Pure Base Training Centre

Management Information System With Semantic Web

by

Najib Bin Ab Hamid

Dissertation submitted in partial fulfillment of

the requirements for the

Bachelor of Technology (Hons)

(Business Information System)

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Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan
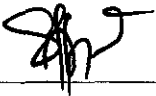
CERTIFICATION OF APPROVAL

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Approved by,

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(Mrs. Syarifah Bahiyah Rahayu Syed Mansoor)
FYP Supervisor

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

July 2007

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CERTIFICATION OF ORIGINALITY

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This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

NAJIB BIN AB HAMID

ABSTRACT

This paper involved with the development of web based Management Information System which applies to Pure Base Training Centre management system by using Java technology with Semantic Web approach. The objective of this research is to develop Management Information System application integrates with Semantic Web technology. It is to enable proper data and information management and to provide quick data access. This will be a tool for system managers to work in offices and physical workspace. Application areas include J2EE application as applied to view, report, record, and access appropriate data using information technology which involving transfer of digital data between authorized members and management. This proposed technology hopefully will be useful as well as initial step towards changes in a new alternative technology in the future.

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In the name of Allah s.w.t, the most Gracious and the most Merciful

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CHAPTER 1

INTRODUCTION

1.1   Background of Study

Pure Base Training Centre is a newly established company that involve in the fields of school motivation program, training for trainer program, seminar, workshop and camping trip for education purposes. Pure Base Training Centre always involved with data information such as module, paper work and official letter. It is important for Pure Base Training Centre to have a good system to manage their data information.

The main idea in this study is to develop a web-based Management Information System (MIS) for Pure Base Training Centre using Semantic Web. Information management is a crucial thing that every company needs to manage and organize. It is a part of the company to compete in the business world. MIS application can provides company with the tools for organizing, evaluating and efficiently running their business process. It can bring many advantages to the company such as proper data management, easy data analysis and quick decision making. Semantic Web technology is used to enhance the capability of World Wide Web to support data integration and rich data define. By combining MIS application and Semantic Web technology, it can give user the power to use data information with ease and accurate. Having this advantage, a company can safe a lot of time and use their organize data information to assist their business process.

1.2 Problem Statement

1.2.1 Problem Identification

i. Traditional Management Information System

This study based on the problems of inefficient current management information system which applied in traditional way. The current management information system that applied in Pure Base Training Centre normally based on manual system such as filing system. The system has a lot of problem in arrangement of data, inaccurate information, slow in update information and use a lot of filing. It has no automated system that can function as their management information system. This will affect on management of files and data which the system sometime misses allocate the data or misplaced it to another files. Further more it would slow down the update of data into the system which manually done in word processing or spreadsheet. The traditional way also incurs more cost on spreadsheet; files, printer, and also it need the effort to ask particular person to find the information or data that only the person have. This consumes a lot of time.

ii. No Centralize Data for Management

At current Pure Base Training Centre, information data are not centralized. It is manually managed by a particular person individually. So, it is hard for the other members to get the required information or data unless the responsible person is there. This would create a problem to the management because information data will not be synchronized to each other. The information data will be hard to update and improve in the future development.

1.2.2 Significant of the Project

The solution for problems statement above is implementing the new concept of data information management "Pure Base Training Centre MIS using Semantic Web". This study will approach to the MIS application and semantic technology where it can be integrate to create the management system. The purpose of this research, to develop MIS application for Pure Base Training Centre is to provide the company a proper management system so that it can improve their data information management. This will verify the efficiency of this system as comparing with traditional management system. In addition, this research also integrates the Semantic Web functionality that can optimize the limitation of web-based management system nowadays. Further more it can be significant informational databases for storing and retrieving information about the company management information. This system provides benefits to the company to organize information data, synchronize information data between other management and many more just by having a proper web-based MIS application.

1.3 Objectives of Study

   i. To develop Management Information System application.
  ii. To integrate Semantic Web technology with the system.
 iii. To enable proper data information management.
 iv. To provide quick data information access and updating.
  v. To retrieve data information by using web browser.

1.4 Scope of Study

   i. Capable to organize, manage and store the data information for Pure Base Training Centre.
  ii. Enable certain features of Semantic Web.
 iii. The system can be access through the World Wide Web.
 iv. Enable data updating by authorized user.

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.1 Introduction to MIS (Management Information System)

The use of MIS has been increase year by year in developed country especially at United States and United Kingdom. In our country many organizations such as private and government has take advantages on this MIS technology. What is MIS all about?

Management term used because MIS tend to deal primarily with managing something. Information represents the large amount of data, which are usually handled within a MIS. System is represent computer technology such as computer hardware, software, data, procedures and personal functions as an automated system for the capture, storage, update, retrieval, manipulation, analysis, management and display of all forms of information.

According to Webopedia.com, "MIS refers broadly to a computer-based system that provides managers with the tools for organizing, evaluating and efficiently running their departments". In order to good information, an MIS can include software that helps in decision making, data resources such as databases, the hardware resources of a system, decision support systems, people management and project management applications, and any computerized processes that enable the department to run efficiently.

2.2 Internet

The increasing popularity of the Internet, from on-line surfing to e-commerce to interactive chatting, has made the internet and integral part of our society. The nearly ubiquitous access to the Internet and interactive content of the World Wide Web (WWW) have made them a powerful means for people to access, exchange and process information. Many applications in journalism, sciences, publishing and other fields have been changes by and adapted for use on the Internet (Plewe, 1997). Likewise, the Internet has changes how MIS data and processing are accessed, shared and manipulated.

The Internet is a modern information relay system that connects hundreds of thousands of telecommunication networks and creates an "internetworking" framework. Internet MIS is a research and application area that utilizes the Internet and other internetworking systems (including wireless communications and intranets) to facilitate the access, processing and dissemination of data information and analysis knowledge.

The development of information relay systems can be traced back thousands of years. The earliest information relay systems were developed in Egypt and in China by using human beings on horseback and relay stations situated on major roads. Maps, military documents, and letters delivered by postmen or messengers who traveled between villages, cities and countries. Another type of early information relay systems was created by using pigeons. Some historical documents indicate that pigeons were used to deliver the outcomes of the Olympic Games in ancient Greece, around 776 B.C. The Romans, around the fourth century also used homing pigeons as the messengers, Two thousand years later, the electric modern information relay systems were invented by Samuel Finley Breese Morse, the electric telegraph in 1838 (Holzmann and Pehrson, 1994).

One hundred and twenty years after Morse created the telegraph, the U.S. Department of Defense (DOD) developed the progenitor of the modern Internet in the 1970s: a self-adjustable, decentralized networking system called ARPANET. The original goal of the ARPANET project was to provide a reliable

telecommunications network that could survive a nuclear war (http://www.cybergeography.org/atlas/historical.html). In 1983, the ARPANET project adopted the Transmission Control Protocol/Internet Protocol (TCP/IP) as the standardized protocol for communications across interconnected networks, between computers with diverse hardware, and between various operating systems. The dramatic success of the Internet and the popular adoption of TCP/IP pushed the development of telecommunication into a new age. Along with the rapid development of the Internet, many applications and programs have been developed, such as Newsgroup, Gopher, Bulletin Board System (BBS), Telnet and so on. The MIS community also began to utilize the Internet to develop Internet MIS and other Internet-based applications.

2.3   Semantic Web and Ontology

The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation (Tim Berners-Lee, James Hendler, Ora Lassila, 2001). Following this definition, the Semantic Web is not a new Web but an extension of the existing Web. This extension consists of meta-data describing the semantics of the Web pages in a machine process able way.

The key enabler of the Semantic Web is the need of many communities to put machine-understandable data on the Web which can be shared and processed by automated tools as well as by people. The Semantic Web promises more accurate discovery of information and web services on the web by both human and computer applications.

To accomplish this vision, efforts to link the existing web contents to semantic descriptions followed by the creation of a set of applications that can utilize this newly created metadata are desperately in need, which thus stimulate a new research horizon (Fensel et al., 2002; Semaview, 2002). In order to bring the vision of the Semantic Web into being, the research community came with standards, W3C recommendations, development frameworks, APIs, and databases.

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Ontologies are decentralized vocabularies of concepts and their relations to which the existing web contents can refer. These decentralized vocabularies not only define the meaning of web page contents but also the contents of other information resources, including documents (paper-based) and databases. Ontologies are therefore the kernel of the Semantic Web that allow computers to better categorize, retrieve, query and deduce information from the WWW than the current web technology (Ding et al, 2003; Fensel, 2001).

The concept of ontology applied in Artificial Intelligence is to facilitate knowledge sharing and reuse (Fensel, 2001). Ontology is claimed able to provide a shared and common understanding of a domain so that people and various application systems can communicate across the widely spread heterogeneous sources (Maedche et al., 2001). As defined by Gruber (Gruber, 1993), ontology is a formal explicit specification of a shared conceptualization. Thus, it should be machine-readable (Ding et al., 2003; Fensel, 2001). In general, ontology is a graph which nodes represent concepts or individual objects while arcs represent relationships or associations among concepts. The ontology network takes account of properties and attributes, constraints, functions, and rules that govern the behavior of the concepts (Fensel, 2001).

Ontologies are useful to organize and share information while offering intelligent means for content management as well as enhancing semantic search in distributed and heterogeneous information sources (Filos, 2002; Fensel et al., 2002). In accordance with Maedche (Maedche et al., 2001), establishing domain specific ontologies is important for the success and proliferation of the Semantic Web.

In view of the increasing importance of ontologies, international research in this arena, which has been conducted during the last decade has presented promising results in the creation of ontology languages (W3C, 2002; DAML, 2002; OWL, 2003), ontology editors (Protégé; Fillies, 2001), reasoning techniques and development guidelines (W3C, 2002). To date, the applications of ontologies are mainly found in e-commerce.

The Semantic Web based knowledge management system will be able to keep weakly structured collections consistent, to generate information presentations from semi-structured data, and to create semantics of these collections and data which is both machine-accessible and machine-processable (Ding et al., 2003; Fensel et al., 2002). To accomplish this, the semantics must be represented based on formal ontologies (Fensel, 2001) with the use of ontology languages that have been developed since the past decades.

2.3.1 RDF (Resource Description Framework)

The basis of most of these developed or developing ontology languages is the one called Resource Description Framework (RDF), which is the outcome of industry group W3C (W3C, 2002). RDF is a specification for defining machine-understandable metadata while its schema (RDFS), provides a simple mechanism for defining ontologies. With regard to ontologies, RDFS provides two important contribution: a standardized syntax for writing ontologies and a standard set of modeling primitives such as instance-of and sub-class-of relationships (W3C, 2002), see Figure 2.1. An RDF document consists of a variable number of triples, each of which is composed of subject, predicate and object. Triples exist independently without concerning the order in which they occur. The use of RDF and their associated RDFS defined ontologies provide the computer with information to discover the meaning of the data.
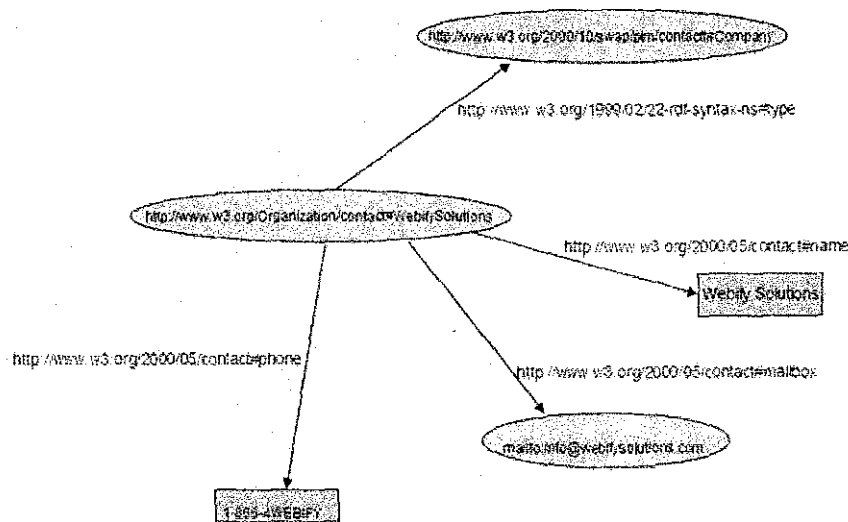
Figure 2.1   RDF graph example

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2.3.2 OWL (Web Ontology Language)

OWL adds more vocabulary to describe properties and classes than RDF or RDF Schema: among other things, it can describe relations between classes such as disjoint-ness, cardinality, equality, richer typing of properties, and characteristics of properties such as symmetry (W3C, 2002), see Figure 2.2.

The OWL Web Ontology Language is designed for use by applications that need to process the content of information rather than just presenting information to humans. OWL facilitates greater machine interpretability of Web content than that supported by XML, RDF, and RDF Schema by providing additional vocabulary along with formal semantics.
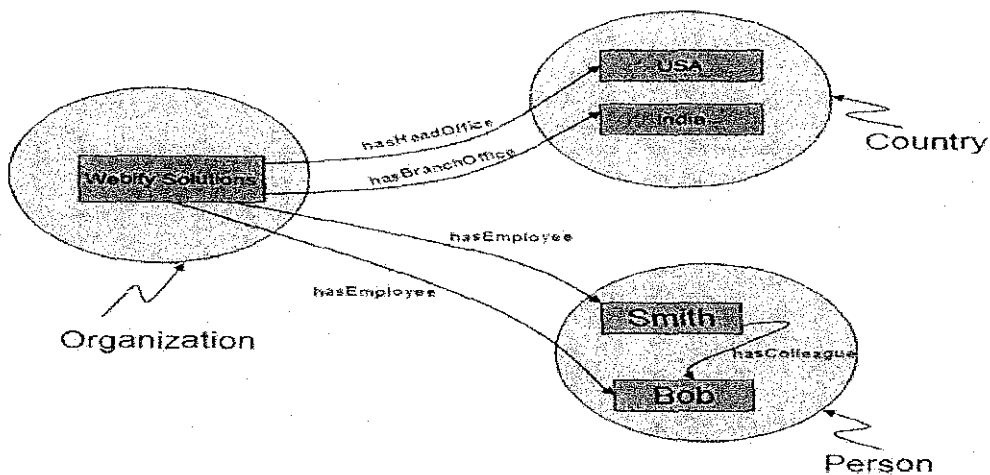
Figure 2.2 OWL Ontology example

CHAPTER 3

METHODOLOGY

3.1 Procedure Identification

To develop this system, RAD (Rapid Application Development) becomes the methodology. RAD (Rapid Application Development) is a system development methodology created to decrease time needed to design and implement Information Systems radically. It is involved with four phases, which are analyzing, designing, implementing and testing. Each phase was followed step by step. Next step cannot be done if the previous step was not finished.
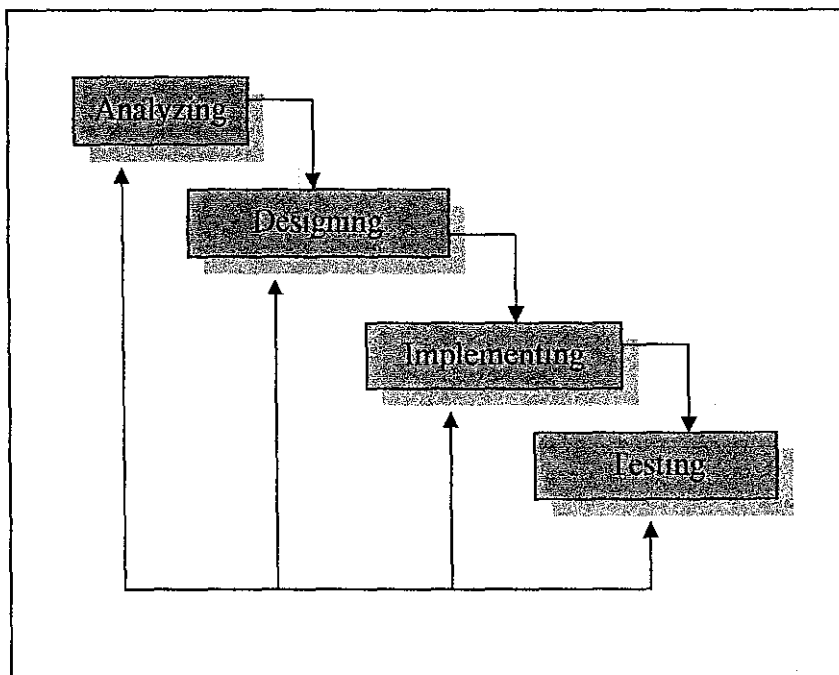
3.1.1 Analyzing

At this phase, the problem and the significant was identified. Followed through reading, understanding and literature review about MIS application from books, articles, thesis and interview. The research of the functionality and interactivity can be performed through by the system. Beside that the author also has done the research on selecting the tools for deliver the successful system and it can be run smoothly. The author also have identified what kind of application to be implement, which software to be used and what kind of hardware needed for the system development.

The author found that the objective can be achieved in MIS by simplifying the current situation through the systematic selection of information to be entered into the system which is known as data structuring. The information can be synchronize by gathering the existing data and organize it into the system. The system analysis is shown in the Figure 3.2.
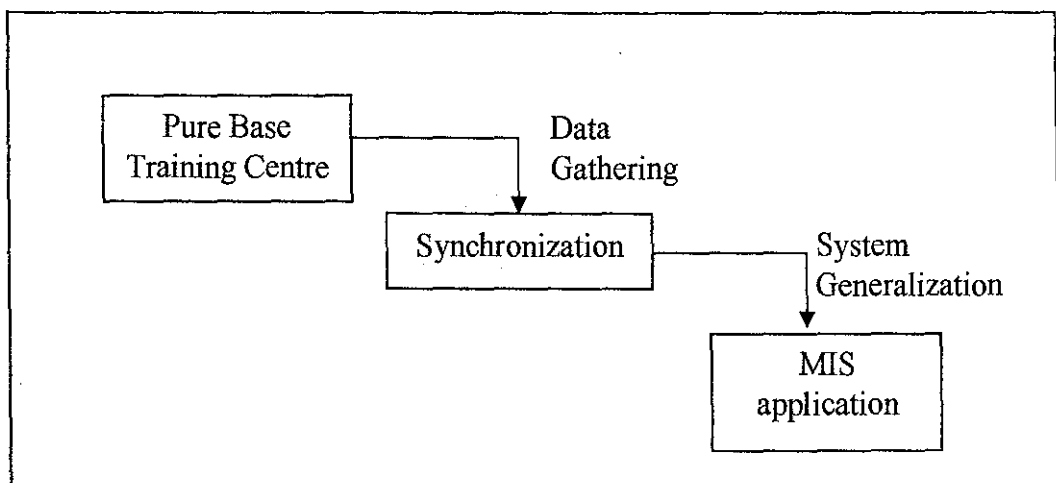
Figure 3.2   The System Analysis

In order to provide a good solution for Pure Base Training Centre, the author has done some analysis to make sure that the system will benefit the company. The analysis has been break into several part to identify all the elements that contribute to the system development.

The first analysis that the author done is on the company activity structure. The important entity from the company has been list out as a guideline for the system development. Figure 3.3 shows the entity represent Pure Base Training Centre.
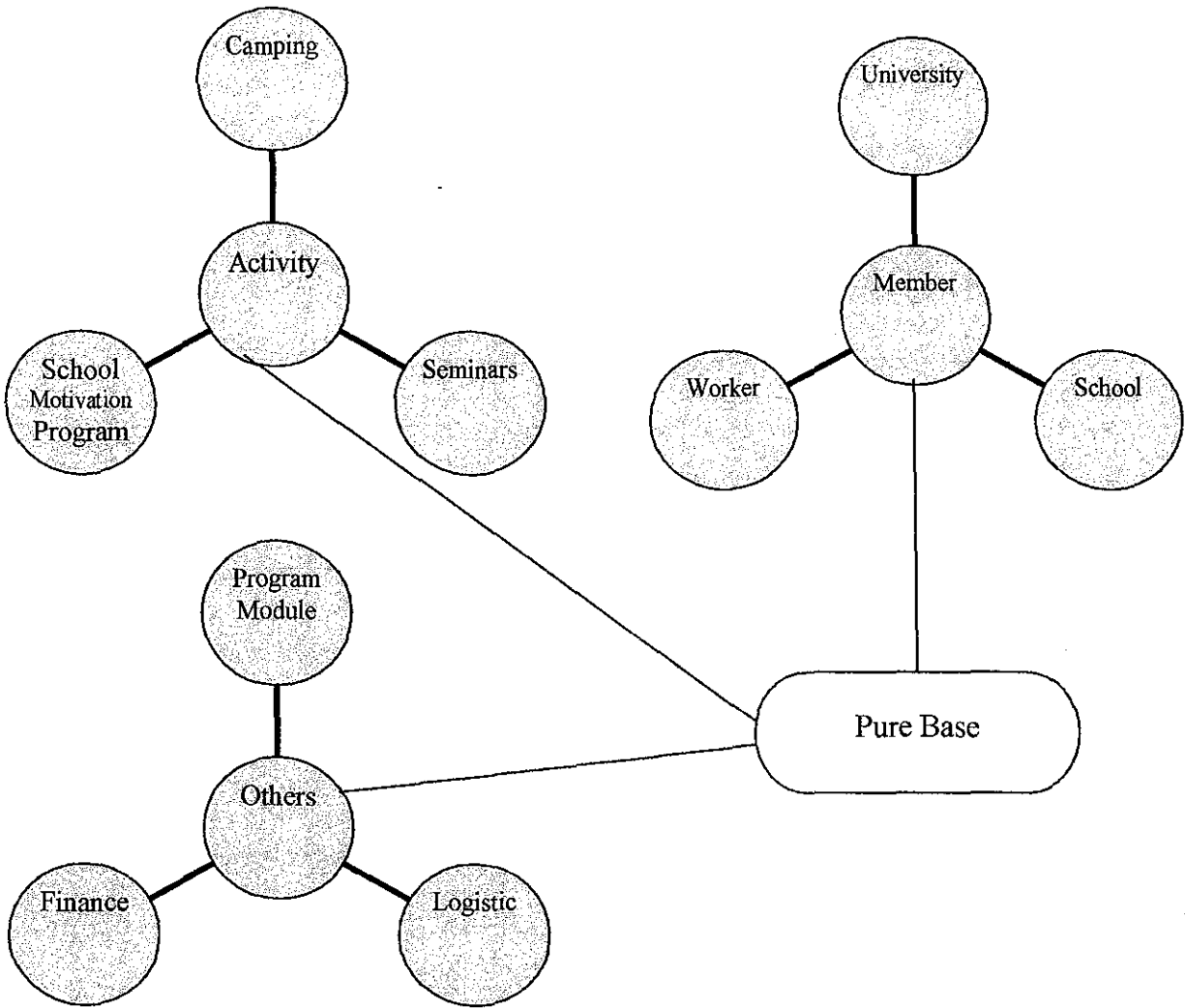
Figure 3.3   Pure Base Training Centre Entity

Next, the author performs a research on web development application and specified which application to be used as a tool for developing the system. There are many differences between architecture and supported tools between the several web development applications and also the availability of the software in the market. The application is vary from open source application to commercial application. For this project, the author has decided to use an open source application to create the system as it incurs less cost for the system development.

The author also performed some research on the basic architecture of Semantic Web to make sure that the system can be integrated between each other. And then the author also need to specified which system technology to select and available to be used in the system. Some analysis need to be done for identified the best solutions.

i. Web Development Application

To choose what is the tool for developing a web-based application, the author need to discover or perform some research on the technology of web-based system. In author finding, there are three famous technologies of web-based system development can be used; PHP, J2EE and .NET. Between these three technologies, each of them provides their own solution and approach for the web development system. Table 3.1 shows the author finding about the suitable web development application.

	Web Development Application	Support Technology	Application Type
1	Macromedia Dreamveawer	PHP, J2EE	Shareware
2	Visual Studio .NET	.NET	Shareware
3	Eclipse IDE	PHP, J2EE	Freeware
4	NetBeans	J2EE	Freeware

Table 3.1   Web Development Application

The author also looks into the Semantic Web technology to choose what is best to implement with the system. The author found that for these three technologies, PHP, J2EE and .NET, there are some developments done on Semantic Web, see Table 3.2.

	Web Technology	Semantic Tools
1	PHP	RAP
2	.NET	CARP
3	J2EE	JENA
4	Perl	PerlRDF
5	Python	RDFLib

Table 3.2   Semantic Tools

Database plays an important roll in web development. This is where all the data will be store. The author does some research for suitable database to be used with the MIS web-based system. Table 3.3 shows the suitable database available for the system.

	Database Application	Database Type
1	Oracle	Shareware
2	MySQL	Freeware
3	Postgres	Freeware
4	IBM	Shareware

Table 3.3   Database Application

For this system, the author has to choose the available freeware application to develop the system. Although the shareware has more advantage, it incurs more cost compare to the freeware application.

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ii. Selected Technology and Application

The author has decided to use J2EE technology for the system development. J2EE which stands for Java 2 Standard Edition can be used to develop server-side applications, such as Java servlets and JavaServer Pages. To cope with this technology, the author use Eclipse IDE for development application and Jena framework for the semantic purposes. Eclipse IDE supports the use of plugin. Using this ability, it is possible for the author to integrate semantic tools within the system.

iii. Selected Database Application and Web Server

Postgres 8 is used as a backend database for the system for data storing purposes. Tomcat 5 which function as the web server is used to connect the system with the database.

The hands on Eclipse 3.1 and Postgres 8 database also been carried out to get familiar with the software and try to learn how to install and use the software before starting the design phase. The story board needs to be design first before implement it on the web application software.

3.1.2 Designing

In this phase, the data that had been analyzed before is put into data models and process models. System users were involved in this activity to help address data and process issues. The key inputs to the tasks were the facts, recommendations, and opinions that were solicited from various sources. The author is working closely with the system users to develop input, output, and dialogue specifications. For interface and dialogue design, the author has considered such factors as terminal familiarity, possible errors, and misunderstanding that the end users may encounter. Furthermore, the author was trying to make it easy for the end users to understand what the screen is going to display at any given time.

i. Object Orientation and UML

The project uses the Object Orientation Methodology to develop the web-based MIS application. The techniques and notations involved will be based on Unified Modeling Language (UML). UML which used graphic interpretation make it easier to understand the process flow of the system.
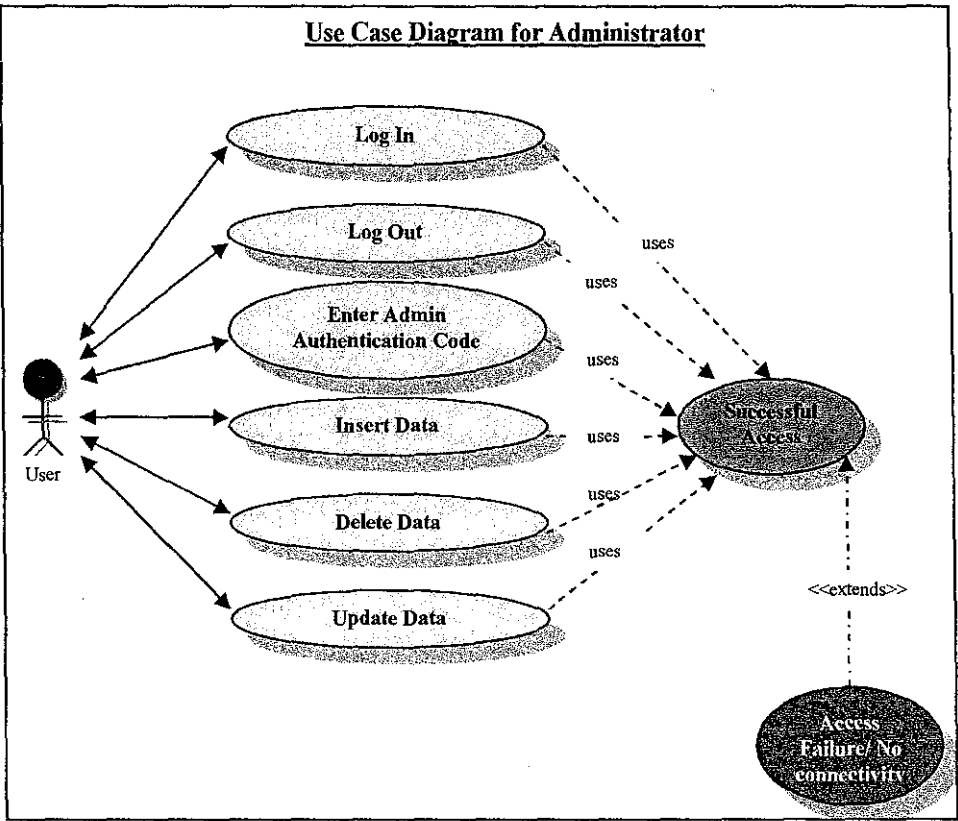
Figure 3.4   Use Case Diagram for Administrator

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ii. Developing Database

Database design was created based on the need for visualization and data input for analysis. These include the database for Pure Base Training Centre members' information. The important data needed to perform in the system management is set as primary key for easy reference. Some of the attributes data were manually inserted into database for testing purposes. The important step is to determine data such as number, string or Boolean concisely to avoid any obstructions while doing the analysis.

iii. Storyboard
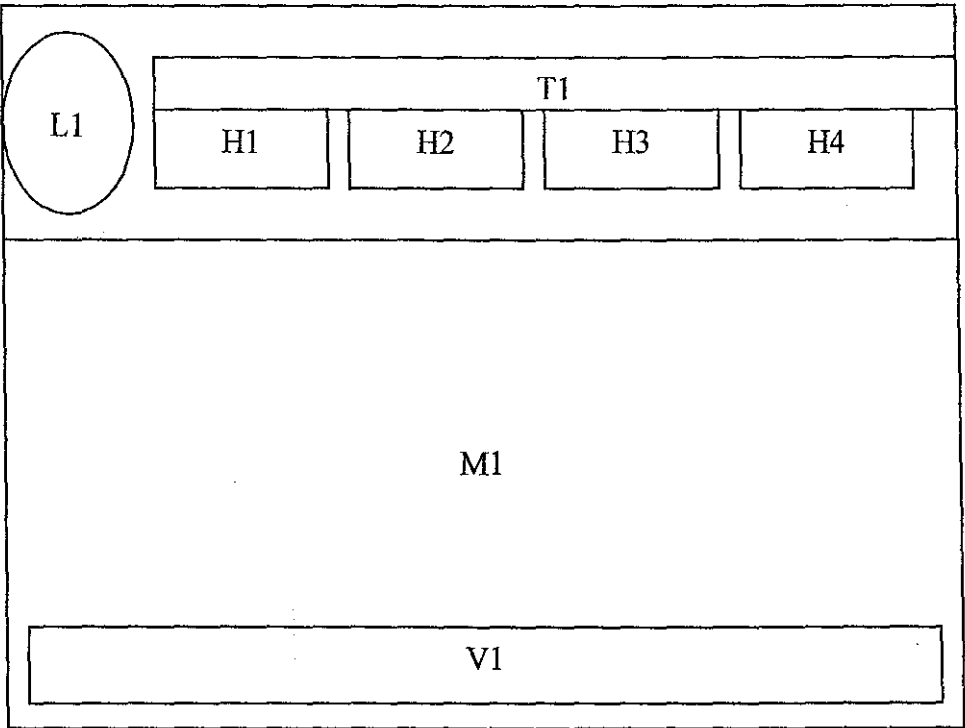
Figure 3.5   Storyboard

The design is based on the web design. The storyboard will explained more details on the description below:

U1:   Pure Base logo

H1:   Hyperlink to Home

H2:   Hyperlink to Human Resource

H3:   Hyperlink to Event

H4:   Logout

T1:   Title

M1:   Data Display

V1:   Trademark

3.1.3 Implementing

After completing the design, the system will be implemented by module. This is to ensure that the author can provide the evaluation testing based on the module. Table 3.4 shows the step taken following the module.

	Module	Application Involves
1	Installation and configuration	Eclipse, Postgres, Tomcat
2	System Programming	Eclipse
3	Database Input	Postgres
4	Graphic Design	Eclipse

Table 3.4 Implementation Module

i. Installation and Configuration

In this module, all the application needed to build the system is install and configure. Eclipse IDE is installed as web development application which will be the main interface that interacts with author during system

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development. Jena framework is setup into the Eclipse IDE as a plugin to make sure that it can be integrate with the system.

Postgres 8 database is installed as a backend database for the system. New database is created and named accordingly to store all the system data into suitable database. Tomcat 5 is installed as a web server to link the web application with the database application.

ii. System Programming

The system programming is done using Eclipse IDE. The programming language is determined by the web technology that the author used which is J2EE. The programming process is done following the standard programming convention and suitable structure for MIS application

iii. Database Input

Some data will be inserted to the database to support the system development process. This is to make sure that the system will have no problem to access and view the data when the program runs.

iv. Graphic Design

The graphic design will be the last module for the system development. This module is to make the system look interesting and easy to understand by the user. The selection of picture and color is based on Pure Base Training Centre standard.

3.1.4 Testing

After completing all the four stages, testing needed to be implement so that the system can be accepted not only from the audience or the user but also meet the objectives that being stated previously. The testing also to make sure the system is compatible to the client side.

i. Stability and Compatibility from Client Side Processing

The author already tests the system with different kind of operating system platform at client side processing. The author tests the system by using VMware Workstation. This software helps the author to test the system at the local workstation, and determine whether the system client side is compatible with the different kind of operating system environment, especially with the Microsoft Window based operating system. VMware Workstation can run multiple kind of operating system at the same time with the author's laptop and it creates virtual PC within the author's operating system. The table below showing the result after testing with different operating system environment and tested with HTML viewer:

Operating System	Result	Notes
Window XP Home	Success	Internet Explorer and Mozilla
Window XP Professional	Success	Internet Explorer and Mozilla
Linux Red-Hat 7.1	Success	Mozilla

Table 3.5 Stability and Compatibility Results

ii. Graphical User Interface Testing

This test is to ensure that the system graphical user interface meet the user requirements. The author have done with the test and the users that using the system and evaluate the GUI of the system are among friends and Pure Base Training Centre members. The users test the system prototype and the author write down what the changes that needs to perform. From the test that have being implemented on the Graphical User Interface, now the system prototype design already improved and it can be continued to change, following with user responses.

3.2 Tools

For developing "Pure Base Training Centre Management Information System using Semantic Web", there are many stages in MIS system development to be followed in order to achieve the objective. Tools is needed to created and maintain the system development phase.

Implementation Tool	Task
Eclipse 3 IDE	Develop the system and integrate Jena framework with the system.
Postgres 8	Store the data for the system.
Tomcat	Web server to link database and application.
Jena Framework	Framework for Semantic Web.
Graphic editor	Designing web pages.

Table 3.6 Application Software Requirement

The minimum configuration and requirement that required for supporting the application is the standard or basic hardware infrastructure such as stand alone PC, keyboard, mouse, monitor and printer for printing application.

Basic or Minimum Requirement for client side:

```
CPU               : 800Mhz Pentium II
Memory            : 128 MB RAM
Monitor           : 14" monitor with 32MB VRAM
Hard Drive        : Hard Drive 10GB
Operating System  : Windows 95, 98, ME, NT4.0, 2000, XP
Browser           : Internet Explorer 5.1 or above is better
Network Card      : 10mbps – 100mbps
Printer           : 8.5" x 11" color inkjet
```

Basic or Minimum Requirement for server side:

```
CPU               : 800Mhz Pentium III
Memory            : 128 MB RAM
Monitor           : 14" monitor with 32MB VRAM
Hard Drive        : Hard Drive 10GB
Operating System  : Windows NT4.0, 2000, XP
Browser           : Internet Explorer 5.1 or above is better
Network Card      : 10mbps – 100mbps
```

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Results

Results and findings from this project were collected from the three stages of the web-based MIS application development. They are analysis, design, and implementation stages.

4.1.1 Analysis Findings

From the analysis, the author has identified the main functionality for the system. These functionalities are:

Keep record of company activities

The record will give certain information about the company activities such as school motivation program, camping and seminars.

Manage the company and staff information

The system will store the information about the company and staff such as staff name, position and other related information.

Keep record of documented data

The system will act as the centre of data storage for all the data that the company have for easy reference and retrieve.

Within analysis finding, the author has compared the suitable application tools needed to build the system specification. The selection of the application is based on cost and functionality that the application provided.

4.1.2 Design Findings

The system design for Pure Base Training Centre system is created using the results of the analysis stage. Eclipse 3 IDE is used to provide the graphical user interface for the system. This overview will be used as an element to develop the actual MIS system.

Figure 4.1   Eclipse 3 IDE

Eclipse IDE support plugin in its system. This function enable author to integrate Jena framework which is the Semantic Web feature to be used in the system development. The author also used other plugin to support system development such as Exadel Studio 3, for coding convention and interface design viewer.

The database design used is Postgres 8. Figure 4.2 shows the Postgres user interface. Postgres is open source software and it is easy to use because it has a friendly user interface.
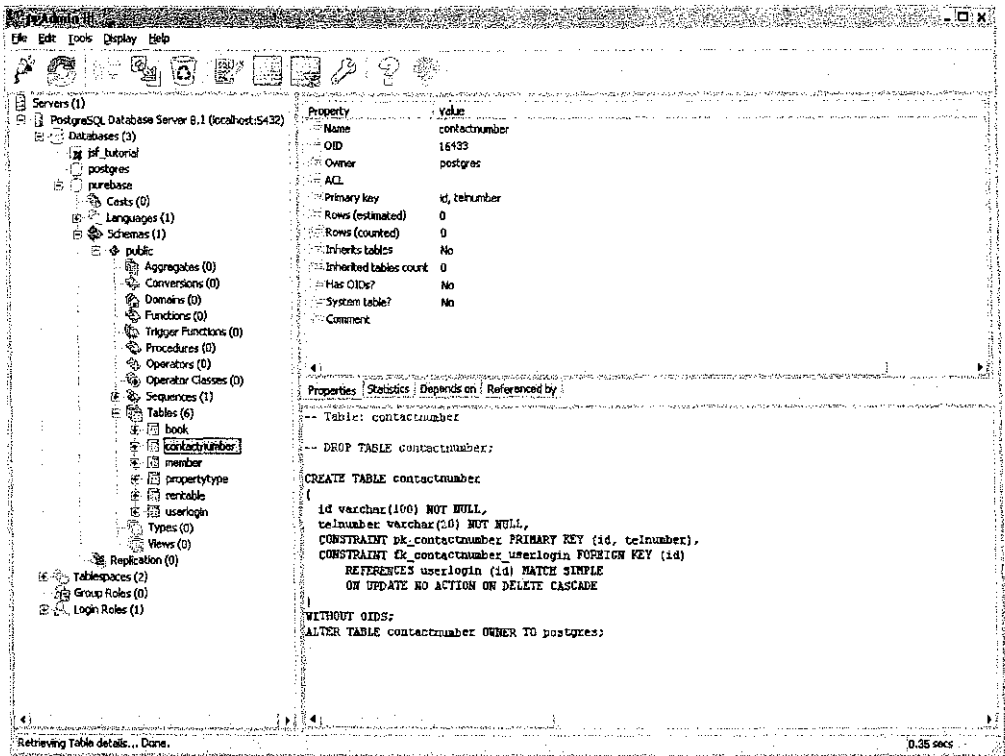
Figure 4.2 Postgres 8 Database

The author has chosen Postgres instead of MySQL because Postgres come up with its own user interface which MySQL is lack off. MySQL use a command prompt instruction to manage its database. Addition software is needed to use MySQL with a friendly user interface.

It is also easier to use Postgres database to maintain and manage the data information inside the database. The speed of the system maintenance and development can be enhanced compare to MySQL database.

Tomcat 5 which function as a web server to link the system application with the database is easy to use and it only need one single file to setup the setting configuration for the system and database connection.
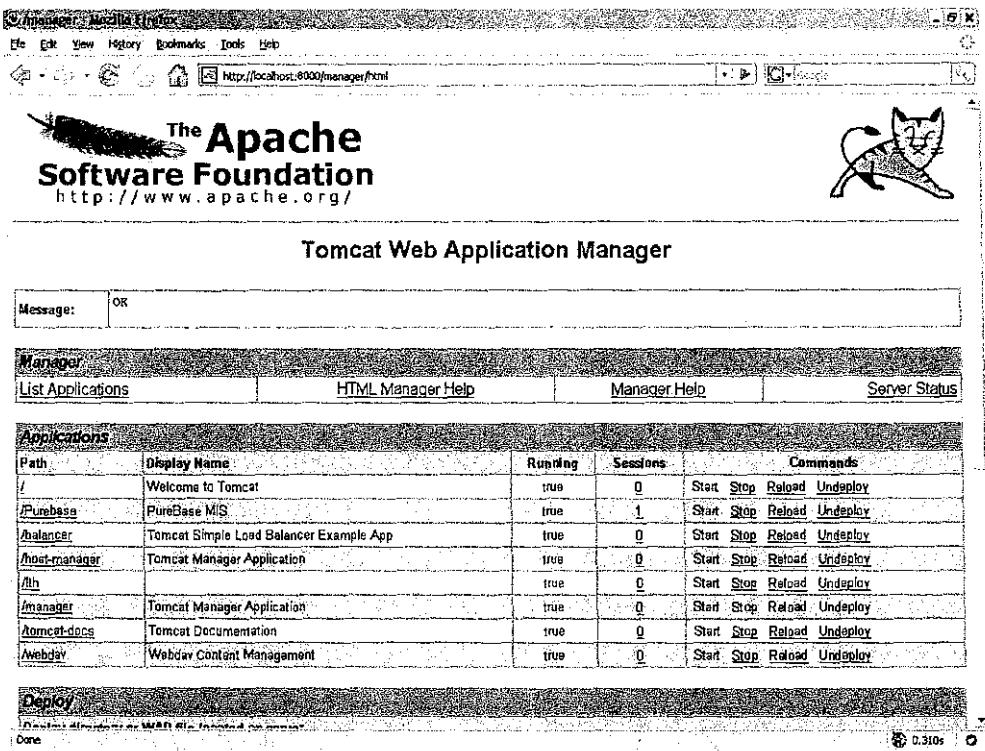
Figure 4.3 Tomcat 5 Server

4.1.3 Implementation Findings

During implementation, the author found that the system security is one of the important features of the system. To cater this feature, an access level login has been implemented within the system.

The ability to create a back up and recovery for the database also caught the author attention. This feature can be done by set up Postgres database to create a back up when needed so that if something happened, the data can still be recovered.

Operations are the elements of system functions. Pure Base Training Center MIS application uses several operations for the system. Some of the actions that being used in the system are:

- *Display Member*

This operation will acquire data from database regarding the member information that has been store inside the database.

- *Add Member*

This operation will allow the received data being kept and stored into database based on the retrieved information.

- *Delete Member*

This operation will allow deleting purpose of the available data from database which being displayed on the lists.

- *Update Member*

This operation will allow updating purpose of the available data from database to make it up to date.

4.2 Discussions

Pure Base Training Centre always involved in various activities. For each activity, documentation needs to be done for easy reference in the future. It is also to make sure that if there are any changes or improvement made, the data will be updated. These process need to have a system which can help to manage the data information and record.

4.2.1 Current System

Based on the problem statements that have been written above, the current system that is used to manage Pure Base Training Centre information management just generates the alphanumeric reports. The system is based on manual system like filing system for recorded information. The system produce a lot of problem in term of arrangement of data, inaccurate information, slow in update information and use a lot of filing. The system can't access record in geographically and needed to refer certain people for certain information. If there were changes in term of information such as the changes of member address, it will not recorded systematically and synchronize. The redundancy will arise since every management will need to update their data. These will incurred cost for the company and affect flow organization in term of cost and redundancy.

4.2.2 Proposed System

The proposed system is a web-based MIS application for Pure Base Training Centre integrated with Semantic Web features. It is a best solution to integrate the solution for all problems above. Before implement it in web based, the data information for Pure Base Training Centre was studied, edited and converted to UML Diagram.

The system not just can be use by one branch only, but it can be use by other branch as well because they will share the data or information within the organization. The data is updated synchronize across departments. This will help to reduce the cost of maintaining information since there is no physical document to deteriorate; no losses data collection and misfiled. The redundancy or duplication can be preventing because the data is kept into centralized database and it also can be accessible through the World Wide Web. This will ensure the consistency of information across branches within Pure Base Training Centre.

4.2.3 Performance

Performance is one of the most important issues in the development of Web based MIS, because network user or internet users are usually impatient waiting for the system to respond. Performance can be measured by user response time. Response time is the amount of user perceived time between sending a request and receiving the response. It includes client processing time, network time and server processing time. The response time of each component, client, server and network also depends on the amount of workload in each component and the speed of each component as well as the user's perception.

4.2.4 Project Achievement

In principle, the system application has been developed first in a web portal part. To ensure the support of system implementation, so the development of database has been done to allow the appropriate data to be stored and access by the system. After the issue of web portal and database development have

been solved, such as database connection from web portal and certain operation to keep the record and data which placed in database. This is the strategy to accelerate of developing such application due to that development quite tough if compared to the desktop application whereby there is several issue need to be considered namely like small memory size, limited display, processing speed which is slow and whereas.

After the system testing being performed, the more confidence that the system has meet the objectives with fully assigned to shift the record case statement process and data access can be applied via online. This definitely will help the management to record or access the system effectively without perform the conventional or common existing method of procedure.

4.2.5 System Weakness

Based on the testing, evaluation, and observation that performed on the system, there is a few weaknesses that have been found. The main weakness is system uptime whereby it is quite slow to access the database. The next identified weakness is that the ability of the system only covers the human resource management within the MIS application.

4.2.6 Improvement Recommendation

Refer to the discovered weaknesses there is several recommendation that can be used to suggest in order getting the better solution for the system implementation. Uptime problem can be solved by having a high ram memory or using specific driver upon certain database to provide connection support from system application to such database. The limit of these MIS application can be cover by adding more MIS module to the system in the future.

CHAPTER 5

CONCLUSION

Based on the final prototype for Pure Base Training Centre MIS using Semantic Web, basically it has been done and completed using J2EE technology together with Semantic Web technology implementation.

In conclusion, the project has managed to fulfill its objectives. The Java technology is able to be applied and adapted to automate the Pure Base Training Centre management system. This system will provide more advantages to the organization if it can be used and implemented wholly in their working area. However, this developed system is merely a prototype and definitely the improvement must be performed to yield the actual result of real application. Hopefully, this system will become impetus to the technology shifting for Pure Base Training Centre.

REFERENCE

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T. Berners-Lee, J. Hendler, and O. Lassila, "The Semantic Web," *Scientific American*, May 2001, pp. 34–43.

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Sheila A. McIlraith, Tran Cao Son, and Honglei Zeng, Stanford University (2001) Semantic Web Services

Holzmann, G.J., and Pehrson, B. (1994). *The Early History of Data Network*. Los Alamitos, California: IEEE Computer Society Press.

D. Fensel, "The Semantic Web and Its Languages," *IEEE Intelligent Systems*, vol. 15, no. 6, Nov./Dec. 2000, p. 67–73.

P. Hayes and C. Menzel. A semantics for the knowledge interchange format. In Proc. of IJCAI 2001 Workshop on the IEEE Upper Ontology, 2001.

WEB RESOURCES

Description	URI
IBM Semantic Project	http://www.ibm.com/developerworks/
Semantic Web Challenge	http//challenge.semanticweb.org
Jena Framework	http://jena.sourceforge.net/tutorial/RDQL/index.html
Eclipse Web	http://www.eclipse.org/

APPENDIX

System Screenshot

Login Page
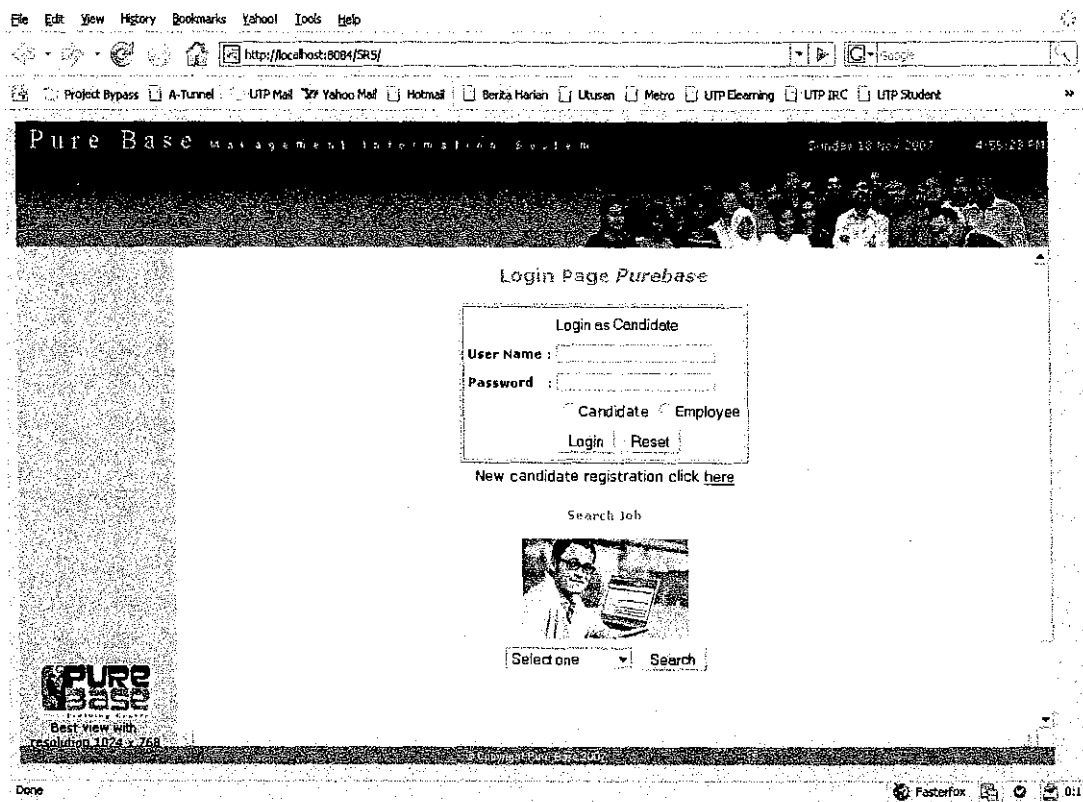
Main Page
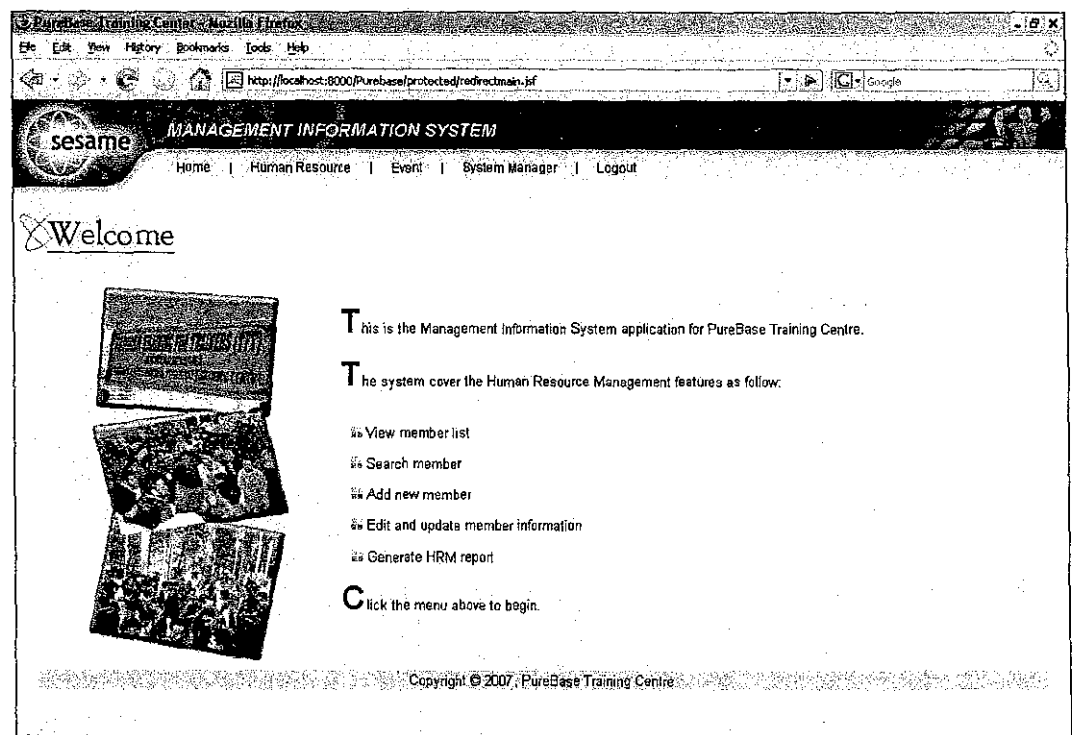
Human Resource Management

List of Member
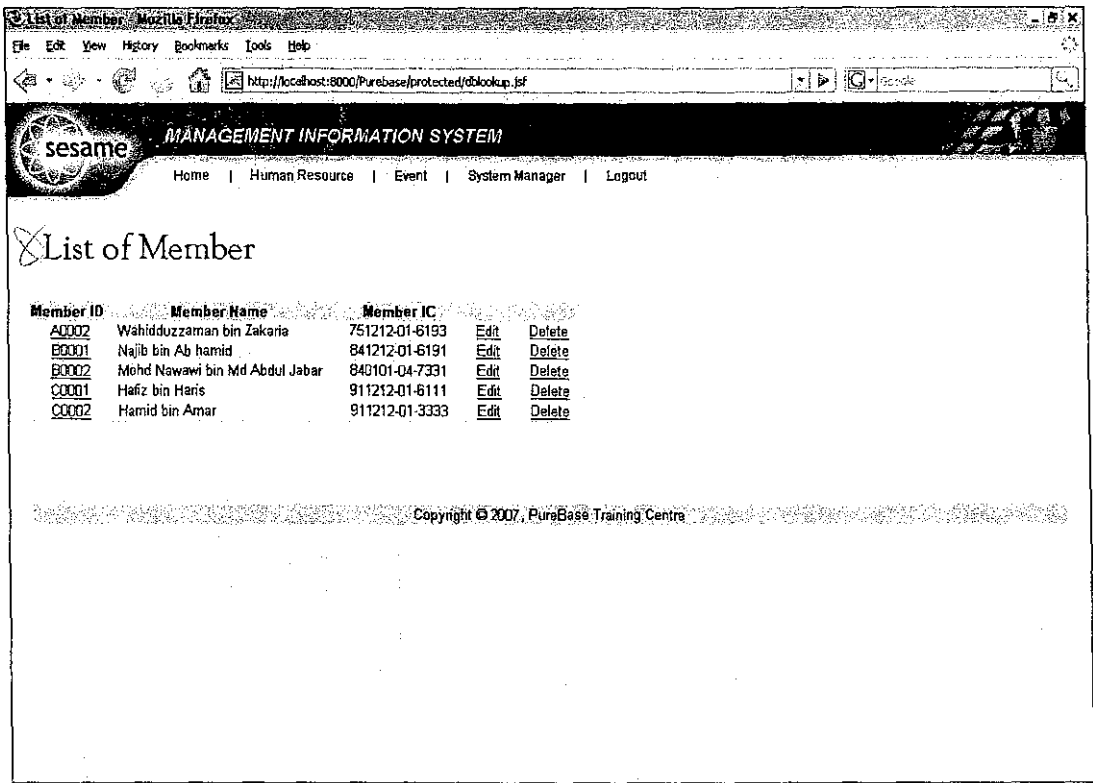
Edit Member
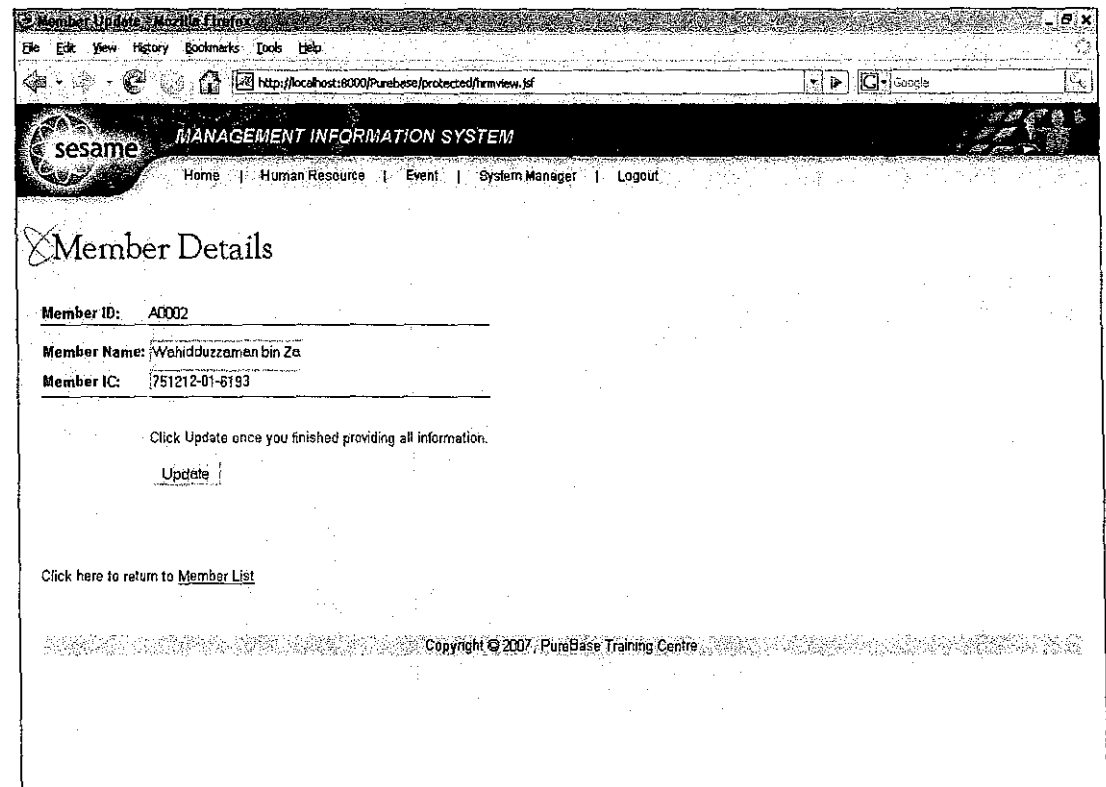
System Structure
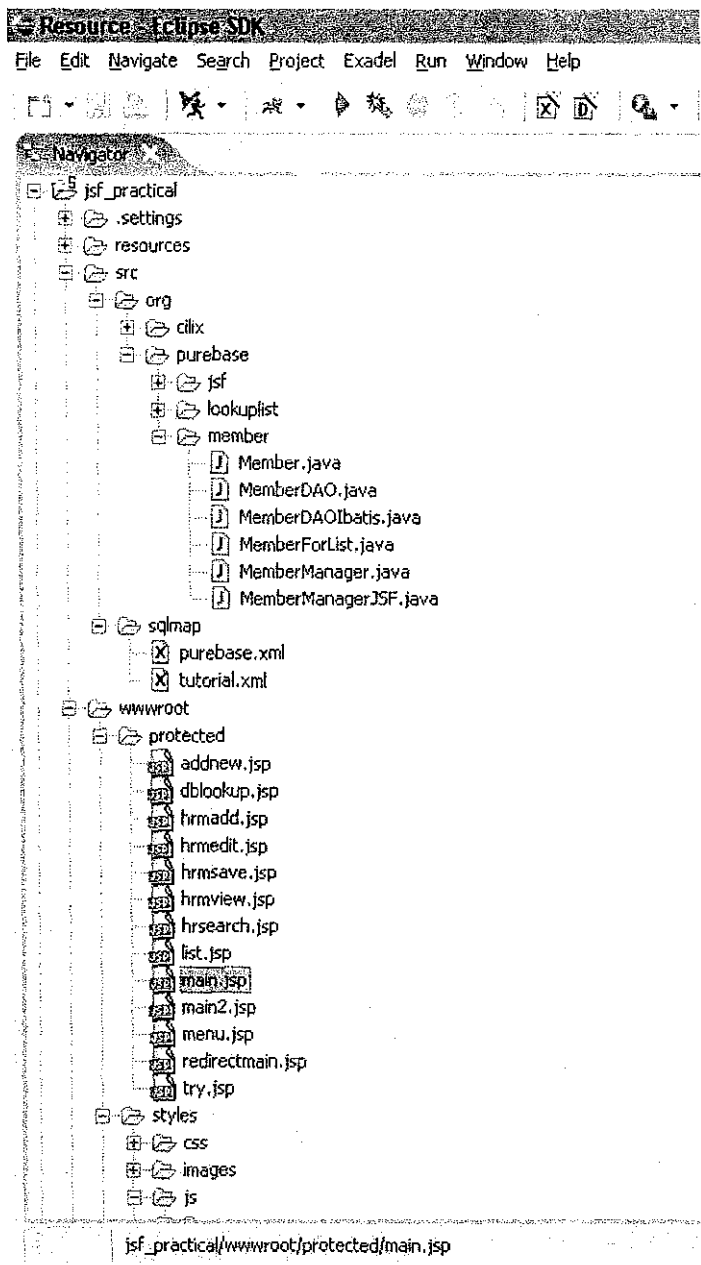
Selected Coding

Database XML

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE sqlMap PUBLIC "-//iBATIS.com//DTD SQL Map 2.0//EN"
      "http://www.ibatis.com/dtd/sql-map-2.dtd">
<sqlMap namespace="Purebase">


      <select id="selectAllMemberAsList"
            resultClass="org.purebase.member.MemberForList">
            select
            i.id as id,
            i.memberid as member_id,
            i.membername as member_name,
            i.memberic as member_ic
            from
            member i
            order by id asc
      </select>

      <select id="selectMemberById"
            parameterClass="int"
            resultClass="org.purebase.member.Member">
            select
            i.id as id,
            i.memberid as member_id,
            i.membername as member_name,
            i.memberic as member_ic
            from
            member i
            where id = #value#
      </select>

      <update id="updateMemberById"
            parameterClass="org.purebase.member.Member">
            update member
            set
            memberid = #member_id#,
            membername = #member_name#,
            memberic = #member_ic#
            where id = #id#
      </update>

      <insert id="insertMember"
            parameterClass="org.purebase.member.Member">
            insert into member
            (
            id,
            memberid,
            membername,
            memberic
            values
            (0,
            #member_id#,
            #member_name#,
            #member_ic#
            )
            </insert>
```

```
        <delete id="deleteMemberById"
            parameterClass="int">
            delete from member where id = #value#
            </delete>
</sqlMap>
```

Configuration XML

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE beans PUBLIC "-//SPRING//DTD BEAN//EN"
        "http://www.springframework.org/dtd/spring-beans.dtd">
<beans>
        <bean id="dataSource"
            class="org.springframework.jndi.JndiObjectFactoryBean"
lazy-init="true">
            <property name="jndiName">
                <value>java:/comp/env/jdbc/mainDb</value> <!-- Get
from Tomcat -->
            </property>
        </bean>
        <bean id="transactionManager"

        class="org.springframework.jdbc.datasource.DataSourceTransacti
onManager"
            lazy-init="true">
            <property name="dataSource">
                <ref local="dataSource" />
            </property>
        </bean>
        <bean id="sqlMapClient"

        class="org.springframework.orm.ibatis.SqlMapClientFactoryBean"
            lazy-init="true">
            <property name="configLocation">
                <value>/WEB-INF/sqlmap-config.xml</value>
            </property>
            <property name="dataSource">
                <ref local="dataSource" />
            </property>
        </bean>
        <bean id="sqlMapClientTemplate"

        class="org.springframework.orm.ibatis.SqlMapClientTemplate"
            lazy-init="true">
            <property name="sqlMapClient">
                <ref local="sqlMapClient" />
            </property>
        </bean>

        <bean id="txProxyTemplate"
            abstract="true"
            lazy-init="true"

        class="org.springframework.transaction.interceptor.Transaction
ProxyFactoryBean">
            <property name="transactionManager">
                <ref local="transactionManager" />
```

```xml
                </property>
                <property name="transactionAttributes">
                        <props>
                                <prop
key="select*">PROPAGATION_REQUIRED,readOnly</prop> <!-- Readonly
transaction -->
                                <prop
key="update*">PROPAGATION_REQUIRED</prop> <!-- Read, Write
transaction -->
                                <prop
key="insert*">PROPAGATION_REQUIRED</prop> <!-- Read, Write
transaction -->
                                <prop
key="delete*">PROPAGATION_REQUIRED</prop> <!-- Read, Write
transaction -->
                        </props>
                </property>
        </bean>


        <bean id="memberDAOIbatis" parent="txProxyTemplate">
                <property name="target">
                        <bean class="org.purebase.member.MemberDAOIbatis">
                                <property name="template">
                                        <ref bean="sqlMapClientTemplate" />
                                </property>
                        </bean>
                </property>
        </bean>

</beans>
```

Index.jsp

```jsp
<%@ taglib uri="http://java.sun.com/jsf/core" prefix="f"%>
<%@ taglib uri="http://java.sun.com/jsf/html" prefix="h"%>

<f:view>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-
8859-1" />
<title>Welcome to PureBase Training Centre</title>
<style type="text/css">
<!--
.style2 {font-size: x-large; font-weight: bold; font-style: italic;
font-family: Arial, Helvetica, sans-serif;}
.style5 {font-size: xx-large; color: #30B1D0; }
-->
</style>
</head>

<body>
<p> </p>
```

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```
<h:form>

<table width="100%" border="0">
  <tr>
    <td width="47%" rowspan="7" valign="top"><img
src="styles/images/pbtc.gif" alt="PBTC Logo" width="445"
height="283" /></td>
    <td> </td>
    <td colspan="2" valign="top" class="style2"><span
class="style5">M</span>anagement <span
class="style5">I</span>nformation <span class="style5">S</span>ystem
    <br><img src="styles/images/titleLine.gif" alt="" width="396"
height="31" /></td>
  </tr>
  <tr>
    <td> </td>
    <td colspan="2" valign="top"><strong><u>Login</u></strong></td>
  </tr>
  <tr>
    <td> </td>
    <td width="9%" valign="top">Username:</td>
    <td width="42%" valign="top"><h:inputText id="username" value=""
size="15" maxlength="50" required="true"/></td>
  </tr>
  <tr>
    <td width="2%"> </td>
    <td>Password:</td>
    <td><h:inputSecret id="password" value="" size="15"
maxlength="50" required="true"/></td>
  </tr>

  <tr>
    <td></td>
    <td> </td>
    <td><h:commandButton value="Login" action="login"
styleClass=""/></td>
  </tr>
  <tr>
    <td> </td>
    <td colspan="2"> </td>
  </tr>
  <tr>
    <td> </td>
    <td colspan="2"> </td>
  </tr>
</table>
<p> </p>
</h:form>

<div id="base-footer">
      <jsp:include page="footer.jsp" />
</div>
</body>
</html>

</f:view>
```

Main.jsp

```
<%@ taglib uri="http://java.sun.com/jsf/core" prefix="f"%>
```

```
<%@ taglib uri="http://java.sun.com/jsf/html" prefix="h"%>

<f:view>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<title>PureBase Training Center</title>

<style type="text/css">
<!--
.style1 {color: #0000FF}
.style3 {font-size: xx-large; color: #0000FF; font-weight: bold;
font-family: Arial, Helvetica, sans-serif;}
-->
</style>
</head>

<body>
<jsp:include page="menu.jsp" />

<h1><u>Welcome</u></h1>
<div align="left">
      <table width="100%" border="0">
            <tr>
                  <td width="30%" align="center"><img
src="../styles/images/leftpic.gif" /></td>
                  <td width="70%" valign="top">
                        <p><span class="style3">T</span>his is the
Management Information System application
                        for PureBase Training Centre.</p>
                        <p><span class="style3">T</span>he system
cover the Human Resource Management features as follow:</p>
                        <br>
                          <img
src="../styles/images/ibox.gif" /> View member list<p>
                          <img
src="../styles/images/ibox.gif" /> Search member</p>
                          <img
src="../styles/images/ibox.gif" /> Add new member<p>
                          <img
src="../styles/images/ibox.gif" /> Edit and update member
information</p>
                          <img
src="../styles/images/ibox.gif" /> Generate HRM report<br>
                        <p><span class="style3">C</span>lick the
menu above to begin.</p>
                  </td>
            </tr>
      </table>
</div>
<div id="base-footer">
      <jsp:include page="../footer.jsp" />
</div>
</body>
</html>

</f:view>
```

Display Member

```
<%@ taglib uri="http://java.sun.com/jsf/core" prefix="f"%>
<%@ taglib uri="http://java.sun.com/jsf/html" prefix="h"%>

<f:view>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
      <meta http-equiv="content-type" content="text/html;
charset=ISO-8859-1" />
      <title>List of Member</title>
      <link title="main" rel="stylesheet" href="../styles/table.css"
type="text/css" />
</head>

<body>
<jsp:include page="menu.jsp" />
      <h1>List of Member</h1>

      <h:form>
            <h:dataTable value="#{memberManager.list}" var="memb"
                  styleClass="listTable" border="0" cellpadding="0"
cellspacing="0"
                  rowClasses=",listOddRow"
                  columnClasses="montylyRental,,,,"
                  binding="#{memberManager.uiData}"
                  >
                  <h:column>
                        <f:facet name="header">
                              <h:outputText value="Member ID" />
                        </f:facet>

                        <h:commandLink
action="#{memberManager.detailFromListAction}">
                              <h:outputText
value="#{memb.member_id}" />

                        </h:commandLink>
                  </h:column>
                  <h:column>
                        <f:facet name="header">
                              <h:outputText value="Member Name" />
                        </f:facet>
                        <h:outputText value="#{memb.member_name}" />
                  </h:column>
                  <h:column>
                        <f:facet name="header">
                              <h:outputText value="Member IC" />
                        </f:facet>
                        <h:outputText value="#{memb.member_ic}" />
                  </h:column>

                  <h:column>
                        <h:commandLink value="Edit"
 action="#{memberManager.editFromListAction}" />
                  </h:column>
                  <h:column>
```

```
                              <h:commandLink value="Delete"
action="#{memberManager.deleteAction}" />
                    </h:column>

            </h:dataTable>


        </h:form>
        <p> </p><p> </p>
<div id="base-footer">
        <jsp:include page="../footer.jsp" />
</div>
</body>
</html>

</f:view>
```

Add Member

```
<%@ taglib uri="http://java.sun.com/jsf/core" prefix="f"%>
<%@ taglib uri="http://java.sun.com/jsf/html" prefix="h"%>

<f:view>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
        <meta http-equiv="content-type" content="text/html;
charset=ISO-8859-1" />
        <title>Add new member</title>
        <link title="main" rel="stylesheet" href="../styles/table.css"
type="text/css" />
</head>

<body>
<jsp:include page="menu.jsp" />
        <h1>Member - Add</h1>
        <h:form>
                <h:messages />
                <table>
                        <tbody>
                                <tr>
                                        <td class="fieldHeader">
                                                <h:outputLabel for="memberid2">
                                                        <h:outputText
value="Member ID:" />
                                                </h:outputLabel>

                                        </td>
                                        <td>
                                                <h:inputText id="memberid2"

        value="#{memberManager.selected.member_id}" />
                                        </td>
                                </tr>
                                <tr class="separator">
                                        <td class="fieldHeader">
                                                <h:outputLabel
 for="memberName2">
```

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```
                                                <h:outputText
value="Member Name:" />
                                        </h:outputLabel>

                                </td>
                                <td>
                                        <h:inputText id="memberName2"

        value="#{memberManager.selected.member_name}" required="true"
/>
                                </td>
                        </tr>
                        <tr>
                                <td class="fieldHeader">
                                        <h:outputLabel for="memberIC2">
                                                <h:outputText
value="Member IC:" />
                                        </h:outputLabel>

                                </td>
                                <td>
                                        <h:inputText id="memberIC2"

        value="#{memberManager.selected.member_ic}" />
                                        <br />


                                </td>
                        </tr>
                        <tr class="separator">
                                <td>

                                </td>
                                <td>
                                <br />
                                        <span class="hint">
                                                Click Add once you
finished providing all information.

                                        </span>
                                        <p></p>

                                        <h:commandButton value="Add"
action="#{memberManager.saveAction}" />

                                </td>
                        </tr>


                </tbody>
        </table>
        <p> </p><p> </p>
        <div>
                Click here to return to
                <h:commandLink value="Member List"
                        action="#{memberManager.populateListAction}"
 immediate="true" />
        </div>
        </h:form>
        <p> </p>
        <div id="base-footer">
```

```
            <jsp:include page="../footer.jsp" />
</div>
</body>
</html>

</f:view>
```

Edit and Update Member

```
<%@ taglib uri="http://java.sun.com/jsf/core" prefix="f"%>
<%@ taglib uri="http://java.sun.com/jsf/html" prefix="h"%>

<f:view>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
        <meta http-equiv="content-type" content="text/html;
charset=ISO-8859-1" />
        <title>Member Update</title>
        <link title="main" rel="stylesheet" href="../styles/table.css"
type="text/css" />
</head>

<body>
<jsp:include page="menu.jsp" />
        <h1>Member Details</h1>
        <h:form>
                <h:messages />
                <table>
                        <tbody>
                                <tr>
                                        <td class="fieldHeader">
                                                <h:outputLabel for="memberid">
                                                        <h:outputText
value="Member ID:" />
                                                </h:outputLabel>
                                        </td>
                                        <td>
                                                <h:outputText id="memberid"
        value="#{memberManager.selected.member_id}" />
                                        </td>
                                </tr>
                                <tr class="separator">
                                        <td class="fieldHeader">
                                                <h:outputLabel for="memberName">
                                                        <h:outputText
value="Member Name:" />
                                                </h:outputLabel>
                                        </td>
                                        <td>
                                                <h:inputText id="memberName"
        value="#{memberManager.selected.member_name}" required="true"
/>
                                        </td>
```

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```
                              </tr>
                              <tr>
                                    <td class="fieldHeader">
                                          <h:outputLabel for="memberIC">
                                                <h:outputText
value="Member IC:" />
                                          </h:outputLabel>

                                    </td>
                                    <td>
                                          <h:inputText id="memberIC"

        value="#{memberManager.selected.member_ic}" />
                                                <br />


                                    </td>
                              </tr>
                              <tr class="separator">
                                    <td>

                                    </td>
                                    <td>
                                    <br />
                                          <span class="hint">
                                                Click Update once you
finished providing all information.

                                          </span>
                                          <p></p>

                                                <h:commandButton value="Update"
action="#{memberManager.editAction}" />

                                          </td>
                              </tr>


                        </tbody>
                  </table>
                  <p> </p><p> </p>
                  <div>
                        Click here to return to
                        <h:commandLink value="Member List"
                              action="#{memberManager.populateListAction}"
immediate="true" />
                        </div>
                        </h:form>
                        <p> </p>
                        <div id="base-footer">
              <jsp:include page="../footer.jsp" />
      </div>
      </body>
      </html>

      </f:view>
```