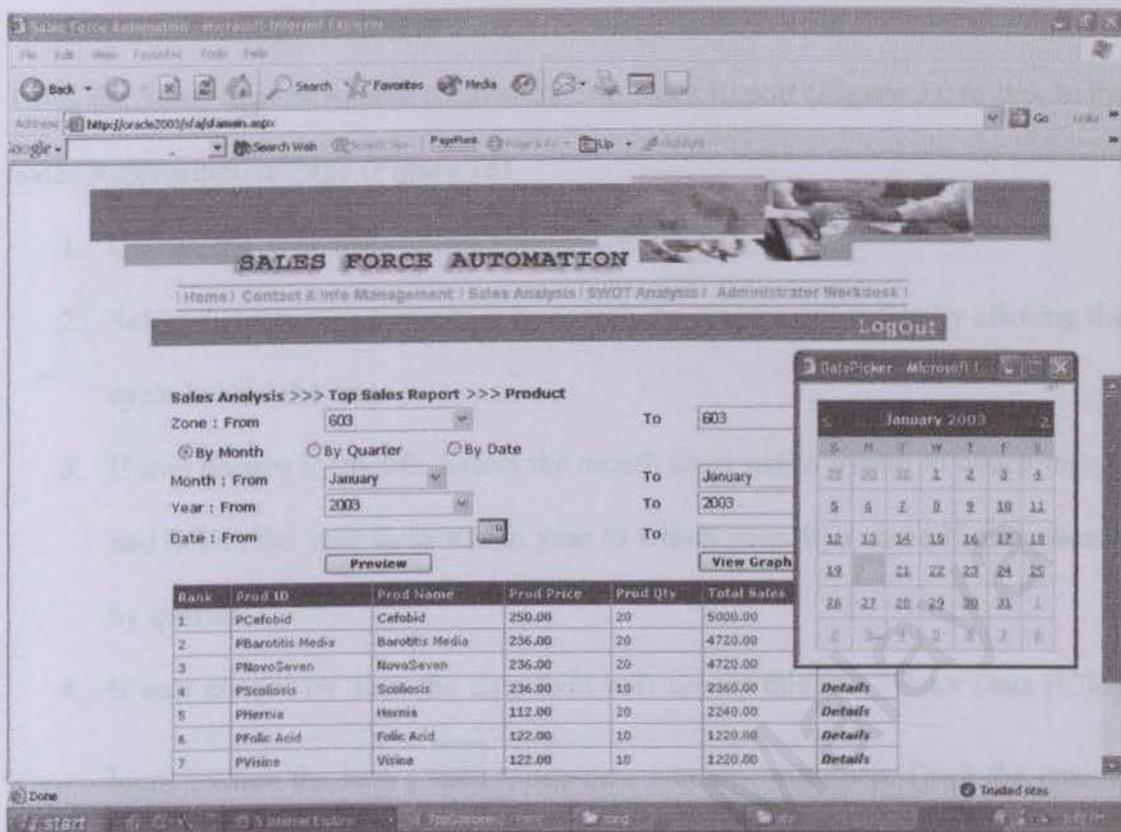


Figure 14: Top Sales Report Page (Product)

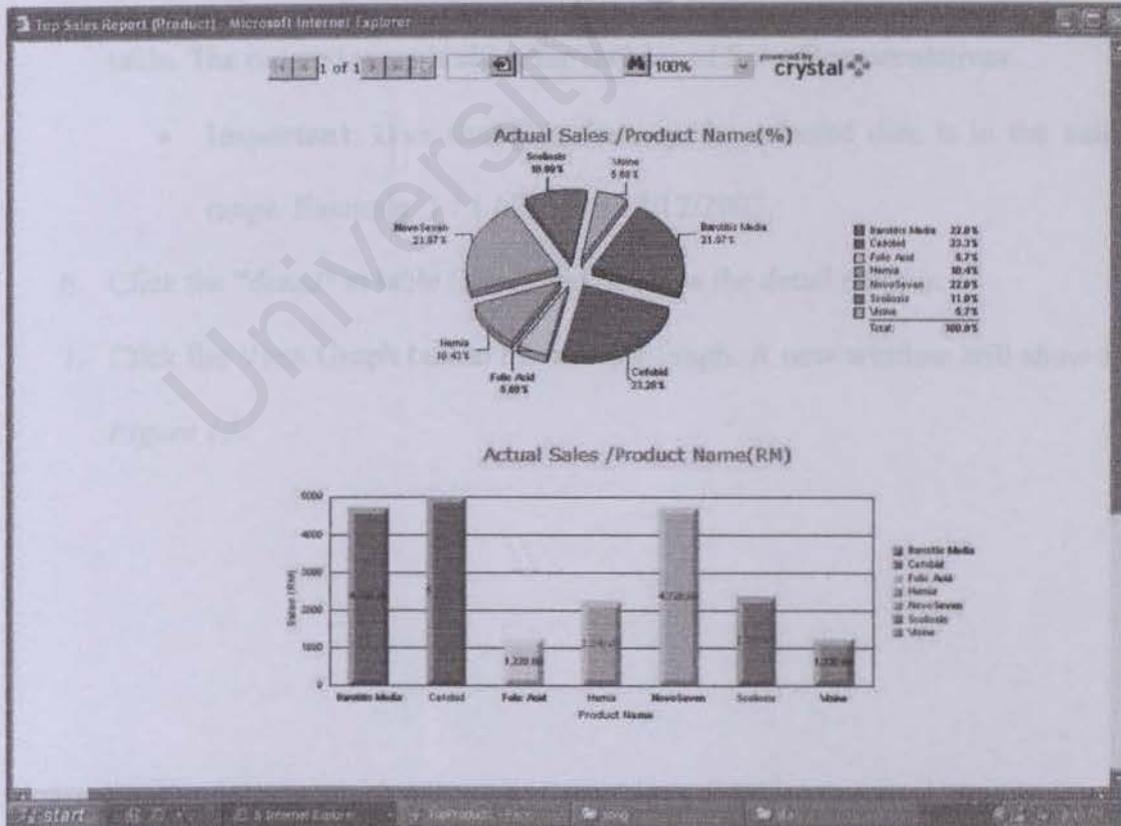


Figure 15: Top Sales Report Page (Product – Graph)

1.3.4.3 Sales Representative

Click the *Sales Representative* (below the Top Sales Report (*Figure 3*)) to link to the Sales Representative Page (*Figure 16*)

1. Choose the zone from which zone to which zone.
2. Select the date selection either by month, by quarter or by date by clicking the cycle behind the text.
3. If user chosen by month, Select the month from which month to which month and Select the year from which year to which year. It is same if user chosen by quarter.
4. If user chosen by date, the date field will appear this text "Enter Date (Click Icon)". Click the icon (), one new window will open. Click the date at the calendar (Date Picker) to select the date.
5. Click the preview button to view the records. The records are shown in the table. The ordered records show the ranking of Sales Representatives
 - **Important:** User should make sure the selected date is in the valid range. Example: 1 / 1 / 2002 to 12/12/2003.
6. Click the "detail" at table (Data Grid) to view the detail records.
7. Click the View Graph button to view the graph. A new window will show as *Figure 17*.

Figure 17. Top Sales Report Page (Sales Representative) - Graph

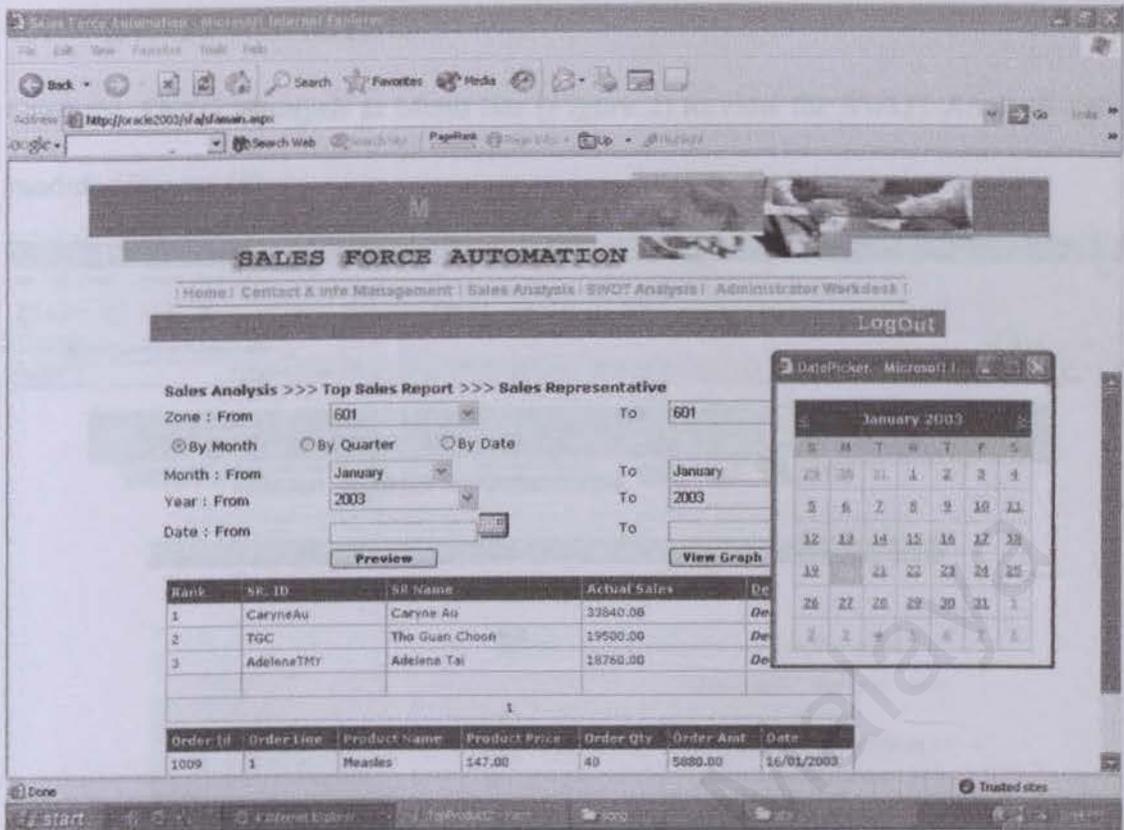


Figure 16: Top Sales Report Page (Sales Representative)

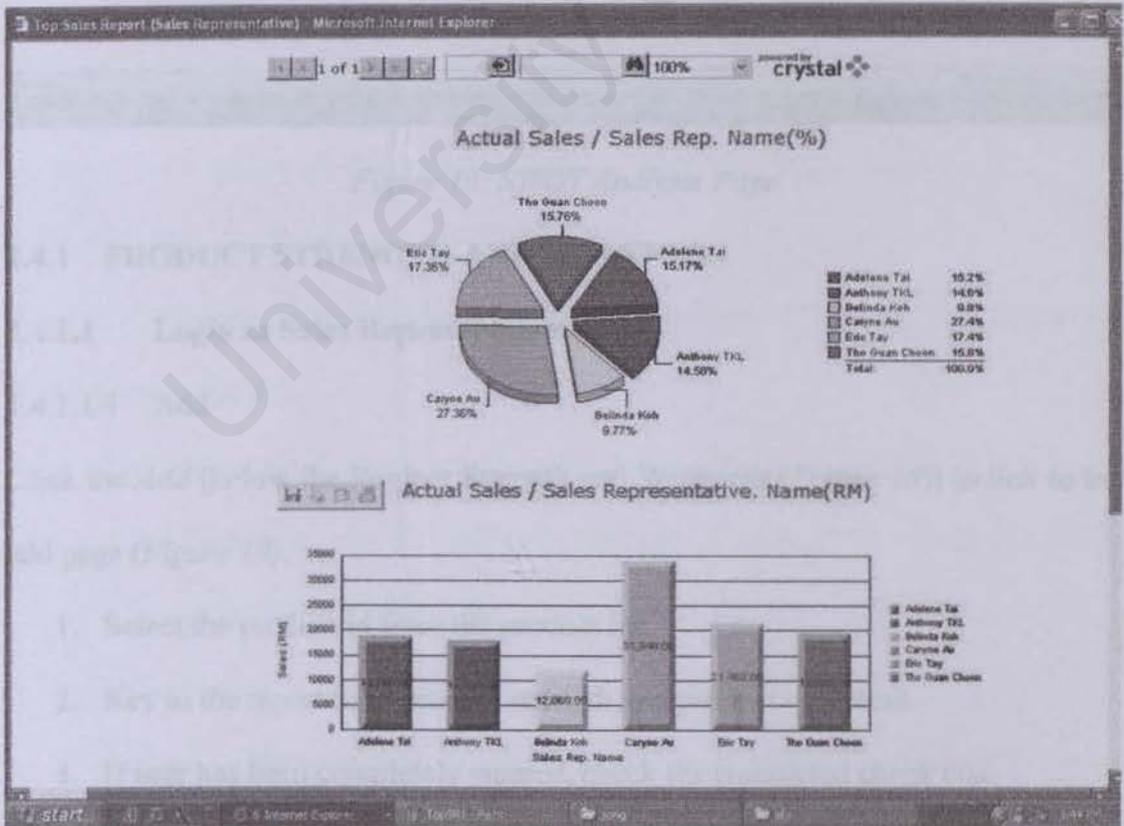


Figure 17: Top Sales Report Page (Sales Representative - Graph)

- **Important:** one message label will show the result either success or fail.

5. Click Cancel to Exit.

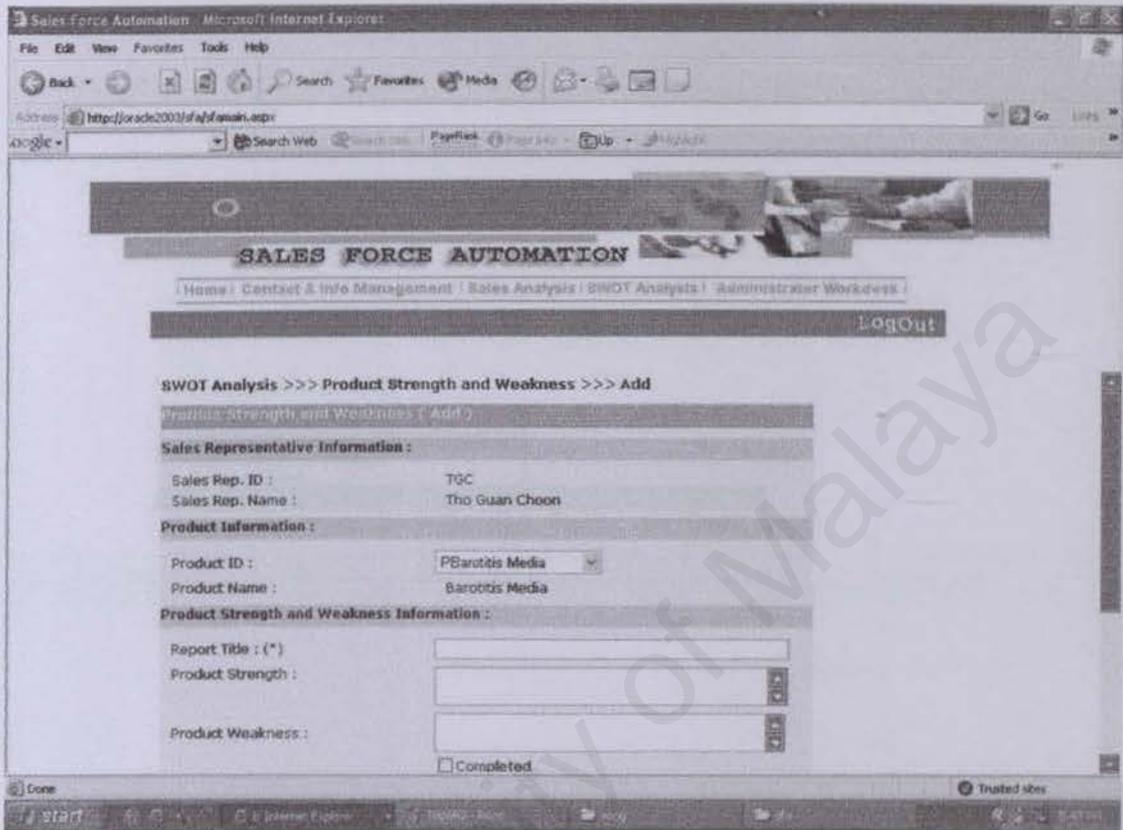


Figure 19: Product Strength and Weakness Page (Add)

1.4.1.1.2 Edit and Delete

Click the **Edit** (below the Product Strength and Weakness (*Figure 18*)) to link to the Edit page (*Figure 20*).

1. Select the record need to edit by click the edit link at the Edit table. Page now link to Edit Page and full fill the existed data (*Figure 21*). Or Click the Delete link at Edit Table to delete the record.
2. Edit the data.
3. If user has been completely entered, check the completed check box.
 - **Important:** After that, user cannot edit the record.
4. Click Edit button to save the data.

- **Important:** one message label will show the result either success or fail.

5. Click Cancel to Exit.

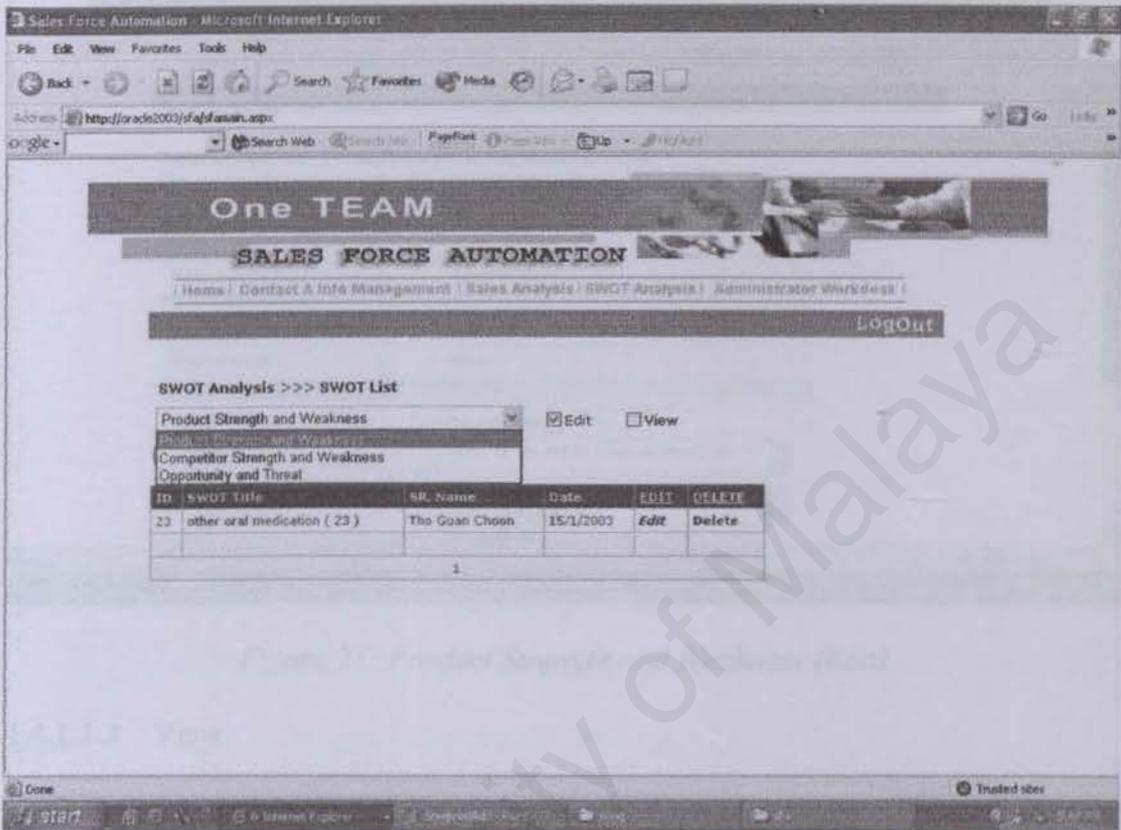


Figure 20: Product Strength and Weakness Page (List)

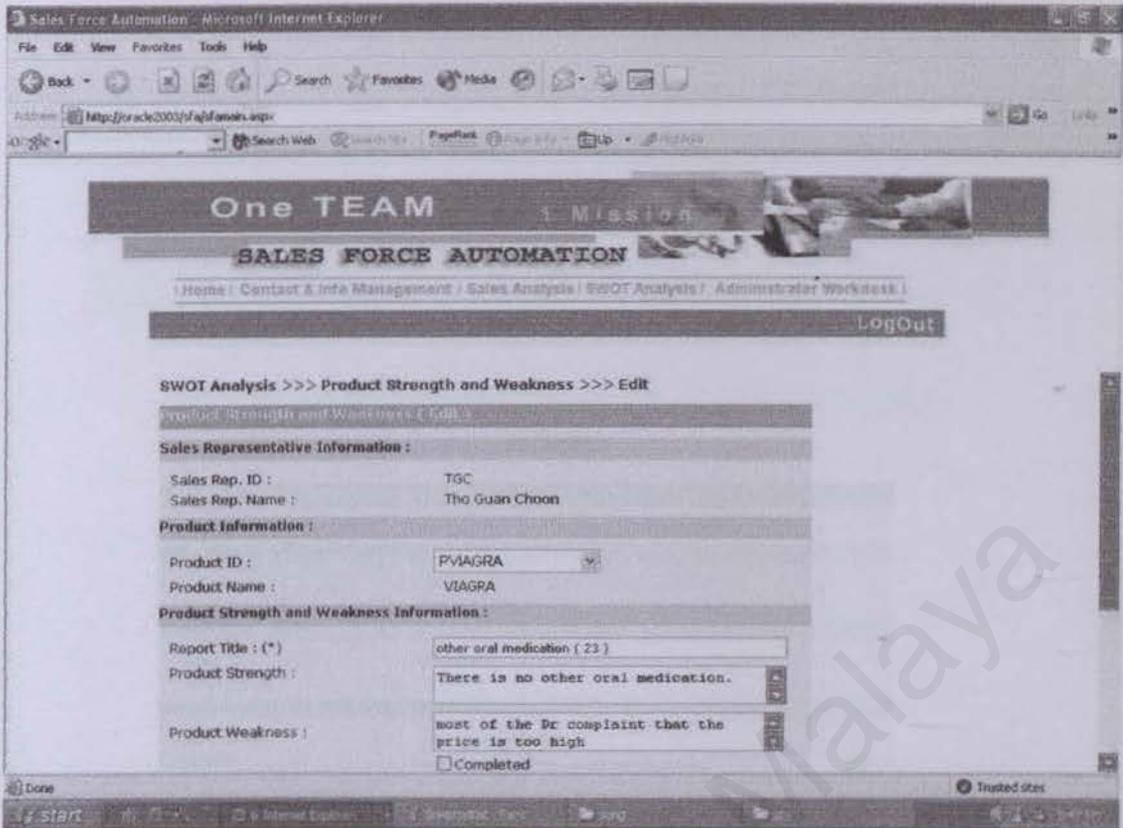


Figure 21: Product Strength and Weakness (Edit)

1.4.1.1.3 View

Click the **View** (below the Product Strength and Weakness (Figure 18)) to link to the view page (Figure 20).

1. Select the record need to view by click the view link at the view table. Page now link to View Page and full fill the existed data (Figure 22).
2. View the data.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Back button to exit.

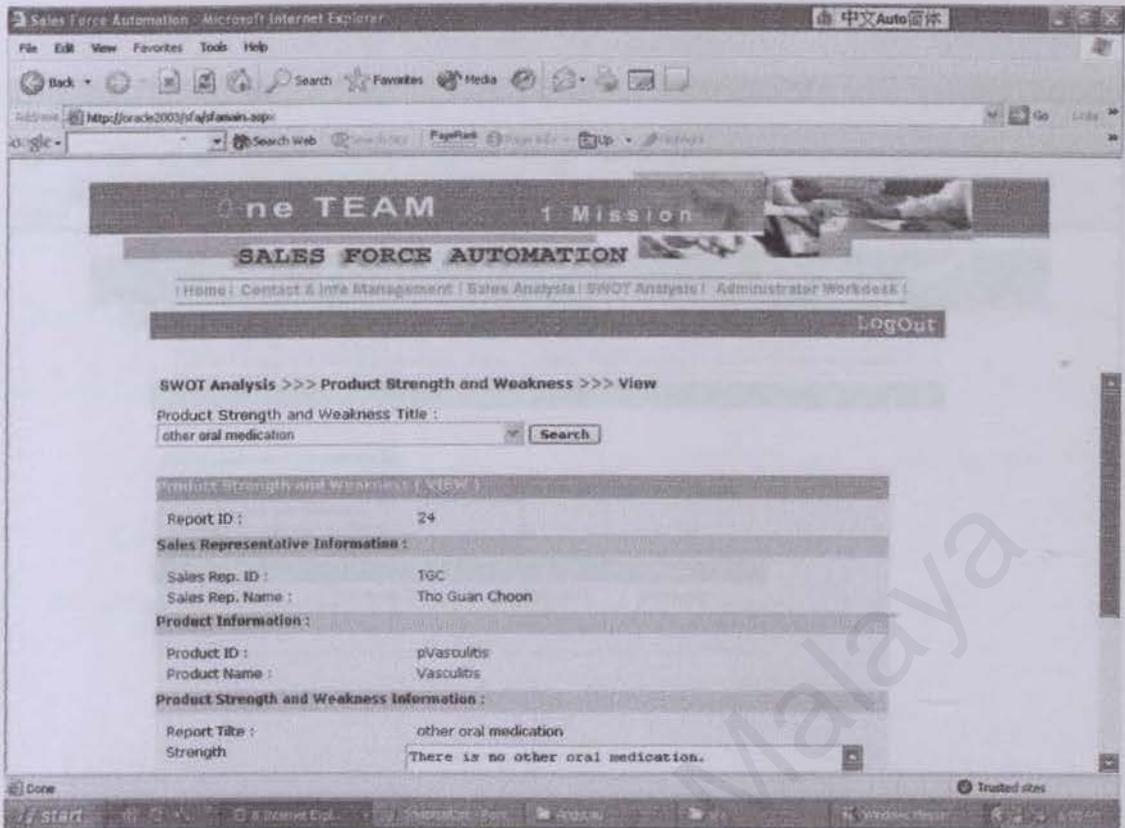


Figure 22: Product Strength and Weakness Page (View)

1.4.1.2 Login As Manager Or Administrator

User can add, edit and view record same as login as Sales Representative. User can refer the step at 1.4.1.1.

1.4.1.2.1 Comment

Click the **Comment** (below the Product Strength and Weakness (Figure 18) to link to the comment page (Figure 23).

1. Select the record need to comment by click the comment link at the view table. Page now link to comment Page and full fill the existed data (Figure 24).
2. Key in Manager Name and comment.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Save button to save the data.

5. Click Cancel button to exit.

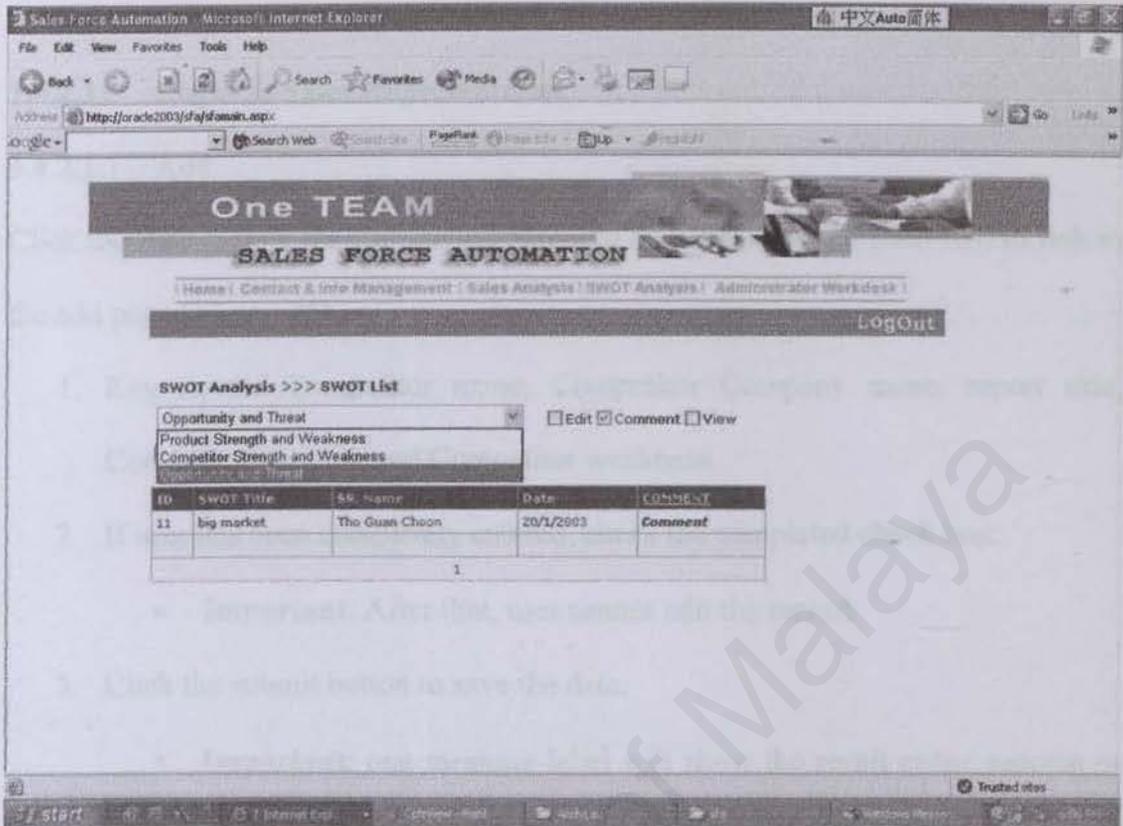


Figure 23: Product Strength and Weakness Page (List - Comment)

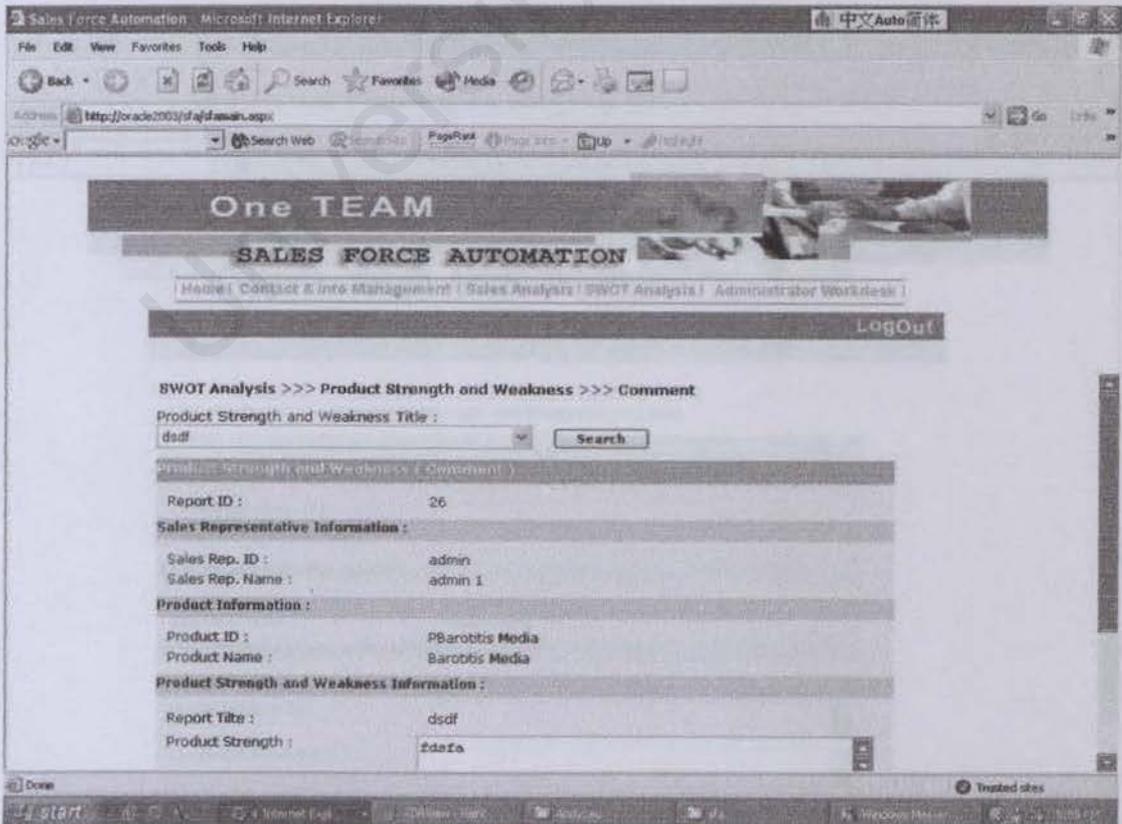


Figure 24: Product Strength and Weakness Page (Comment)

1.4.2 COMPETITOR STRENGTH AND WEAKNESS

1.4.2.1 Login as Sales Representative

1.4.2.1.1 Add

Click the *Add* (below the Competitor Strength and Weakness (*Figure 18*)) to link to the add page (*Figure 25*).

1. Key in the Competitor name, Competitor Company name, report title, Competitor strength and Competitor weakness.
2. If user has been completely entered, check the completed check box.
 - **Important:** After that, user cannot edit the record.
3. Click the submit button to save the data.
 - **Important:** one message label will show the result either success or fail.
4. Click Cancel to Exit.

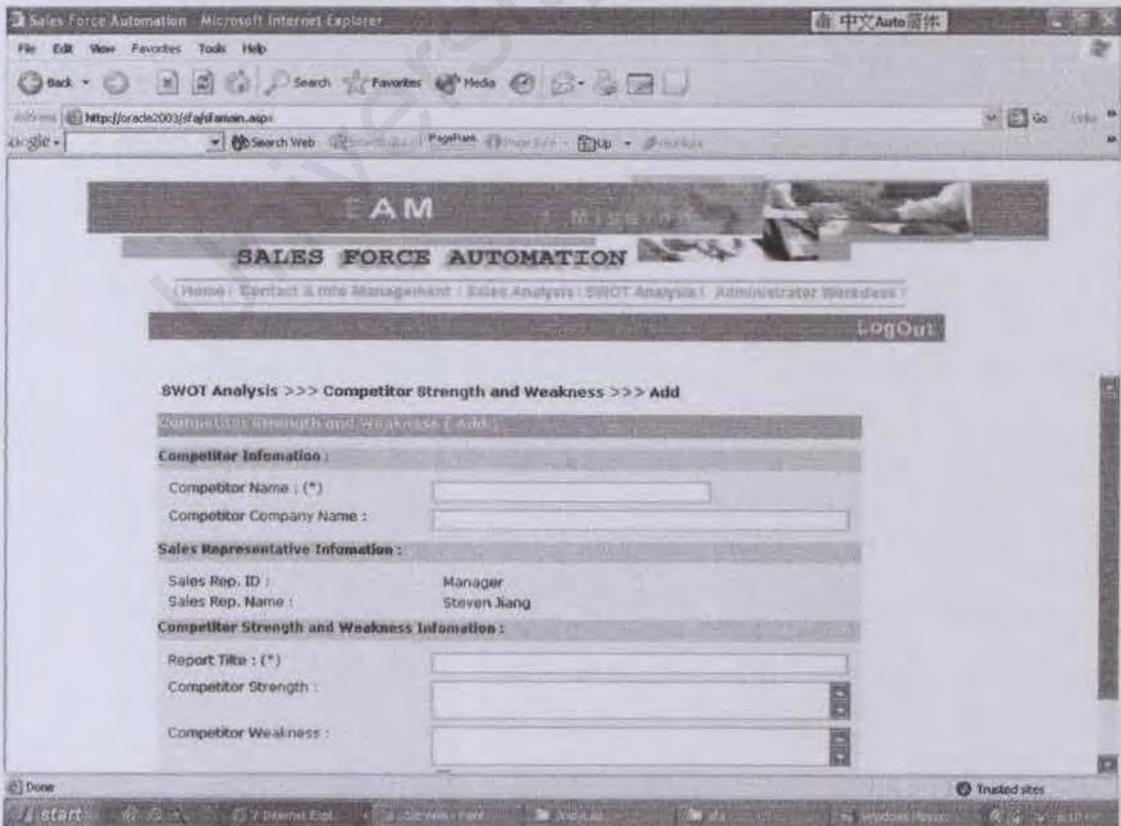


Figure 25: Competitor Strength and Weakness Page (Add)

1.4.2.1.2 Edit and Delete

Click the **Edit** (below the Competitor Strength and Weakness (Figure 18)) to link to the edit page (Figure 20).

1. Select the record need to edit by click the edit link at the Edit table. Page now link to Edit Page and full fill the existed data (Figure 26). Or Click the Delete link at Edit Table to delete the record.
2. Edit the data.
3. If user has been completely entered, check the completed check box.
 - **Important:** After that, user cannot edit the record.
4. Click Edit button to save the data.
 - **Important:** one message label will show the result either success or fail.
5. Click Cancel to Exit.

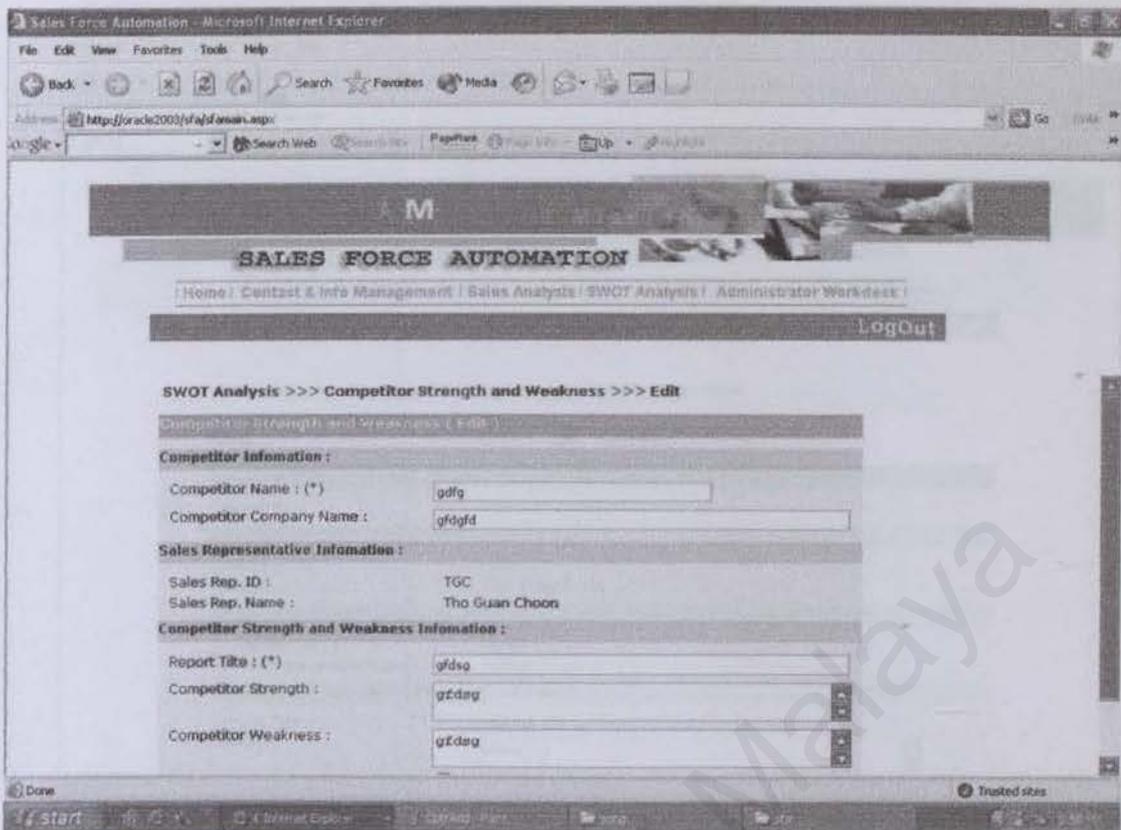


Figure 26: Competitor Strength and Weakness Page (Edit)

1.4.2.1.3 View

Click the *View* (below the Competitor Strength and Weakness (Figure 18)) to link to the view page (Figure 20).

1. Select the record need to view by click the view link at the view table. Page now link to View Page and full fill the existed data (Figure 27).
2. View the data.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Back button to exit

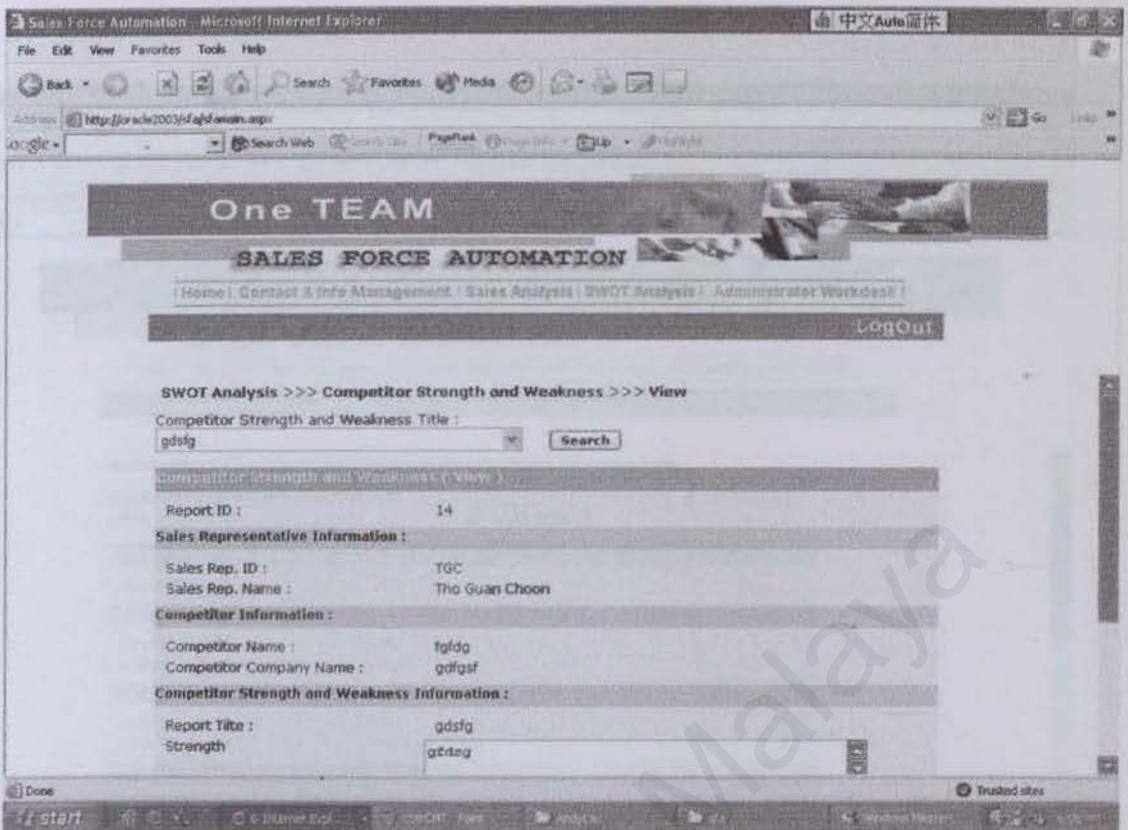


Figure 27: Competitor Strength and Weakness Page (View)

1.4.1.2 Login as Manager or Administrator

User can add, edit and view record same as login as Sales Representative. User can refer the steps at 1.4.2.1.

1.4.1.2.1 Comment

Click the **Comment** (below the Comment Strength and Weakness (Figure 18)) to link to the comment page (Figure 23).

1. Select the record need to comment by click the comment link at the view table. Page now link to comment Page and full fill the existed data (Figure 28).
2. Key in Manager Name and comment.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Save button to save the data.

5. Click Cancel button to exit.

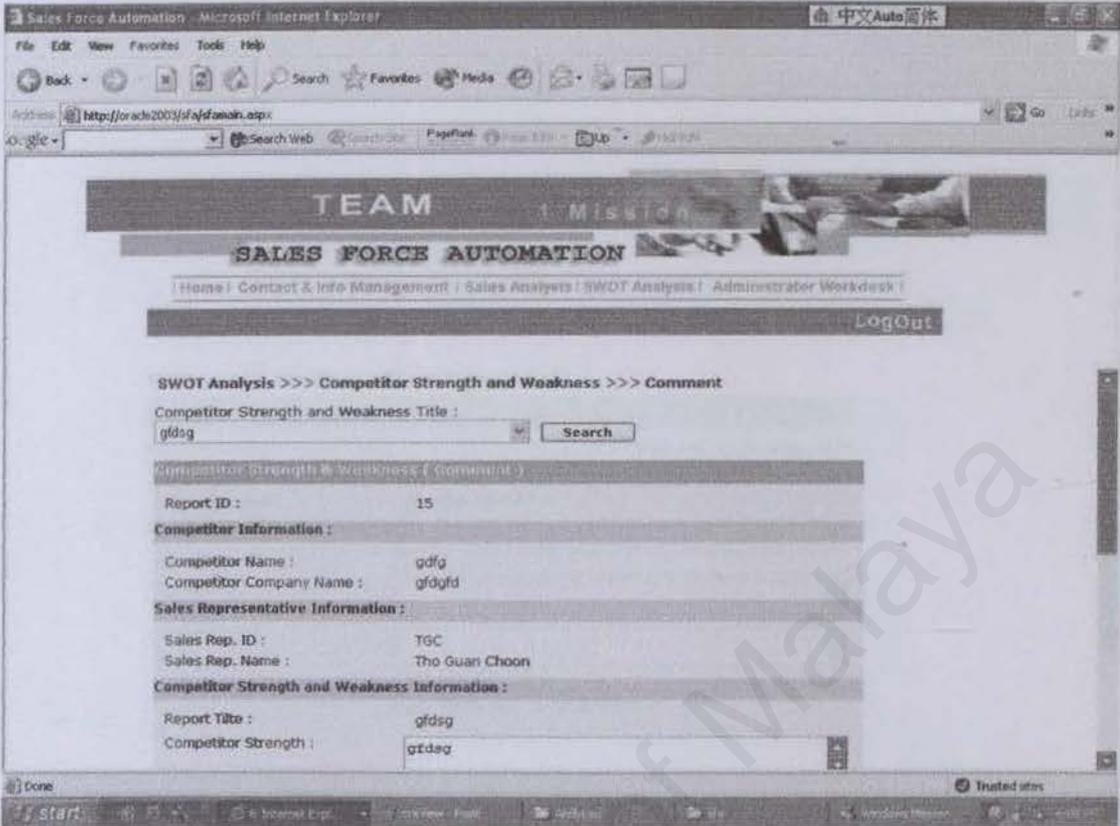


Figure 28: Competitor Strength and Weakness Page (Comment)

1.4.3 OPPORTUNITY AND THREAT

1.4.3.1 Login as Sales Representative

1.4.3.1.1 Add

Click the **Add** (below the Opportunity and Threat (*Figure 18*)) to link to the add page (*Figure 29*).

1. Select the product id from the product list.
2. Key in the report title, Opportunity and Threat.
3. If user has been completely entered, check the completed check box.
 - **Important:** After that, user cannot edit the record.
4. Click the submit button to save the data.
 - **Important:** one message label will show the result either success or fail.

5. Click Cancel to Exit.

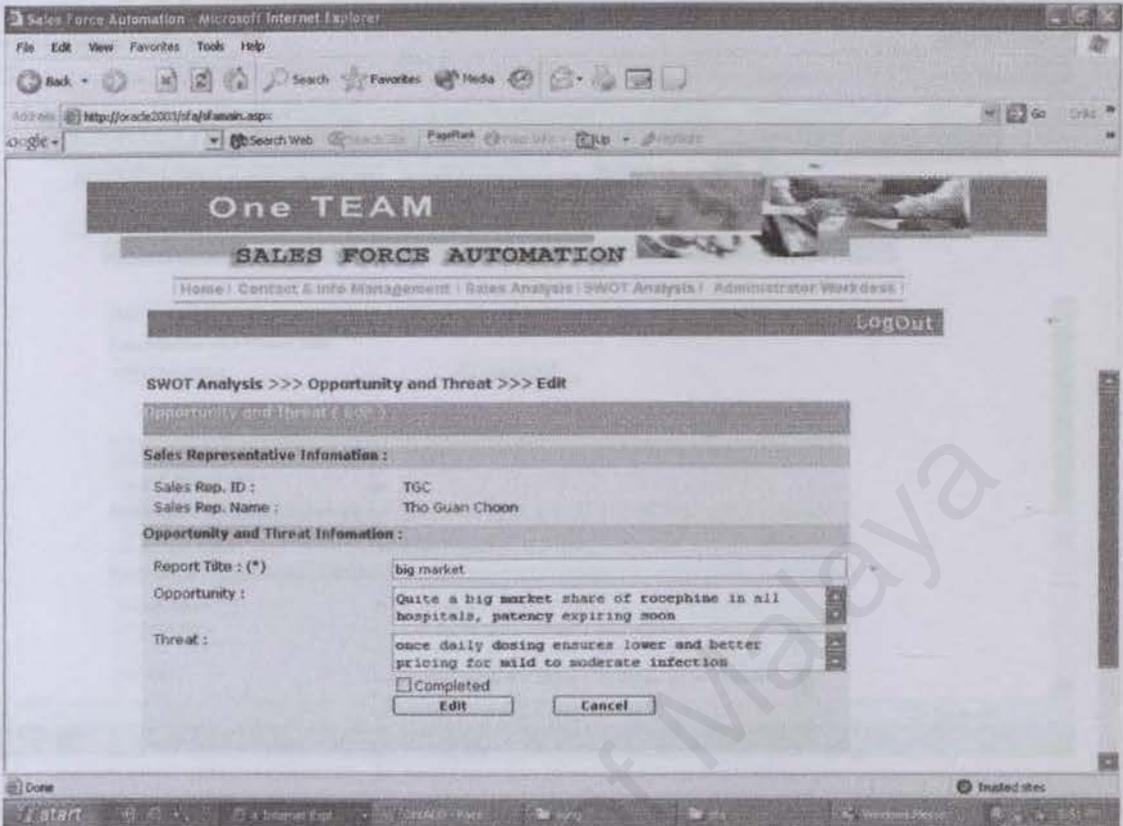


Figure 30: Opportunity and Threat Page (Edit)

1.4.3.1.3 View

Click the **View** (below the Opportunity and Threat (Figure 18)) to link to the view page (Figure 20).

1. Select the record need to view by click the view link at the view table. Page now link to View Page and full fill the existed data (Figure 31).
2. View the data.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Back button to exit

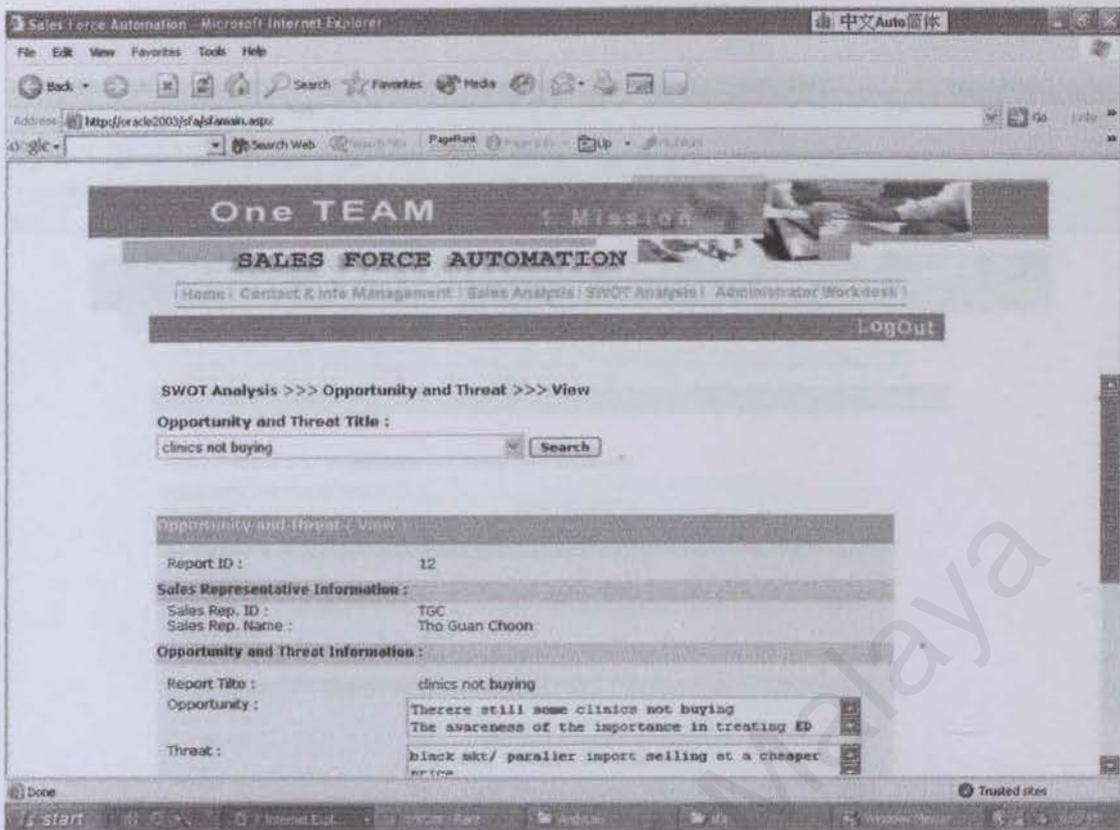


Figure 31: Opportunity and Threat Page (View)

1.4.3.2 Login as Manager or Administrator

User can add, edit and view record same as login as Sales Representative. User can refer the step at 1.4.3.1.

1.4.3.2.1 Comment

Click the **Comment** (below the Product Strength and Weakness (Figure 18)) to link to the comment page (Figure 23).

1. Select the record need to comment by click the comment link at the view table. Page now link to comment Page and full fill the existed data (Figure 32).
2. Key in Manager Name and comment.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Save button to save the data.

5. Click Cancel button to exit.

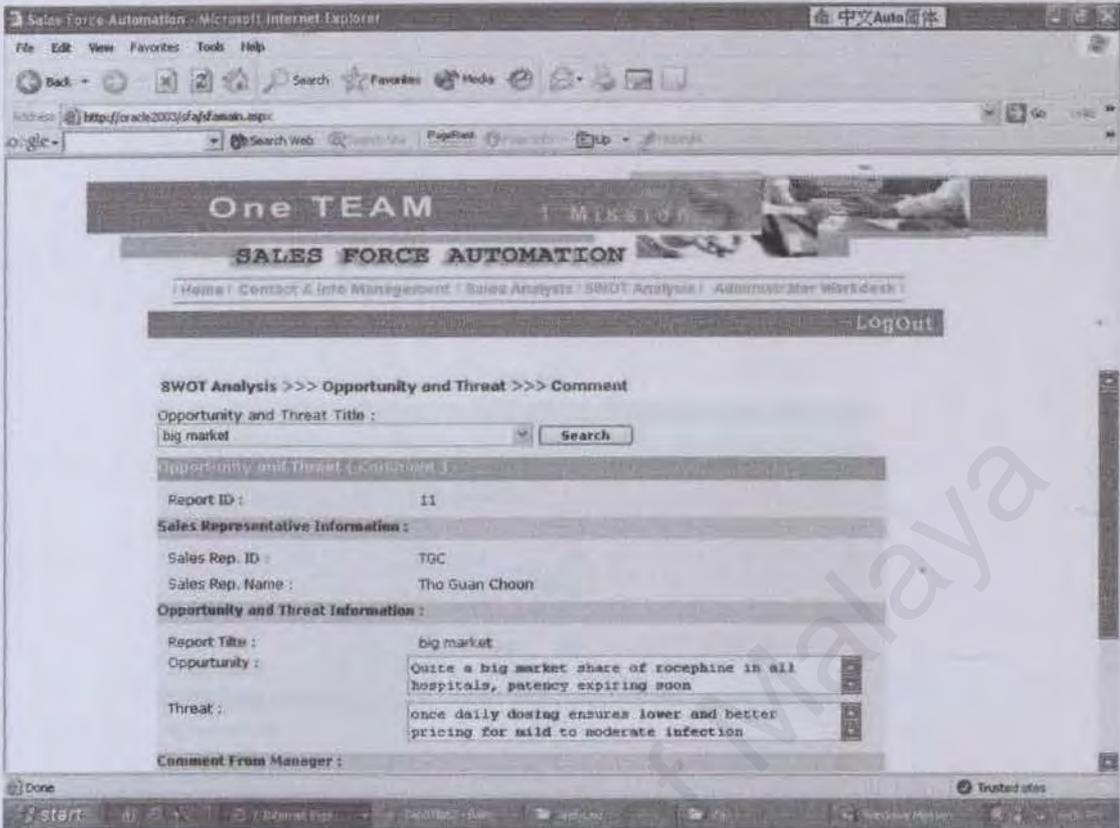


Figure 32: Opportunity and Threat Page (Comment)

1.4.4 ADVERSE DRUG REPORT

1.4.4.1 Add

Click the *Add* (below the Adverse Drug Report (*Figure 18*)) to link to the add page (*Figure 33*).

1. Select the Product ID from the Product list.
2. Select the Customer ID from the Customer list.
3. Key in the report title, Product Adverse.
4. If user has been completely entered, check the completed check box.
 - **Important:** After that, user cannot edit the record.
5. Click the submit button to save the data.
 - **Important:** one message label will show the result either success or fail.

6. Click Cancel to Exit.

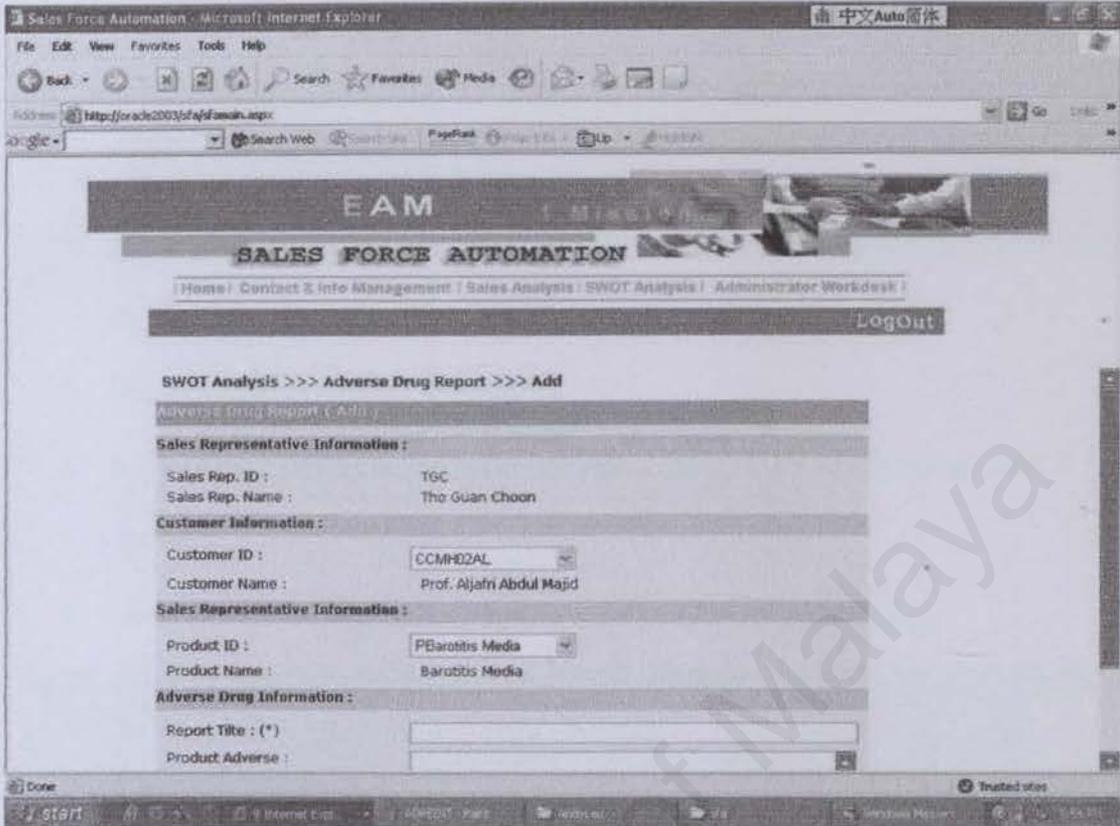


Figure 33: Adverse Drug Report Page (Add)

1.4.4.2 Edit and Delete

Click the **Edit** (below the Adverse Drug Report (*Figure 18*)) to link to the edit page (*Figure 34*).

1. Select the record need to edit by click the edit link at the Edit table. Page now link to Edit Page and full fill the existed data (*Figure 35*). Or Click the Delete link at Edit Table to delete the record.
2. Edit the data.
3. If user has been completely entered, check the completed check box.
 - **Important:** After that, user cannot edit the record.
4. Click Edit button to save the data.
 - **Important:** one message label will show the result either success or fail.

5. Click Cancel to Exit.

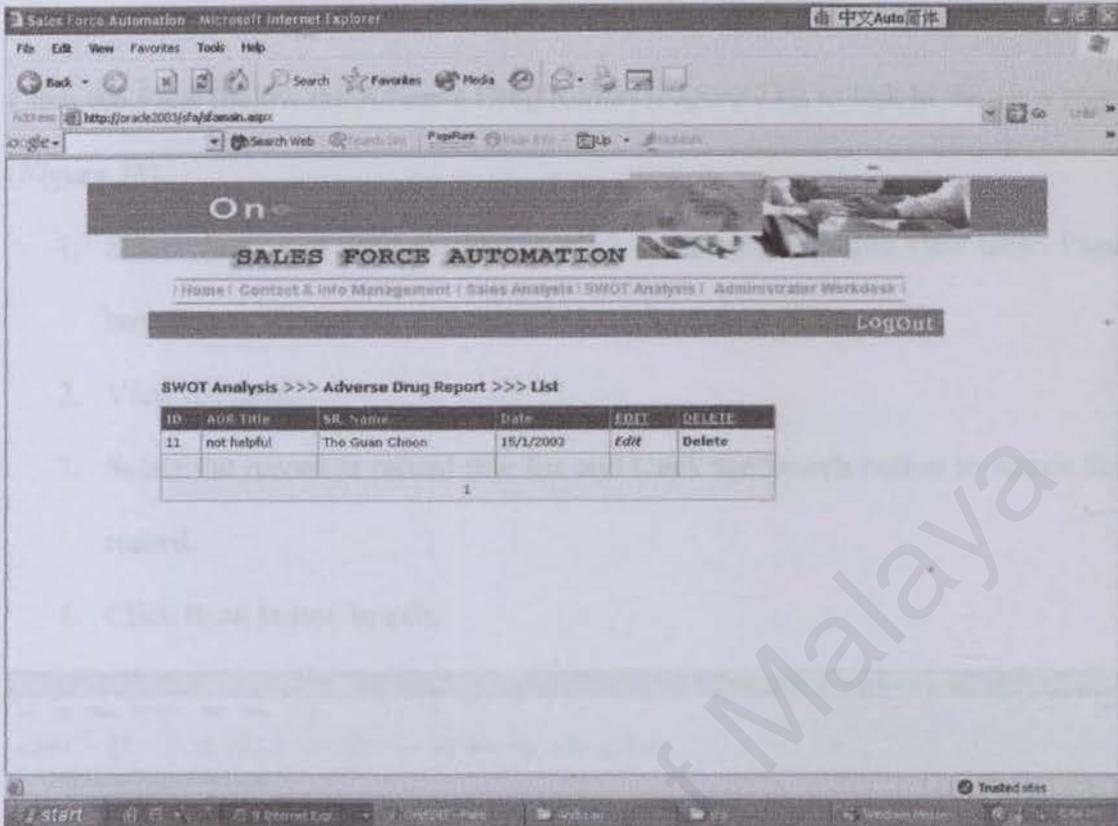


Figure 34: Adverse Drug Report Page (Edit List)

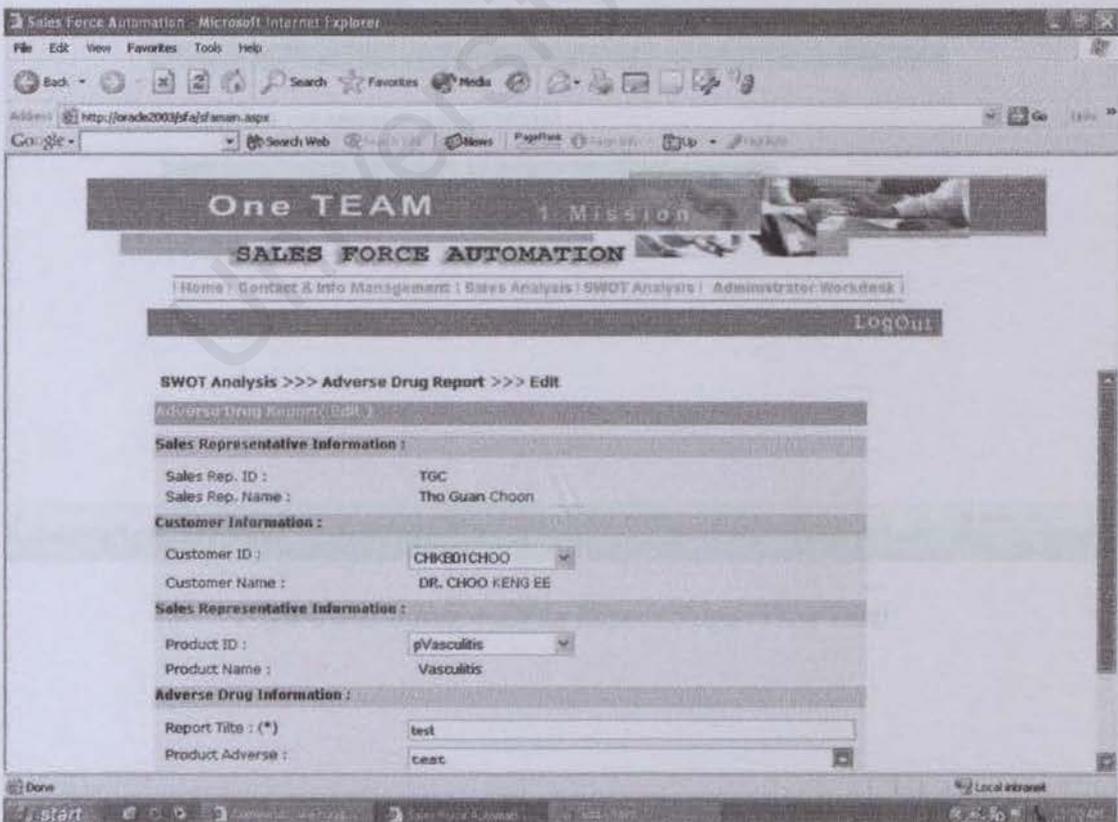


Figure 34 Adverse Drug Report Page (Edit)

1.4.4.3 View

Click the *View* (below the Adverse Drug Report (Figure 18)) to link to the view page (Figure 36).

1. Select the record need to view by click the view link at the view table. Page now link to View Page and full fill the existed data (Figure 37).
2. View the data.
3. Select the record at record title list and Click the Search button to search the record.
4. Click Back button to exit.

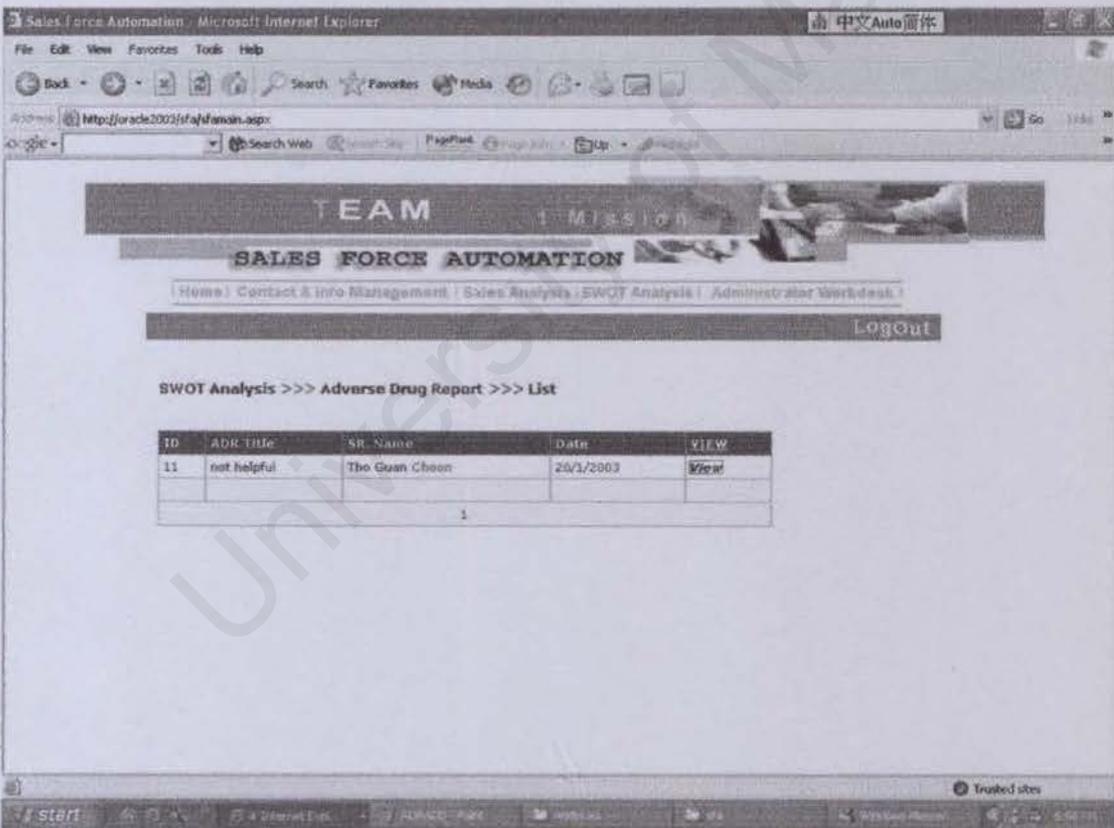


Figure 36: Adverse Drug Report Page (View List)

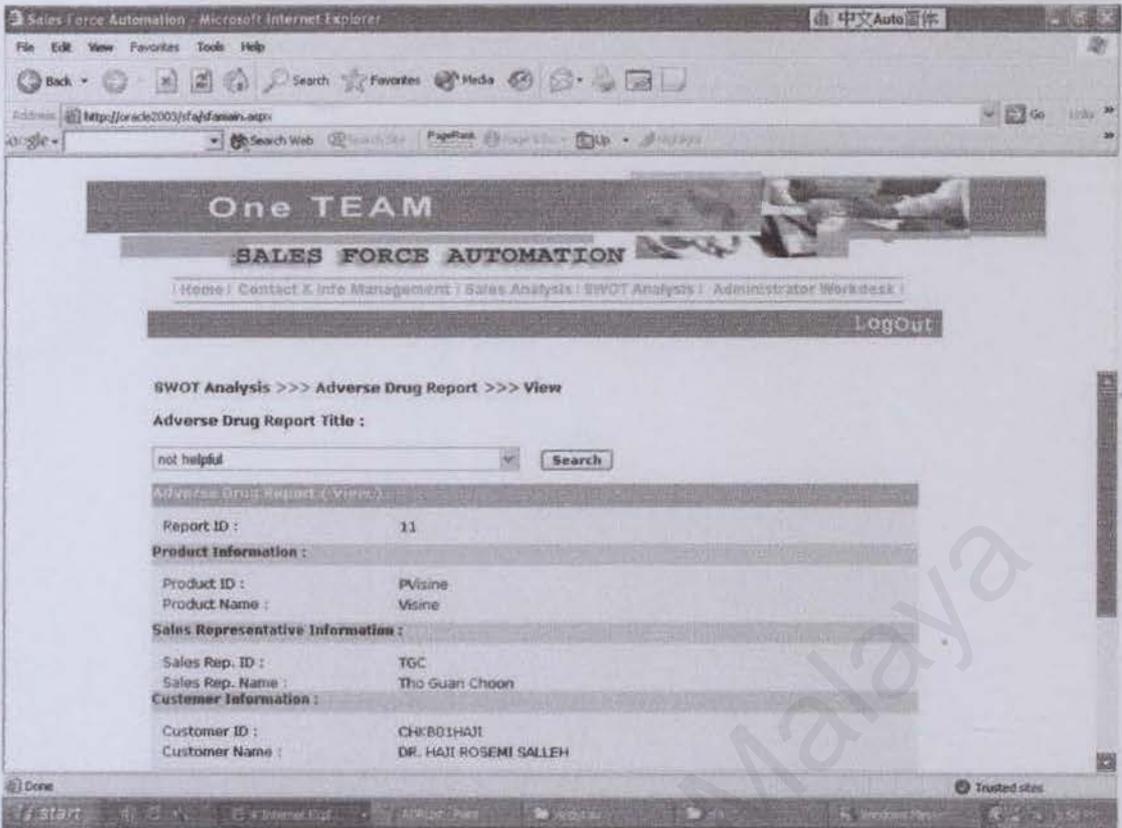


Figure 37: Adverse Drug Report Page (View)