DEVELOPING STRATEGIC REPORTS FOR NATIONAL CO-OPERATIVE OF MALAYSIA (ANGKASA) USING DATA WAREHOUSE AND DECISION TREE MODEL

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A project submitted to Dean of Awang Had Salleh Graduate School in Partial Fulfillment of the requirement for the degree Master of Science (Information Technology) Universiti Utara Malaysia

BY

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ABSTRACT

Managing an organization requires access to information in order to monitor activities and assess performance. Business Intelligence (BI) solutions provide organizations with timley, itegrated information that is crucial to the understanding of their business. Data Warehouse (DW) technology is one of the important strategic management approaches for decision making in an organizations. The BI combines architectures, tools, databases, analytical tools, and methodologies to enable the implementation of interactive information in generating analytical reports. Strategic reports, which influence the enduring way of the whole company, are typically used by top managers. These kinds of decisions are repeatedly complex and the outcomes unsure, because existing information is habitually incomplete. Managers at this point must normally depend on history experiences and their instincts when making strategic decisions. DW is a technology allows integrating and transforming enterprise data for strategic decision making. Furthermore, Decision Tree (DT) is a decision support tool that uses a tree-like graphof decisions and their possible consequences, including chance event outcomes, resource costs, and utility. The organization, which is, responsible to manage people activities need strategic decisions making. This paper will be focused how to design and develop Strategic Reports using DW and DT Model for National Co-operative Organization of Malaysia (ANGKASA) called DSRNCO, as a case study. This system has been evaluated through the system user feedback by using Computer System Usability Questionnaire (CSUQ), which measures system usability and user satisfaction.

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LIST OF ABBREVIATIONS

ANGKASA	National Co-operative Organisation of Malaysia
BI	Business Intelligence
CEDI	Cooperative and Entrepreneurship Development Institute
CoDMODS	Conceptual Design Model Using Operational Data Store
CSUQ	Computer System Usability Questionnaire
DM	Dimensional Modeling
DSS	Decision Support Systems
DW	Data Warehouse
DT	Decision Tree
DMM	Data Mining Model
ERD	Entity Relationship Diagram
ETL	Extract, Transfer And Loading
DSRNCO	Developing Strategic Reports for National Co-operative of Malaysia
GMDR	General Methodology for Design Research
KPI	Key Performance Indicator
MAKMUM	Majlis Keusahawanan Mahasiswa Universiti Malaysia
OLAP	On-Line Analytical Processing
OLTP	On-Line Transaction Processing
ReCODS	Requirement Centric Operational Data Store
SBU	Strategic Business Unit

SQL	Structured Query Language
SSAS	SQL Server Analysis Services
SSIS	SQL Server Integration Services
SSRS	SQL Server Reporting Services
RAD	Rapid Apliction Developing
UML	Unified Modeling Language
UUM	Universiti Utara Malaysia

CHAPTER ONE
INTRODUCTION

1.1 Introduction

A businessman is a person who is employed by an organization or company in a business at a managerial level, especially an executive or proprietor. The business man monitors and controls his business activities as a manager. In National Co-operative Organisation of Malaysia or Angkatan Koperasi Kebangsaan Malaysia Berhad (ANGKASA), the supporting of the businessman (ANGKASA members involved in business) has become to enhance an agenda in national policy for many countries. ANGKASA is an organization that promotes the cooperative philosophy, provides member education and advisory services and publishes co-operative literatures as well as represents the co-operative movement in national and international matters. ANGKASA is an APEX cooperative, recognized by the government as the National Co-operative Movement of Malaysia. It provides training programs to members of the cooperative in addition to providing payroll deduction services to statutory bodies, government staffs, clubs, cooperatives, unions and the Global Local Company (GLC). Senior Management and executives in ANGKASA deal with reporting figures at an overview level in contrast to an analyst in a department who deals with data at finer level of detail. Reports of this type may also require operability with charts, tabular metrics and graphs. Strategic reports may involve complex analysis, which can be resolved by a Business Intelligence (BI) system.

BI refers to applications that are able to transform data into information and then into knowledge (Golfarelliet al., 2004). The main function of BI is the ability to generate analytical reports,

which helps the management to make right decisions. BI is supports better business decision making, therefore BI systems known as Decision Support Systems (Sol etal., 1985).One of the many key technologies that can form a BI implementation is Data Warehouse (DW).

DW is a tool to provide information relative to tendency and historical analysis, and to provide information necessary to perform periodic business functions for many organization elements (Connolly &Begg, 2010). However, the major challenge of BI is how to represent knowledge uncovered during the use of advanced management technologies, and their distribution (Huang & Tseng, 2009). Figure 1.1 illustrates a typical layered view of architecture for a BI (Liya et al., 2007). In short, it is a database intended to support decision making in an organization (Chau et al., 2003; Seungjae et al., 1998). In theDW, data are taken from the operational source to be edited and then assembled into meaningful information to support making decision for analysis by the business users (Inmon, 2002; McFadden, 1996; Chau et al., 2003; Seungjae et al., 1998). Organizations consist of a hierarchy of divisions, planned at clarifying their duties and obligations, and are typically categorized into three different levels of management according to tasks and decision structure; namely strategic or analytical, tactical, and operational levels (Wolte, 1998).

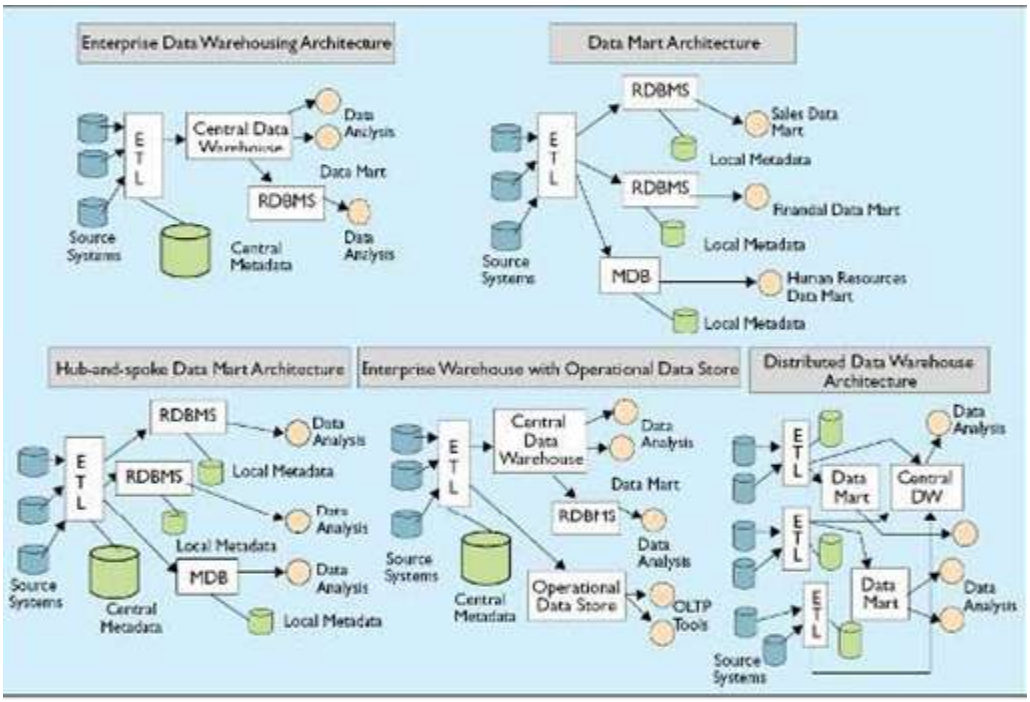


Figure 1.1: Different types of DW Architectures (Sahama & Croll, 2007)

Dimensional Modelling (DM) is the modeling techniques in DW. It is a model of entities and relations that is formed with the purpose of making optimal decision query performance in the relational databases or to the measurement of the result(s) for the business progress being modeled.

Enterprise Reporting provides BI to individuals by producing detailed information that empowers decision makers throughout the enterprise, in which it is essential within every organization and almost within every business application (Firestone, 2003). The enterprise stakeholders will specify requirements that are best carried out as operational functionality.

In addition, reports can be submitted in a variety of styles, in the forms of printed or displayed on a screen (Moeller, 2007). Currently, BI with DW has grown to be one of the most significant strategic management tools. Additionally, DW technologies in organizations can provide clear and meaningful information and can reduce working hours. In ANGKASA, the management

team needs meaningful information for decision making. Hence, this study discusses on developing a BI application for meeting their aspirations. Microsoft Business Intelligence tool consists of SQL Server Integration Services (SSIS), and SQL Server Analysis Services (SSAS) is used for the development. SSIS is a tool to extract, transfer, and loading the data from several data sources to DW (Haselden, 2006), while, SSAS is used to create the cube for data preparation and analysis (Melomed et al., 2006). Another is SSRS, which is used to create the whole BI to be accessed through the web (Lisin& Joseph, 2006).

On the other hand, the data mining algorithm is the mechanism that creates data mining models.To create a model, an algorithm is first analyzed with a set of data and looks for specific patterns and trends such as Decision Tree (DT) Model. The algorithm uses the results of this analysis to define the parameters of the mining model. These parameters are then applied across the entire data set to extract actionable patterns and detailed statistics.In relation, SSAS provides several algorithms for use in data mining solutions. These algorithms are a subset of all the algorithms that can be used for data mining. Also, third-party algorithms that comply with the OLEDB for Data Mining specification can be used (Zubcoff & Trujillo, 2007). The aim of this project is to develop Strategic Reports called DSRNCO for National Co-operative Organisation of Malaysia.

1.2 Problem Statement

ANGKASA management needs a good strategic planning and decision making tool to archive their mission. In current practice, ANGKASA does not have any analytical tools to monitor the channel of management, analysis, and monitoring user's activities. Without strategic reports, it is

exhausted and difficult to manage a team to have a right picture about the fundamental level of information with the huge number of records in the operational database. Indeed records in the operational database are not normally organized efficiently, without any sorting for specific objective analysis, and are very difficult to use in making decisions (Zhang, 2009). Ideally, good and valid enterprise reports allow companies and organizations to assist a better understanding over their business vision and mission by putting crucial facts in the hands of all their employees, managers, partners, and customers (Jorden, 2007).The major problem regarding the operational database falls in its inability of meeting up the requirements of the managers who require an intelligent analysis tool (Tong et al., 2008). Critically, the information must be correct, accurate and systematic in deriving and determining the fulfilment of organizational objectives.

The traditional approach to data analysis for decision support has been a couple domain experies with statiscal modelling techniques to develop handcrafted solutions for specific problem (Aptc C.et al., 2002). The challenge for this approach is increasing availability of large voulumes of high dimensional data occupying database tables with millions of rows and thousand of column and competitive demand for the rapid constraction and deployment data-driven analytics. Data supporting organizational activities in a meaningful way should be warehoused (ballou, 1999). However, a particular data set may support several low-level orgnanizational activities, whereas another supports only one activity but with hight priority. Moreover, it may be relatively inexpensive to clean up a data set that is seldom used, but expensive to improve the quality of a frequently used data set.

The 1990's saw remarkable developments in the field of computing and communication (Turban, 20007). This led to an exponentially growth of businesses, which had started using Internet for business more extensively. This growth in businesses resulted in huge volumes of data to be managed. The main problem with such data often distributed across the globe and when companies needed to have an overview of their sales or earnings, information gathering had to be done manually. DW gave a breakthrough in this problem as it provided companies with the kind of strategic and planning information they need. DW paved a way for many other applications to be interduced into the market. Applications like Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and BI are being used effectively in today's business word.

Many BI applications are being used in organizations, however gaps will arise especially when designs and dominant design stakeholders are remote from the context of IS implementation. Heeks (2002) describe the country context gaps can be drowning from the health information system in Philippines. There, an aid-funded project to interduce a field health information system was designed according to northern model that assumed the presence of skilled programmers, skilled project manager, a sound technological infrastructure, and a need for information outputs like those used in an American health care. In reality, none of these was present in the Philippine context and the information system failed. It showed that a system development in Information Technology (IT) should align with user's requirement.

All decisions must be made as quickly as possible based on the history and current data and through the implementation of the up-to date technologies that store.

1.3 Research Questions

Based on the problems as discussed in the previous section, this study attempts at providing answers to the following questions:

i. How to determine the requirements for developing an application that produces strategic reports in ANGKASA?

ii. How to design and develop an application that produces strategic reports by using DW and DT Model?

iii. Are the developed reports in the BI application satisfied in terms of usability from users' view?

In providing answers to the questions above, and solve the problems as discussed previously, this study has stated objectives as outlined in the following section.

1.4 Research Objectives

This study aims at providing solutions to the problems posed earlier, and providing answers to the research questions. In short, the aim is to design and develop an application that produces strategic analytical reports in ANGKASA incorporating DW model. This study proposes that the application is called Developing Strategies Reports for National Co-operatives for Malaysia (DSRNCO). To achieve the main aim, three sub-objectives are formed:

i. To determine the requirements for developing DSRNCO.

ii. To design and develop DSRNCO by using DW and DT Model.

iii. To evaluate the DSRNCO in terms of its usability.

1.5 Research Scope and Limitation

The scope of this research is to design and develop strategic reports through a BI tool in operational data at ANGKASA. Detailed information for this organization will be used to design the DM for generating strategic reports. This study focused on the functional requirement to develop a module for the top management view based on existing data provided by ANGKASA. The DSRNCO was developed using the existing BI tools in Universiti Utara Malaysia (UUM).

1.6 Significance of the Research

Generally, this study contributes significantly to the knowledge, because it provides practical study. This study builds the DM and produces analytical, tactical, and operational reports from the developed multidimensional cube. We attempt to define the BI modelling and develop the relevant DW and show how the BI system canbe developed and deployed it to find, view and analyze business information throughout the exiting database. In addition, some other significant contributions of this study are listed below:

i. To prepare the Strategic reports with short time period
ii. More reliable, quality and up to date information for ANGKASA Management.
iii. Can be a guideline for BI developer to design and develop Strategic report using DW Model in other subject domain.
iv. DSRNCO Prototype using Web Based Application allows system users to access the reports at anytime and anywhere.

1.7 Report Structure

This chapter explains some introductory background of the study, problems faced by ANGKASA, objectives, and the scope of this study. Next chapter presents some reviews on related works and concepts. Further, Chapter three outlines how the study has been carried out. The models are presented in Chapter four, while results are discussed in Chapter five. The final chapter concludes the study with some suggestions for future enhancements.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews on the background of ANGKASA, DW Model and related works with BI projects. Firstly, this chapter gives an introduction about ANGKASA, including its background and objectives, related activities and business process. Then, this section explains about the Business Intelligence components included to extract, transfer, and loading (ETL) architecture, DM, OLAP, and the differences between Online Analytical Processing (OLAP) and Online Transaction Processing (OLTP). This chapter also discussed about decision tree (DT) model, which is used to predict and analyses the data. The comparison between the operational system and informational systems is also discussed.

2.2 Background of National Co-operative Organisation of Malaysia (ANGKASA)

Angkatan Koperasi Kebangsaan Malaysia Berhad or ANGKASA is the APEX Cooperative for all types of basic cooperative, lower and upper secondary schools throughout the country, which is recognized by the Government as the body representing the Malaysian Co-operative movement nationally and internationally. ANGKASA was founded by Co-operative Movement in Malaysia through the First Co-operative Congress in 1966 and the Second Co-operative Congress in 1971. It is administered in a cooperative manner, but does not engage in business activities like other co-operatives. As an APEX for cooperatives, ANGKASA is championing

aspirations and rights of the importance of cooperative movement in the country. It is administered by a committee of 15 persons known as the National Administrative Committee, which consists of a President, three Vice-Presidents and 10 Chairman of State Liaison Committee. In addition, 15 members of the National Governance Committee, including two Government representatives, one each from the Ministry of Land and Cooperative Development and the other represent the Ministry of Finance. The objectives of ANGKASA are:

i. To integrate the co-operatives in Malaysia in order to protect and advance the rights and interests of the cooperative movement.
ii. To represent the cooperative movement at the national and international levels.
iii. To implement the cooperative education program and develop the concept and principles of co-operatives among the people.
iv. To provide a range of affordable services to assist in ANGKASA and the governance of co-operative members.

Based on the objectives, ANGKASA has huge responsibilities in developing businessmen, particularly nurturing knowledgeable businessmen, establishing consulting centers and conducting research in business areas. At the same time, ANGKASA is also involved with the development of cooperatives as well as generating revenue. Also, the management intends for activities such as training, workshop and seminar, which involve businessmen, companies and related organizations. In addition, the management of ANGKASA needs sufficient, quality, and accurate information to help them understanding their businessmen's performance and help in making decisions.

2.3 Business Intelligence (BI)

BI is a wide topic, wrapping various operations and technologies. An investigation into the literature shows numerous varying definitions of BI. These definitions are included into two classes: a technical explanation of the forming parts that provide a BI solution and a clarification of the business principle of BI (Balaceanu, 2007).A superior definition of BI that encloses both technical functionality and business purpose is the following: "*BI is an extensive category of applications and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions*" (Terzić, 2008; Venkatadri, Hanumat, &Manjunath, 2010). In fact, to evaluate the presentations of BI vendors, how good a presenting fulfills both parts of the equation must be examined (Knight & Horton, 2005).

Another definition to BI in the aspect of management level is that BI is a compilation of actions to achieve a perception and insights about a business by performing different types of analysis on company's data in addition to external data from third parties to assist performing strategic, tactical, and operational business decisions and take the required actions to improve business performance (Rainardi, 2008). BI associates information within actions in organizations. With the various definitions, people tend to get confused about where the values of BI solutions. So, the BI values are reached from promoting good decision making behaviours (Scheps, 2008).An IBM researcher, Luhn, was the first person to use the term BIin 1958 (Khan, 2009; Kress, Mostaghim & Seese, 2009).Luhn (1958) defined it as "*the capability to arrest the inter relationships of offered facts in such a way as to direct action towards a preferred goal"* (Luhn, 1958). In 1960s, it was associated with DSS (Power, 2002). DSS arose in the computer assisted

models produced to help with decision making and planning (Foulds, 1999; Hofreiter & Huemer, 2002). It is worth mentioning that BI has become an important factor of the enterprise's core qualification. It is an approach allowing an organization to describe what information is useful and relevant to its' corporate decision making (Li, Qu, Zhu, & Han, 2009).

2.4 Data Warehouse

DW combines data from multiple sources into one comprehensive and easily manipulated database. It is a BI component that enables integration of multiple databases into a single database to support decision making (McFadden, 1996; Chaudhuri et al., 2002; Simitsiset al., 2010). Familiar accesses into systems with DW include queries, analysis and reporting. Because DW creates one database in the end, the number of sources can be varying, provided that the system can handle the volume. The result, however, is homogeneous data, which can be more easily manipulated. DW is normally used by organizations to analyze trends over time. In other words, organizations might extremely use the DW to view day-to-day operations, but its main function is facilitating strategic planning resulting from long-term data overviews. From such overviews, business models, forecasts, and other reports and projections can be made. Regularly, because the data stored in DW are intended for providing more overview-like reporting, the data is read-only. If the data stored via DW is to be updated, a new query needs to be built (Yeung & Hall, 2007). In addition, DW can be updated and created to make appropriate data for analysis by business-oriented customers. By using ETL as a link among the operational heterogeneous data and the DW the collecting from different sources applications can be done (Shaikh et al., 2010).

The features of DW are subject oriented, integrated, non-volatile and time-variant as shown in Figure 2.1.

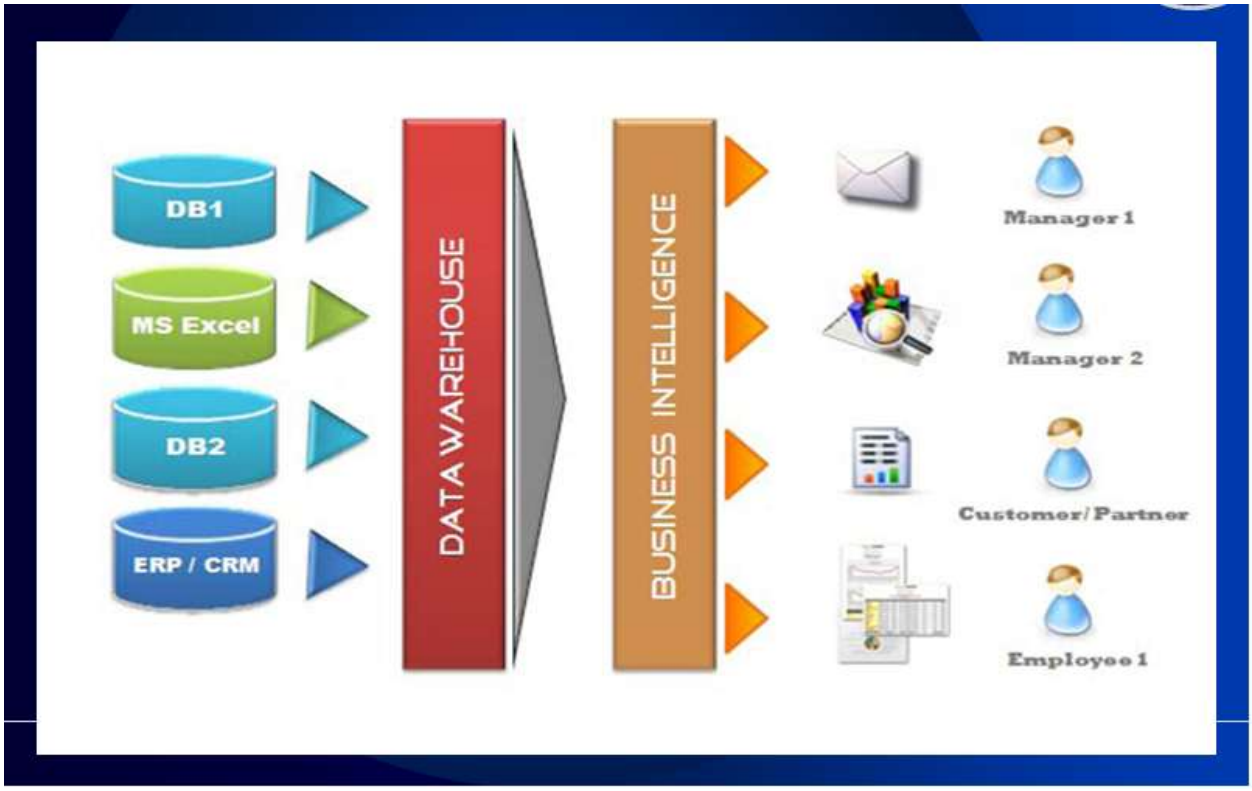


Figure 2.1: The Relationship between BI and DW

2.4.1 Extract-Transform-Load Process

The ETL process consists of three main steps, which is a procedure used to gather data and information from different sources; transforming the database requirement or business needs and load the data into other new forms of database called DW as a destination database. The need to use the ETL arises from the fact that in modern computing business data resides in multiple resources and in many incompatible formats. For example, business data might be stored on a file system in different formats (such as Word, PDF, spreadsheets, and plain text), or can be

stored as email files, or can be kept in various database servers like MS SQL Server, Oracle, and MYSQL. Handling all this information efficiently is a huge challenge and ETL plays an important role in solving this problem (Li &Xu, 2010). ETL is a process in database usage and especially in data warehousing that involves extracting data from outside sources, transforming it to fit operational needs and loading it into the end target. According to Tang et al. (2009), ETL processes areseparated into five modules consisted of data extraction, data validation, data cleaning, conversion, and load to the target destination as shown in Figure 2.2.

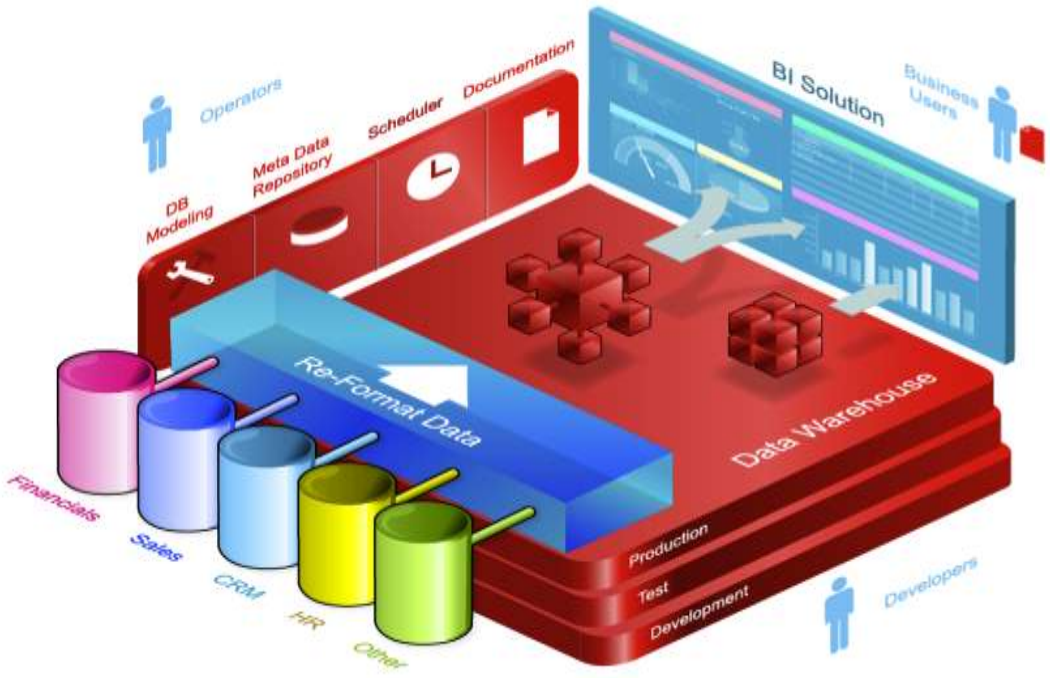


Figure 2.2: ETL Process

2.4.2 Dimensional Modeling (DM)

DM is a logical design technique that seeks to present the data in a standard, natural structure that supports high-performance and simplicity of understanding. It is inherently dimensional in

nature, and it does stay to the relational model, but with some important restrictions. As an example, DM is consisted of one central table with a multi part key, called the fact table, and a set of smaller tables called dimension tables. Each dimension table has a single-part primary key (surrogate key) column that is created with a unique identity. It corresponds exactly to one of the components of the multi part key in the fact table. The database part of a DW is characterized using a technique known as dimensionality modeling (DM) (Connolly &Begg, 2010). Kimball and Erz (1998) said that a DM is an approach of the data modeling suite for DW package information per particular business queries and procedures. This results in a characteristic structure (star schema, snow flake schema or star flake schema). The DW schema is designed based on the model of the source schema and the requirements from the users. The single table represents a transaction or differences of events that occur in a single period of time while the fact table represents the single branch in the hierarchy. In relation, Malinowski and Zimanyi (2006) said that the structure of DW is mostly described using the star schema as a logical structure that has a fact table in the core, bounded with dimension tables as shown in Figure 2.3. A fact table contains foreign keys for all dimension tables and the type of its relationship is many-to-one with dimension tables. Besides, each dimension table has a simple primary key known as a surrogate key that is agreed to one of the elements of the composite key (collection of surrogate keys) in the fact table. Working with data in DW, the star schema is used to deliver data to the end-user. Figure 2.3 depicts the relationships between fact table and dimension tables inside the star schema. The benefit of using DM is to present the data in a standard framework for use in a high performance access.

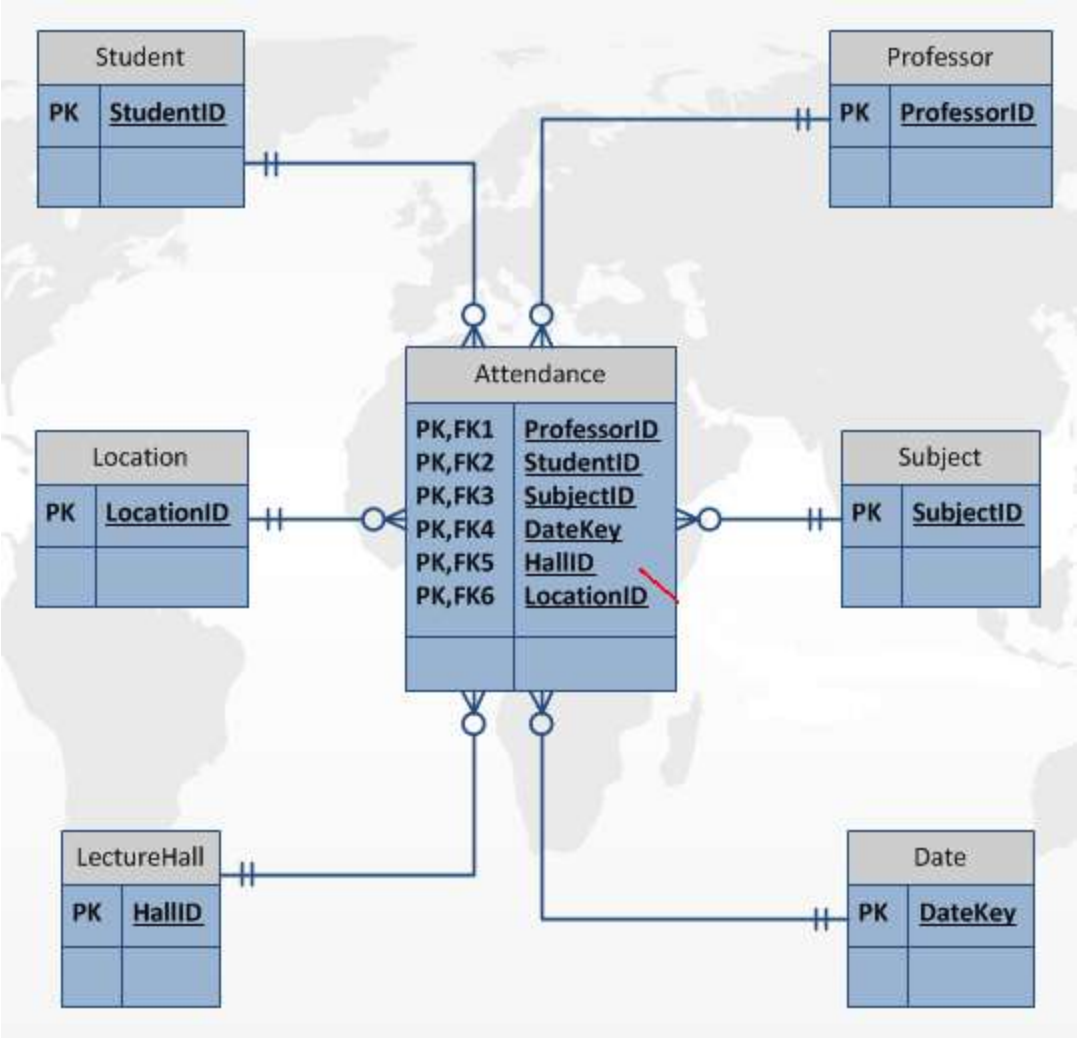


Figure 2.3: A fact and dimension tables for star schema

2.4.3 Online Analytical Processing (OLAP)

To create tactical and strategic business decisions, one of DW component called OLAP should be used as the activities that interactively analyze transactions with the data stored in the dimensional DW. Business managers, business analysts and business executive are among people who typically do the OLAP. Typically, OLAP functionalities include aggregating (totalling), drilling down (getting the details), and slicing and dicing (cutting the cube and

summing the values in the cells); which could be delivered using multidimensional database or relational database. OLAP that uses a relational database is well-known as relational online analytical processing (ROLAP) while OLAP that uses a multidimensional database is well-known as multidimensional online analytical processing (MOLAP) (Folorunso et al., 2010; Morgner, 2010). In addition, OLAP analysis capabilities provide answers to questions such as:

i. How do this month's sales for Products A and B across the city compared with sales a year ago?
ii. What causes the major differences between this month's actual and budget variance?
iii. What would be the impact over the bottom line if a new store is opened in the city?
iv. How do profitability ratios and liquidity ratios compared across entities?

2.5 Data Mining Techniques

Data mining is a multidisciplinary area in which several computing paradigms converge: such as decision tree construction, rule induction, artificial neural networks, instance-based learning, Bayesian learning, logic programming, and statistical algorithms (Romero & Ventura, 2007).It is a key member in the BI product family particularly in SQL Server 2005and 2008. It focuses on analyzing data and finding hidden patterns using automatic or semi automatic means, which can be explored for valuable information. Additionally, it is about learning the characteristics of data set, which are not possible to discover by simple seeing. There are several attempts to define the learning tasks applied to software such as: "*Learning is any process that enables a system to achieve a better performance when working on the same task*" or "*Learning consists of constructing or modifying representations of past experience*". Large volumes of data which

comes from information systems are accumulated and stored in databases. From the data, patterns could be generated and analyzed. The information found in the patterns can be used for reporting, and, most importantly, for prediction in supports of enriching knowledge.

2.5.1 Data Mining Algorithms

The data mining algorithm is the mechanism that creates a data mining model. To create a model, an algorithm is first analyzed with a set of data and looks for specific patterns and trends. The algorithm uses the results of the analysis to define the parameters of the mining model. These parameters are then applied across the entire data set to extract actionable patterns and detailed statistics. According to Zubcoff and Trujillo (2007), the mining model that an algorithm creates can take various forms, including:

i. A set of rules that describe how products are grouped together in a transaction.
ii. A decision tree that predicts whether a particular customer will buy a product.
iii. A mathematical model that forecasts sales.
iv. A set of clusters that describe how the cases in a dataset are related.

In addition, analysis services in data mining solutions include the following algorithm types:

i. Classification algorithms – predicts one or more discrete variables, based on the other attributes in the dataset. An example of a classification algorithm is the Microsoft Decision Trees Algorithm.

ii. Regression algorithms – predicts one or more continuous variables, such as profit or loss, based on other attributes in the dataset. An example of a regression algorithm is the Microsoft Time Series Algorithm.

iii. Segmentation algorithms – divides data into groups, or clusters, of items that have similar properties. An example of a segmentation algorithm is the Microsoft Clustering Algorithm.

iv. Association algorithms – finds correlations between different attributes in a dataset. The most common application of this kind of algorithm is for creating association rules, which can be used in a market basket analysis. An example of an association algorithm is the Microsoft Association Algorithm.

v. Sequence analysis algorithms – summarizes frequent sequences or episodes in data, such as a Web path flow. An example of a sequence analysis algorithm is the Microsoft Sequence Clustering Algorithm.

Choosing the best algorithm to use for a specific business task can be a challenge. While different algorithms can be used to perform the same business task, each algorithm produces different results, and some algorithms can produce more than one type of result. For example, Microsoft Decision Trees algorithm can be used not only for prediction, but also as a way to reduce the number of columns in a dataset, because the decision tree can identify columns that do not affect the final mining model.

Also algorithms can be used dependently. In a single data mining solution multiple algorithms can be used to explore data, and then use other algorithms to predict a specific outcome based on that data. For example, clustering algorithm, which recognizes patterns, to break data into groups

that are more or less homogeneous can be used, and then use the results to create a better decision tree model. Multiple algorithms within one solution can be usedto perform separate tasks, for example by using a regression tree algorithm to obtain financial forecasting information, and a rule-based algorithm to perform a market basket analysis. In relation, Table 2.1 provides suggestions for which algorithms to use for specific tasks.

Table 2.1 suggestions for which algorithms to use for specific tasks

	Task	**Microsoft algorithms to use**
1	Predicting a discrete attribute. For example, predicting whether the recipient of a targeted mailing campaign will buy a product.	Microsoft Decision Trees Algorithm Microsoft Naive Bayes Algorithm Microsoft Clustering Algorithm Microsoft Neural Network Algorithm
2	Predicting a continuous attribute. For example, forecasting next year's sales.	Microsoft Decision Trees Algorithm Microsoft Time Series Algorithm
3	Predicting a sequence. For example, performing a click stream analysis of a company's Web site.	Microsoft Sequence Clustering Algorithm
4	Finding groups of common items intransactions. For example, using market basket analysis to suggest additional products to a customer for purchase.	Microsoft Association Algorithm Microsoft Decision Trees Algorithm
5	Finding groups of similar items. For example, segmenting demographic data into groups to better understand the relationships between attributes.	Microsoft Clustering Algorithm Microsoft Sequence Clustering Algorithm

In this study Microsoft Decision Trees Algorithm is used to analyse the ANGKASA database. The statements below justify the selection:

i. It supports the use of Predictive Model Markup Language (PMML) to create mining models.

ii. It supports drill through.

iii. It supports the use of OLAP mining models and the creation of data mining dimensions.

2.5.2 Decision Trees Algorithm

The Microsoft Decision Trees algorithm is a classification and regression algorithm provided by Microsoft SSAS for use in predictive modeling of both discrete and continuous attributes. For discrete attributes, the algorithm makes predictions based on the relationships between input columns in a dataset. It uses the values, known as states, of those columns to predict the states of a column that is designated as predictable. Specifically, the algorithm identifies the input columns that are correlated with the predictable column. For example, in a scenario to predict which customers are likely to purchase a bicycle, if nine out of ten younger customers buy a bicycle, but only two out of ten older customers do so, the algorithm infers that age is a good predictor of bicycle purchase. The decision tree makes predictions based on this tendency toward a particular outcome. For continuous attributes, the algorithm uses linear regression to determine where a decision tree splits. If more than one column is set to predictable, or if the input data contains a nested table that is set to predictable, the algorithm builds a separate decision tree for each predictable column.

2.5.3 How DecisionTrees Algorithm Works

The Microsoft Decision Trees algorithm builds a data mining model by creating a series of splits in the tree. These split are represented as nodes. The algorithm adds a node to the model every time that an input column is found to be significantly correlated with the predictable column. The way that the algorithm determines a split is different depending on whether it is predicting a continuous column or a discrete column. The Microsoft Decision Trees algorithm uses feature selection to guide the selection of the most useful attributes. Feature selection is used by all Analysis Services data mining algorithms to improve performance and the quality of analysis. Feature selection is important to prevent unimportant attributes from using processor time. If too many inputs or predictable attributes are used when designing a data mining model, the model can take a very long time to process, or even run out of memory. In relation, methods used to determine whether to split the tree include industry-standard metrics for entropy and Bayesian networks.

2.5.4 Predicting Discrete Columns

The way that the Microsoft Decision Trees algorithm builds a tree for a discrete predictable column can be demonstrated by using a histogram. The following diagram shows a histogram that plots a predictable column, profit performance, against an input column, gender. The histogram shows that the gender of a person helps distinguish whether that person will gain a high profit or not. Figure 2.4 shows the Predicting Discrete Columns using Microsoft Decision Trees Algorithm.

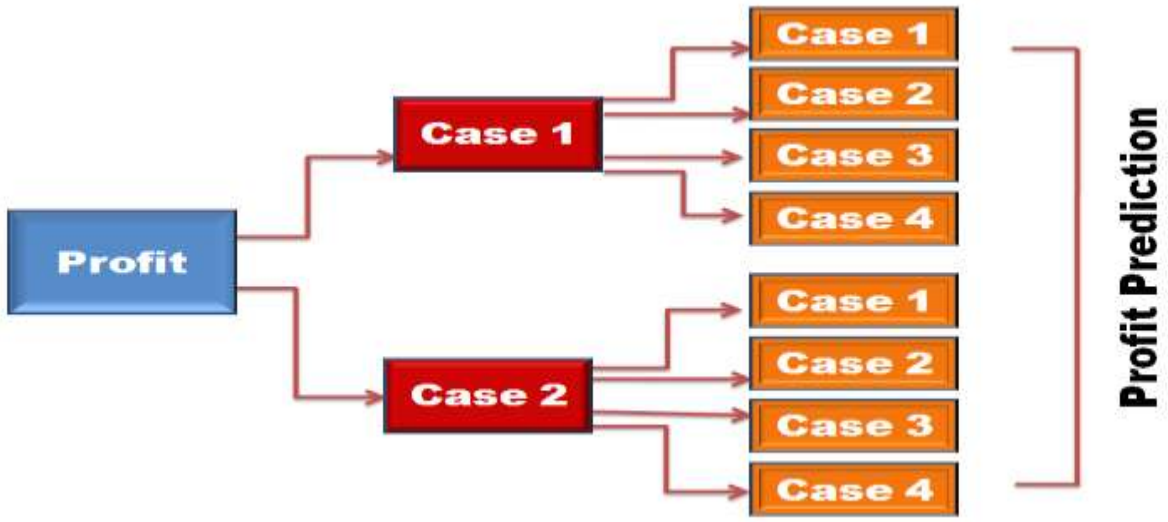


Figure 2.4: Predicting discrete columns using Microsoft Decision Trees Algorithm

2.5.5 Data Required for Decision Tree Models

When data for use in a decision tree model are prepared, the requirements for the particular algorithm should be understood, including how much data is needed, and how the data is used. The requirements for a decision tree model are as follows:

i. **Single key columns**– each model must contain one numeric or text column that uniquely identifies each record. Compound keys are not permitted.

ii. **A predictable column**– requires at least one predictable column. This model can include multiple predictable attributes in a model, and the predictable attributes can be of different types, either numeric or discrete. However, increasing the number of predictable attributes can increase processing time.

iii. **Input columns** – requires input columns, which can be discrete or continuous. Increasing the number of input attributes affects processing time.

After the model has been processed, the results are stored as a set of patterns and statistics, which can be used to explore the relationships or making predictions.

2.6 Related Research

Inmon (1996) argues that the data warehouse environment is data driven, in comparison to classical systems, which are a requirement driven, and the requirements are understood after it is populated with data and being used by the decision support analyst. He derives the data model by transferring the corporate data model into a data warehouse schema and by adding performance factors. Later, Anahory and Murray (1997) propose a catalogue for conducting user interviews in order to collect end user requirements. They state that a data warehouse is designed to support the business process rather than specific query requirements, but do not further discuss their statement. Another process driven approach is applied by Kimball (1996 and 1998), whereby the fundamental step of the design process is based on choosing a business process to model. As this approach has proven its success in various projects, and as enterprises in general have shifted to process-centered organizing, they adopt the process-oriented approach for the basis of their work: a formal requirement analysis concept for data warehousing. There are many studies about development of strategic reports by using DW Model in various sectors such as education, telecommunication, banking, transport and health.

2.6.1 DW Development for University Human Resource Management

In related research, DW project has been developed for university human resource management in University of Nanchang, China to deal with human resource information. It was regarding the management of human resources such as staff evaluation, prediction of staff employment and staff performance evaluation (Zhang, 2009). There are a lot of data sources exist in the personnel department. However, the data were lacked of effective analysis and difficult to produce information for decision support. Then, the university management decided to develop an application system using DW technology to solve the problems. It was later found that the Human resource department can easily make a decision analysis regarding staff information in the organization by using DW. Figure 2.5 depicts the process workflow in the DW project.

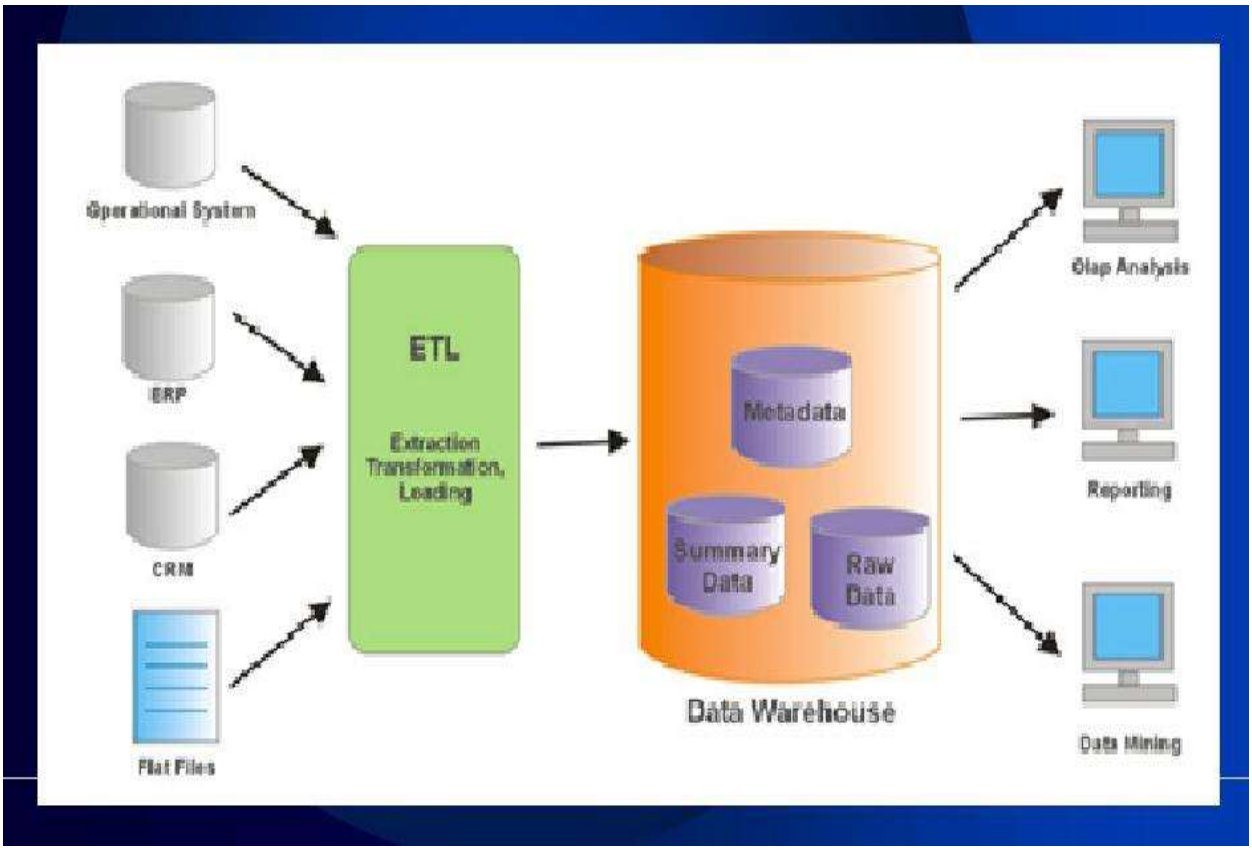


Figure 2.5: Process work flow in DW project

Several steps were involved in developing the DW in this area. IT starts with identifying the domain requirement and ends with browsing through the data set. The process and data definition are listed below:

i. Identify the domain requirement (tables, stored, and views).
ii. Identify the source of the data that will be used in which it will be from different locations or savedin the DBMS.
iii. Identify the fact and rules and the algorithm.
iv. Identify the data type with different types of variables.
v. Build data set using SQL Server.
vi. Modify the data sets.
vii. Browse the data sets.

The choice of a correct life-cycle for the DW must take into account the specificities of this kind of system that has been summarized by Giorgini et al. (2007):

i. DWs rely on operational databases that represent the sources of the data.
ii. User requirements are difficult to collect and usually change during the project.
iii. DW projects are usually huge: the average time for their construction is between 12 and 36 months and their average cost ranges from 0.5 to 10 million dollars.

In addition, Golfarelli (2009) adds that managers are demanding users who require reliable results in a time compatible with business needs.

2.6.2 DW Development at Shan Dong Branch of China Mobile

Qiang et al. (2010) describe that the DSS development using DW technology in a telecommunication company named Shan Dong China Mobile consists of an ETL, various

operational source, BI products such as an Oracle BI and others development tools. Data management in the company involves the data in channel construction and interrelated with serious problems in channel management, especially for monitoring, warning alert, and performs real time analysis.

The system was developed in a two-stage process. The first stage was the data model design and data loading. The second stage was application development that was based on the DW requirements. In the development and the presentation layer, the application is based on the DW structure, which is mainly focusing on an OLAP analysis and predefined reports. Another data analysis and presentation methods like data mining was supplemented to meet the requirements in the company, in which the architecture is illustrated in Figure 2.6.

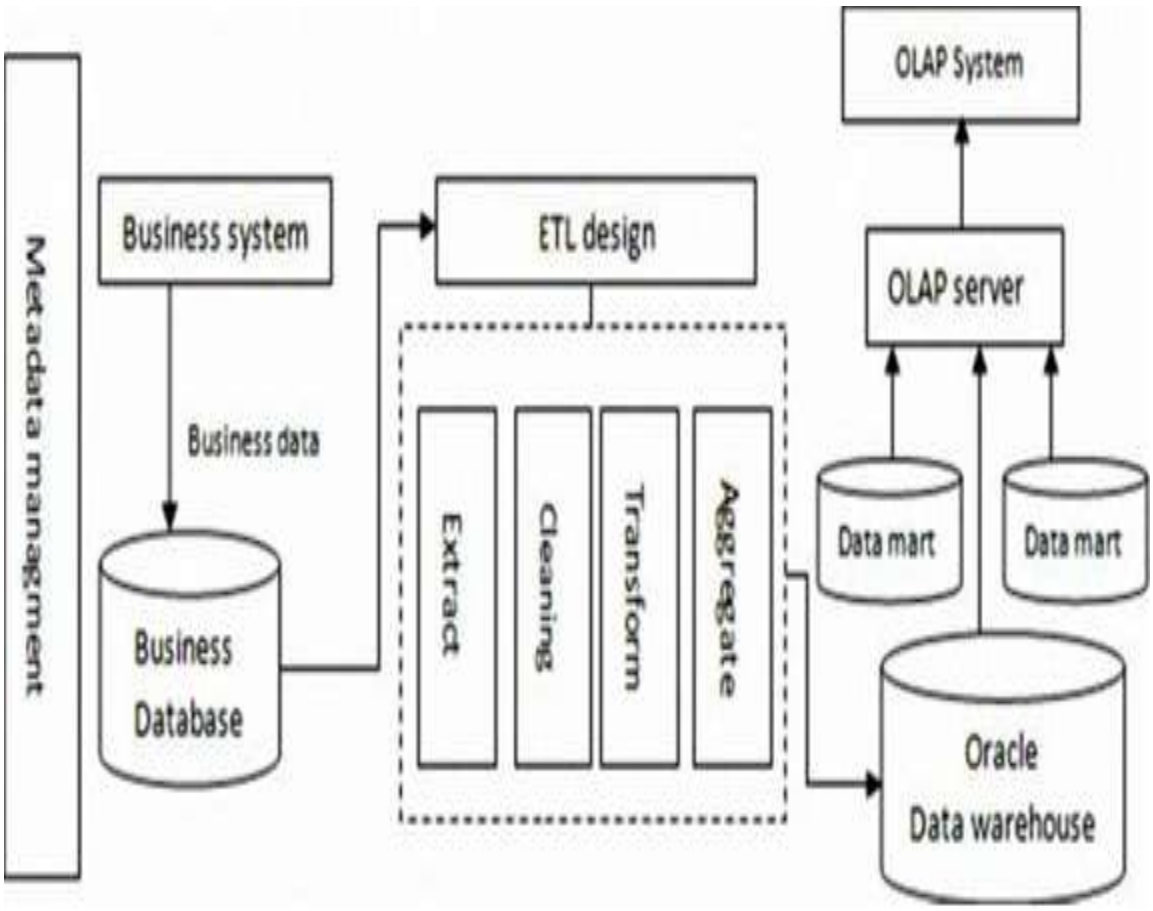


Figure 2.6: Data Warehouse Architecture

2.6.3 Ad-Hoc Association-Rule Mining within the Data Warehouse

Nestorov and Jukic (2002) describe an implementation of an extended association rules within the data warehouse. This implementation is granularity-independent as it can accommodate both transaction and non-transaction level data. The basic architecture of the system is shown in Figure 2.7.

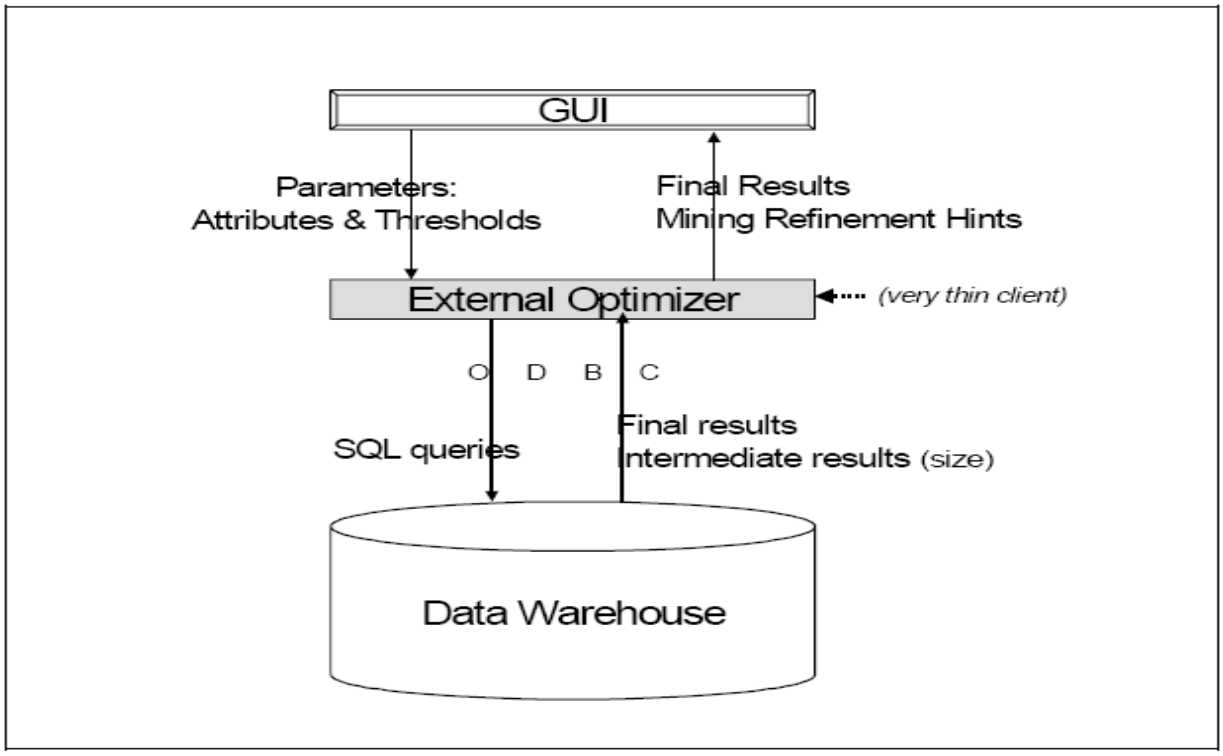


Figure 2.7: System architecture for the ad-hoc data mining system.

The most notable feature of the system architecture is the tightly coupled integration with the relational database that strengthens the data warehouse. The benefits of this integration are threefold:

i. No data leaves the data warehouse so the redundancy is reduced and any privacy, security, and confidentiality issues related to data movement are avoided.

ii. The relational database does all query processing, so the computational and storage resources of the data warehouse are laveraged.

iii. Extended association rules can be mined from any set of tables within the relational database that is storing the data warehouse, so wide-range ad-hoc mining is enabled.

2.7 Conclusion

This chapter discusses about ANGKASA and its background. Then, it explores about BI technologies, which consist of DW, ETL, Dimensional Modeling and OLAP. Furthermore, this section also discussed about data mining focused on Decision Tree model. Finally, the related research for developing strategic management report using DW model in various companies are discussed.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

Methodology is a very important part at any research or study. It is more than combining methods and techniques to accomplish a research; it is a systematic approach to solve the research problem and to achieve its objectives. It is an appropriate, systematic, and logical search for new and helpful information for the specific matter. Also it provides guidelines for requirements gathering techniques from several sources such as books, conference, scholarly, journals, articles, and experiences. In short, the research methods refer to the methods and techniques used by the researcher in conducting the research, for example, data collection technique, data processing techniques, and instruments (Shiratuddin & Hassan, 2010).

3.2 General Methodology for Design Research

This study utilizes the General Methodology for Design Research (GMDR) proposed by Vaishnavi and Kuechler (2004) as shown in Figure 3.1.

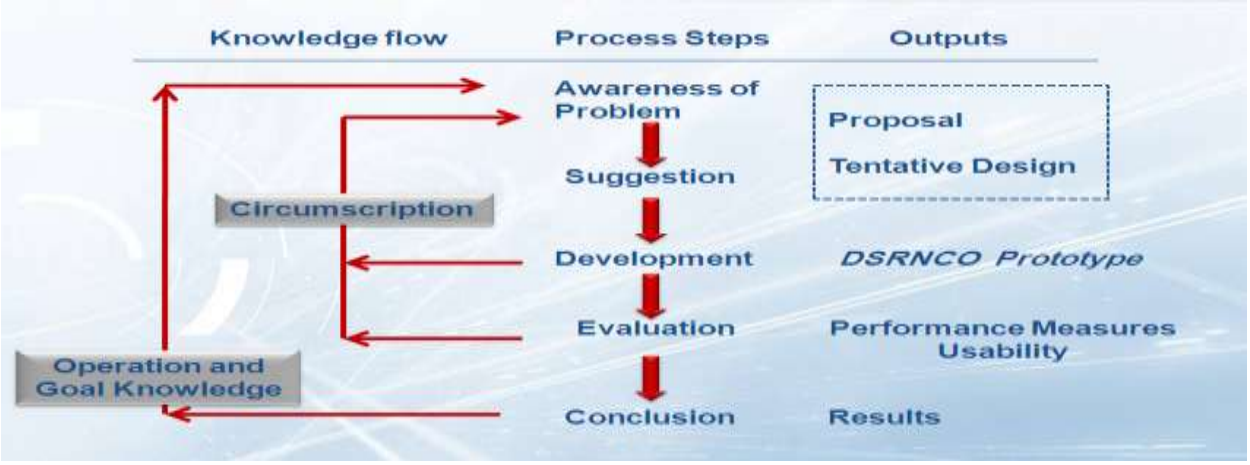


Figure 3.1: General Methodology for Design Research

In additional, Shiratuddin and Hassan (2010) mention that the GMDR consists of five important steps beginning with problem awareness, suggestion, artifact development, evaluation and ending with the artifact conclusion. For requirement management, the Conceptual Design Model Using Operational Data Store (CoDMODS) proposed by Shahbani and Shiratuddin (2011) in which the architecture is shown in Figure 3.2 is used to gather and analyst the requirements. In addition, Rapid Application Development (RAD) methodology which is proposed by Beynon-Davies et al. (1999) is also used.

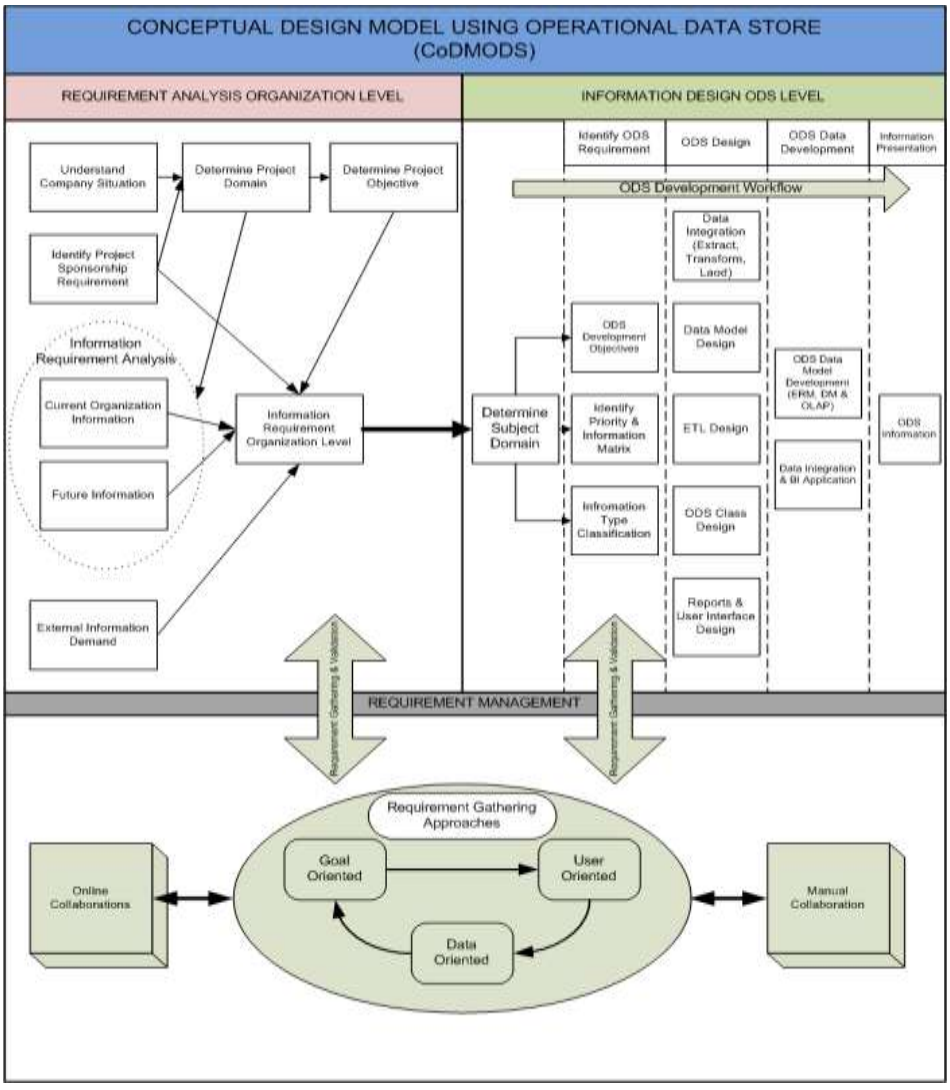


Figure 3.2: CoDMODS Architecture (Shahbani & Shiratuddin, 2011)

The combination of GMDR, CoDMODS Model, and Prototype Methodology has proposed a research framework as shown in Figure 3.3. It starts with problem awareness, which is understanding the current problems in the organization and analyzing the literature review about the related work. The output of this step is the proposal. Then, the tentative design in suggestion step is proposed to solve the existing problem. It gives creative ideas, better processes and more effective ways for the problem solution. For development step, detailed design and DSRNCO prototype incorporating the DW model is developed. An empirical study using a questionnaire is used to validate the DSRNCO in terms of its usability. A summary of the research activity is provided in Figure 3.3.

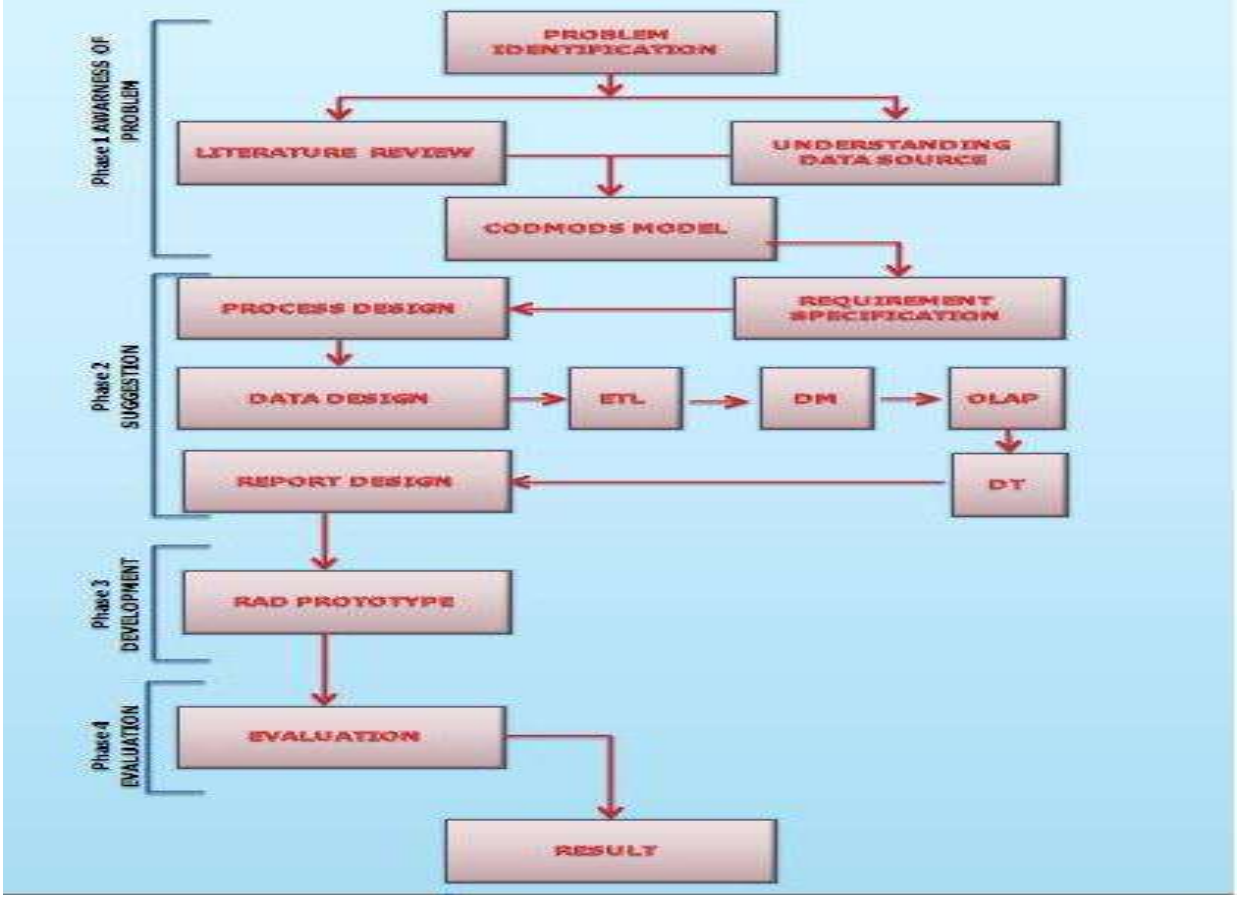


Figure 3.3: Research Framework adopted from GMDR

3.2.1 Awareness of the Problem

The first step in research methodology is awareness of the problem. It pays attention on understanding the objectives, scope, and the problem statement. Also it helps on understanding the tasks in developing the prototype using the DW model through elucidation the associated work in the literature. The result for this step is the project proposal, and it gives a clear and full view about the feature problem, especially in an analytical report in the organizations.

3.2.2 Suggestion

This phase is to understand all the DW requirements in the organization, and understand the high level design and the general tasks for developing the prototype incorporating the DW model. It is focused at reaching the required levels of quality in the analysis, and providing the top management with strategic information to make good decisions and plan properly.

3.2.3 Development

For prototype development, Rapid Application Development (RAD) methodology which is proposed by Beynon-Davies et al. (1999) is used. RAD has a number of distinct advantages over the other development models. One of the principles of RAD is to start developing as early as possible in the project so that the prototype can be modified after being evaluated. Figure 3.4 shows the iterative development cycles in RAD.

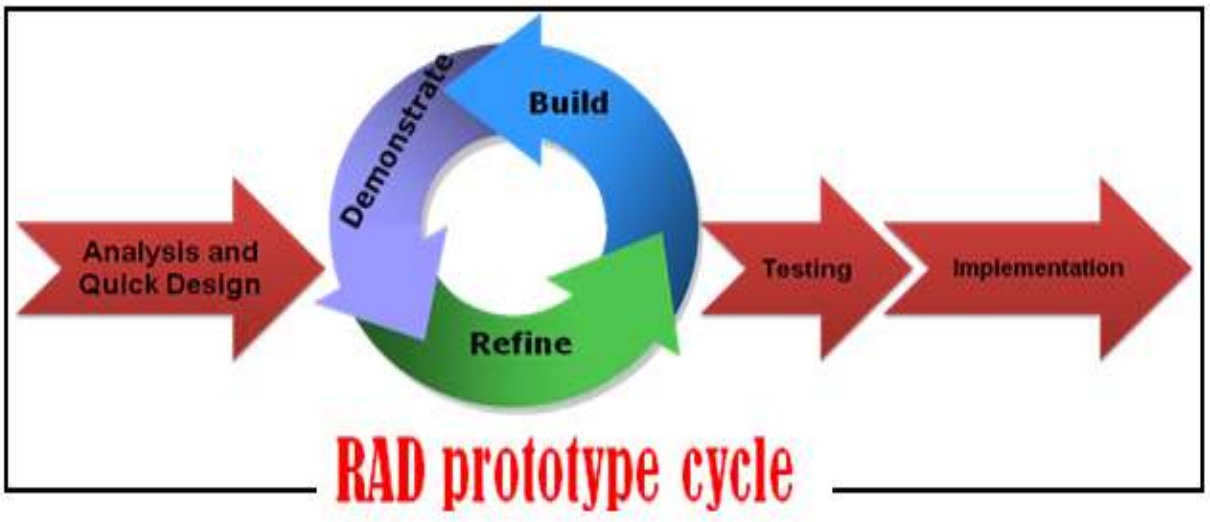


Figure 3.4: Rapid Application Development Methodologies (RAD)

The definitions of the system components determine the relationships between them. The data source (operational data) in this organization was explored using integration service tool to extract, transfer and load the data to DW. This process is done by using SSIS. Then, the SSAS tools were used to produce a cube and finally, the SSRS was used to develop analytical reports. A web-based system is good to use for viewing the reports. To develop DW process, this study uses Microsoft Visual Studio 2008, C# and ASP.NET were used for prototype development.

3.2.4 Evaluation

The Computer System Usability Questionnaires (CSUQ) proposed by Lewis (1995) was used to validate the prototype. It is the most important step of the study because it validates and verifies the research findings. Data were gathered from actual users. The evaluation results are discussed in Chapter 5.

3.2.5 Conclusion

This chapter describes the methodology of the study. GMDR and the Prototyping Methodology are combined and used. GMDR presents a general model for generating and accumulating knowledge that is helpful in understanding design disciplines and the design research process. The research process can be divided by awareness of problem, suggestion, development and evaluation. For requirements process, CoDMODS model is using to get a functional requirement especially for DW model. In conclusion, the research framework begins by identifying the problem and end with research conclusions.

CHAPTER FOUR
REQUIREMENT GATHERING, DESIGN AND PROTOTYPE DEVELOPMENT

4.1 Introduction

The chapter explains the requirement, DW design and DSRNCO development incorporating DW and DT model at ANGKASA. In order to design and develop the DSRNCO, CoDMODS Model is used as the guidelines for gathering the requirements. In CoDMODS Model, the requirement part is divided into two phases; (1) organizational level requirements and (2) operational level requirements (Shahbani & Shiratuddin, 2011). There is a requirement elicitation process which contains requirement gathering approach and community collaboration method. The requirement specifications are focused on how to design and develop strategic reports in ANGKASA to help the top management making decision. After the requirement specification is acquired, the design process comprises of use case specifications, ETL design, DM design, data mining algorithms design, interface design and report design were produced. Then, DSRNCO was developed by using Microsoft Visual Studio 2008, Microsoft Business Intelligence tools, Microsoft SQL Server 2008, database and C# running in ASP.Net. The detail description in this paragraph is summarized illustratively in Figure 4.1.

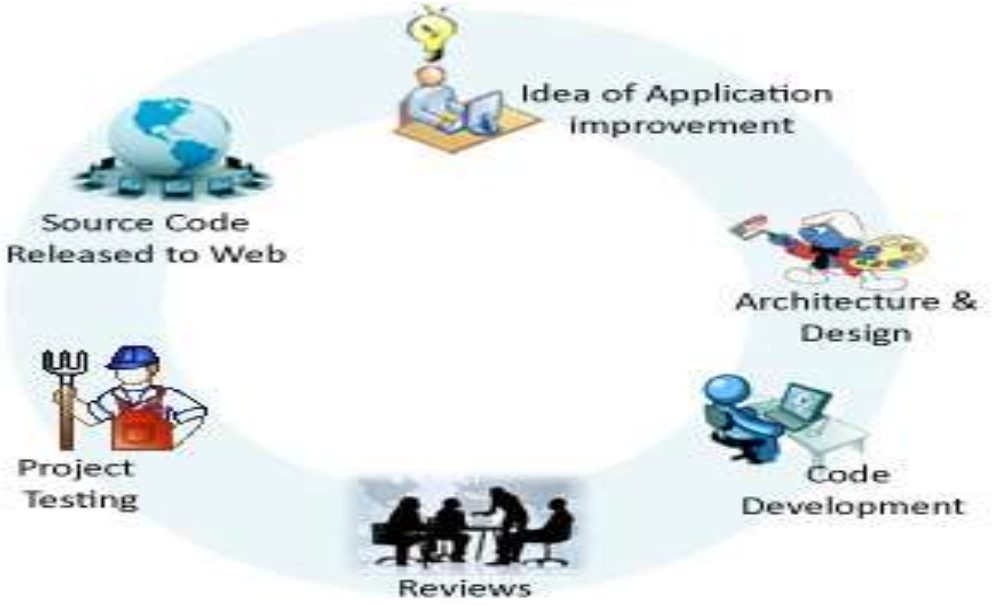


Figure 4.1: Requirements Gathering, Analysis and Specification

4.2 Requirement Specification

A requirement tells about the needs of the stakeholders who directly interact with the system. In engineering, a requirement is a particular documented need of what a particular product or service must achieve. It is most commonly used in a formal sense in systems engineering, software engineering, or enterprise engineering. In detail, it is a statement that identifies necessary attributes, capabilities, characteristics, or quality of a system in order for it to have sufficient values and utilities to users. It could also be viewed as a condition or capability that is needed by a stakeholder to solve a problem or accomplish an objective. Further, congregation requirements refer to the essential first steps when beginning a project because they are needed throughout the whole process. These requirements can be in a variety of forms including diagram, text, and working prototype. It is important to ensure each requirement is detail enough in order to obtain outputs exactly mapping stakeholder's needs.

4.2.1 Gathering Requirement Process

An important part to develop the DSRNCO is gathering requirement which refers to the fundamental activities for any project to be successful as outlined in Figure 4.2. This does not mean that all requirements must be fixed before any architecture, design, and coding is done, but it is important for the development group to realize what to be built. This requires professional abilities and knowledge in software engineering to identify incomplete, contradictory or unclear requirements. At this step expert analysis play a critical role in gathering the knowledge so that the requirements are free from incompleteness, ambiguous, or contradiction. After the detailed requiremenstare gathered, the experts analyze customer requirement and identify the technical and financial feasibility, amount of time and resources, upon which software development process specifications are written (Bruckner, List, & Schiefer, 2001).

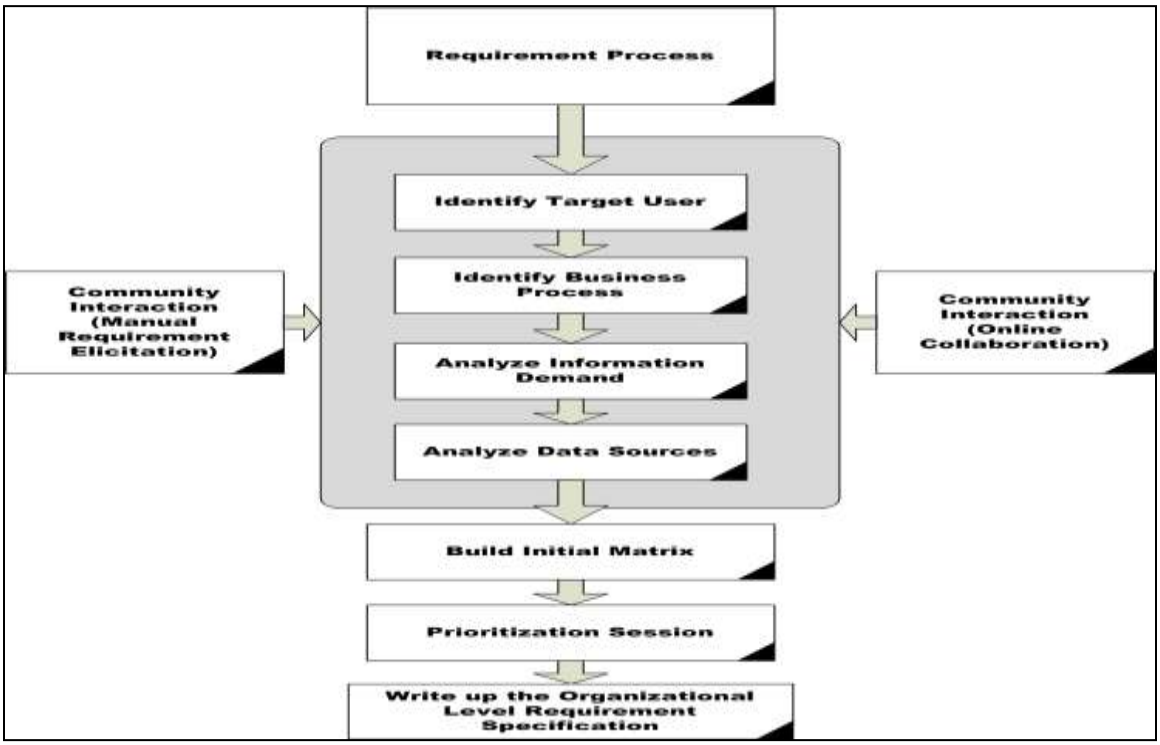


Figure 4.2: Requirement Analysis Process (Shahbani & Shiratuddin, 2009)

In this study, the requirements gathering process is conducted by the domain analysis concept. This process is divided into four components; (1) The requirement gathering methods, (2) components and subject area knowledge sources, (3) sources of subject area references and (4) the target of information requirements. Figure 4.3 shows the components of requirement gathering process for DSRNCO prototype.

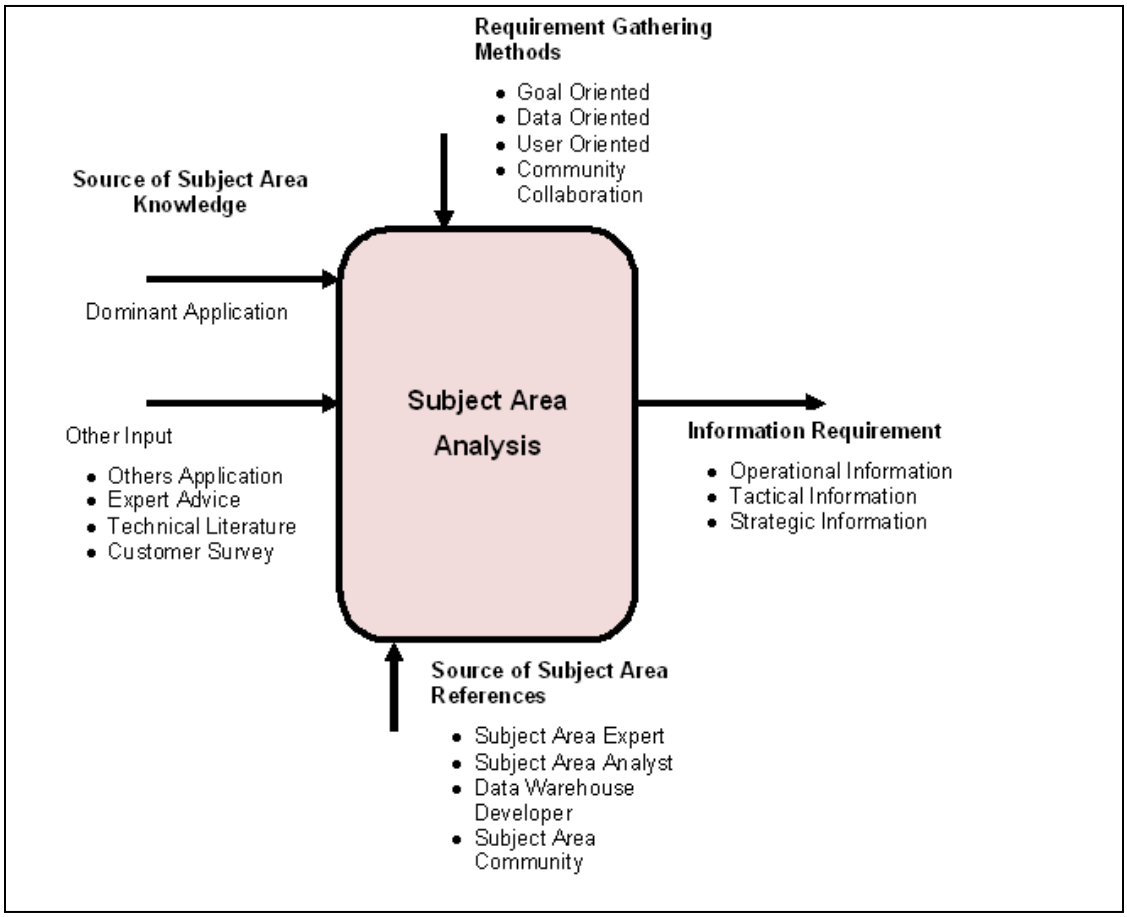


Figure 4.3: Requirement Gathering Process (Shahbani & Shiratuddin, 2009)

As stated in Chapter 1, the main aim for this study is to develop an application that produces strategic reports for businessmen in ANGKASA. Therefore, the subject area analysis has been decided to be interrelated with the ANGKASA business activities such as businessmen profiler, qualification background, business profile, training programs, profit, business type and business

performance. However, data regarding the businessmen in ANGKASA are placed in different formats in many locations; hence different DW models are needed to solve these problems. Requirement gathering process for DSRNCO was started with identifying sources of subject area knowledge, which is mainly focused on the dominant applications in ANGKASA to store all the information about businessmen. Additionally, other inputs come from other applications, expert advice, technical literature, and interaction with users. On the other hand, three requirement gathering methods involved in developing DSRNCO prototype are aim, data, and user oriented. Also, two kinds of community interaction for fact finding techniques such as manual and online collaboration are involved. After all, reports outcome by DSRNCO must meet the needs of the top management in supports of their tasks in making decision.

4.2.2 Strategic Reports Requirement

Strategic Reports Requirement is necessary for the process of discovering, analyzing, defining, and documenting the requirements that are associated with a specific business goal in ANGKASA. The process should be clearly and exactly defined relating with the scope of the strategic reports, for the use of the top management of ANGKASA in making decisions. To obtain the requirements, BI developers need to have clear and thorough understanding of the analytical reports to be developed. This is prepared after a series of comprehensive communications with ANGKASA management, users, and BI developers have been carried out. It was found that some requirements are more important than the others, and also the requirements should be prioritized. It means, identifyingmost appropriate requirements is the most critical, omit the rest. Table 4.1 lists the different report requirements after the requirement gathering process with the management team at ANGKASA. Two types of requirements include functional and non functional contain the following:

i. M: mandatory requirements (ANGKASA must do it).

ii. D: desirable requirements (ANGKASA preferably do it).

iii. O: optional requirements (ANGKASA may do it).

Table 4.1: Strategic Report Requirements

No	Requirement	Priority
1	Profit performance based on Race and Gender	High
2	Percentage of profit categorized by Race	High
3	Profit performance categorized by Business Category	High
4	Profit performance Based on Business Location (State)	High
5	Profit performance besed on Business Type	High
6	Detail Analysis for profit prediction by using gender and race parameter	High

4.2.3 Functional Requirements

The official definition for a functional requirement specifies what the DSRNCO should do "*A requirement specifies a function that a system or component must be capable to achieve*".In other words, functional requirements specify specific behaviours or functions of DSRNCO. Hence, the typical functional requirements include:

i. Business rules.

ii. Transaction corrections, adjustments, cancellations.

iii. Administrative functions.

iv. Authentication.

v. Authorization –functions user is delegated to perform.

vi. Audit tracking.

vii. External interfaces.

viii. Certification requirements.

ix. Reporting requirements.

x. Historical data.

xi. Legal or regulatory requirements.

The example of functional requirement for DSRNCO shows in Table 4.2. This table for functional requirements contains number of requirement, requirement description and requirement priority.

Table 4.2: Functional requirements of DSRNCO

No	Requirement ID	Requirement Description	Priority
No	DSRNCO_01	Login	Priority
1	DSRNCO_01_01	Admin must login to enter into the system.	M
2	DSRNCO_01_02	(Manager and Staff) must login to enter into the system.	M
3	DSRNCO_01_03	Users must enter the user name and password; otherwise the system will not resume, but show an error message.	M
	DSRNCO_02	Register Member	Priority
4	DSRNCO_02_01	Admin can add new members (include all member details).	M
5	DSRNCO_02_02	Admin can delete members (include all member details).	M
6	DSRNCO_02_03	Admin can update member profiles.	M
	DSRNCO_03	View Report	Priority
7	DSRNCO_03_01	Manager can view reports.	M
	DSRNCO_04	Show Report	Priority
8	DSRNCO_04_01	Manager can view reports.	M

4.2.4 Non-Functional Requirements

Non-functional requirements are declarations of how DSRNCO must be having and it is a restraint upon the system's behaviour.They specifies all the remaining requirements not enclosed by the functional requirements. Also, they specify the criteria that judge the DSRNCO, rather than specific behaviours.Typical non-functional requirements are response time throughput utilization, volumetric, scalability, capacity, and availability, in which the detailed non-functional requirements of DSRNCO Table 4.3.

Table 4.3: The non-functional requirements of DSRNCO

No	Requirement ID	Requirement Description	Priority
	DSRNCO_05	Usability issues	
9	DSRNCO_05_01	The system interface must be usable.	M
	DSRNCO_06	Understandability	
10	DSRNCO_06_01	The system must be trouble-free to understand. The system is able to display all figures and charts and is able to print. Actors can display report and graphs.	D
	DSRNCO_07	Availability	
11	DSRNCO_07_01	The system is accessible by the users at any time, any place during workday.	O
	DSRNCO_08	Security issues	
12	DSRNCO_08_01	Only administrator will be able to enter into the system for maintenance.	M
	DSRNCO_09	Performance	
13	DSRNCO_09_01	The system must have a high speed processing for data manipulation and reply upon user requests.	M
	DSRNCO_10	Reliability issues	
14	DSRNCO_10_01	If the system is crashed, it should behave perfectly normal when it reloads again.	M
15	DSRNCO_10_02	If the system is crashed, it should take less than 15 minutes to recover.	M
16	DSRNCO_10_03	If the system is crashed, it should not be more than once in every 24 hours.	M

4.3 System Design

System design is the activity of proceeding from an identified set of requirements for a system to a design that meets those requirements. A distinction is sometimes drawn between high-level, which is concerned with the main components of the system and their roles and inter relationships, and detailed design, which is concerned with the internal structure and operation of individual components. For system design focused on process design, Unified Modeling Language (UML) is used to design a system. It's consisted of Use Case Diagram, Use Case Specification, Activity Diagram and Sequence Diagram.

4.3.1 Process design

A use case illustrates a unit of functionality provided by the system. The main purpose of the use-case diagram is to help the development team visualizing the functional requirements of the system, including the relationship between the "actors" (human beings who will interact with the system) with essential processes, as well as the relationships among different use cases.

4.3.1.1 Use-case diagrams

Use-case diagrams generally depict groups of use cases — either all use cases for the complete system, or a breakout of a particular group of use cases with related functionalities in Unified Modeling Language (UML). This scenario based technique can assist to walk through the whole system or process, step by step, as a user. It helps to recognize how the system or service would

work. In this study, the requirements of DSRNCO need multiple use cases to understand itsall functionalities, in which the illustrative view is provided in Figure 4.4.

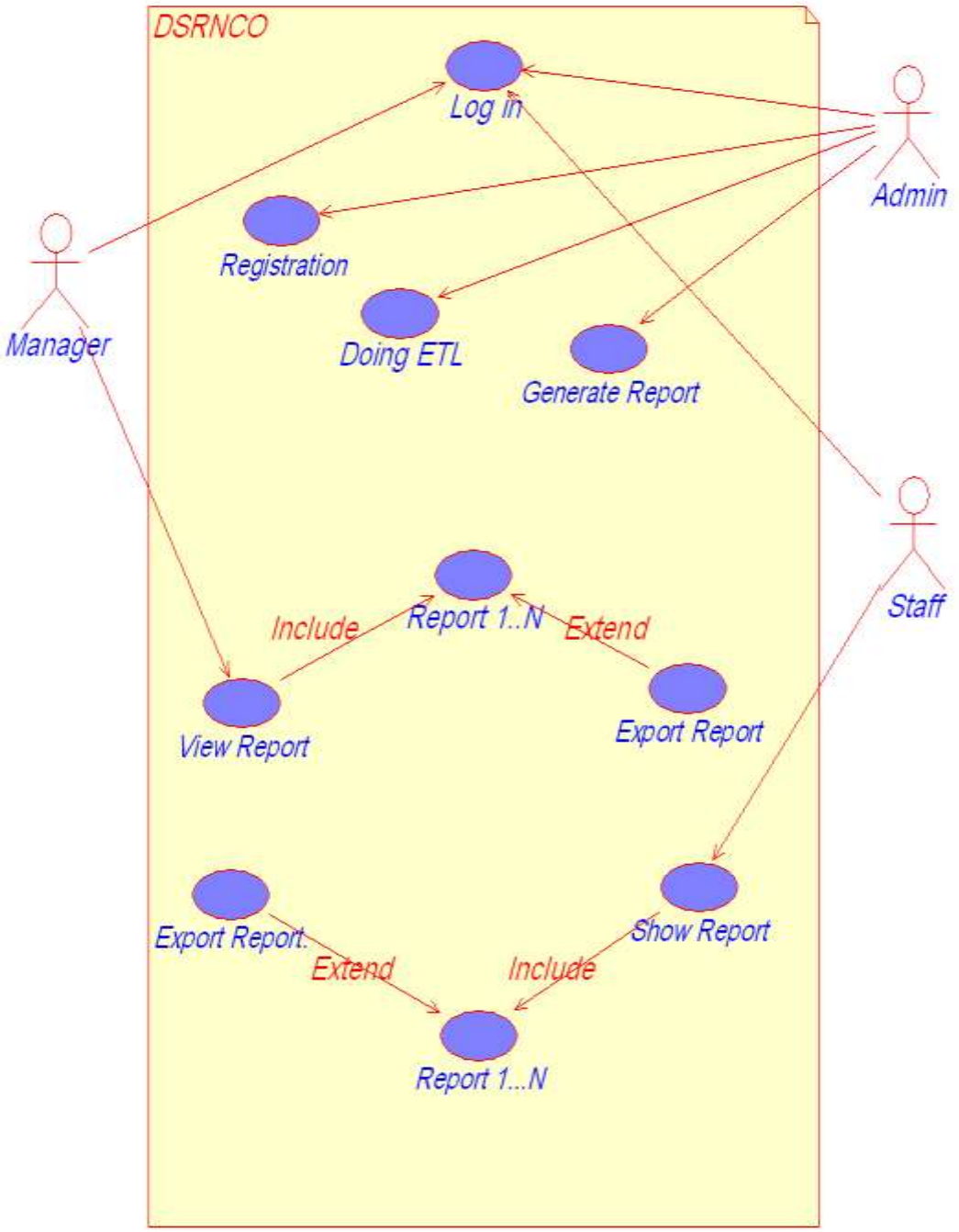


Figure 4.2: Use Case Diagram for DSRNCO

4.3.1.2 Use Case Specification

This use case describes how users use the DSRNCO for obtaining a specific result of value. This section illustrates the tasks for each use case in use case diagram and how the user interacts with the DSRNCO and does hi / her activities.

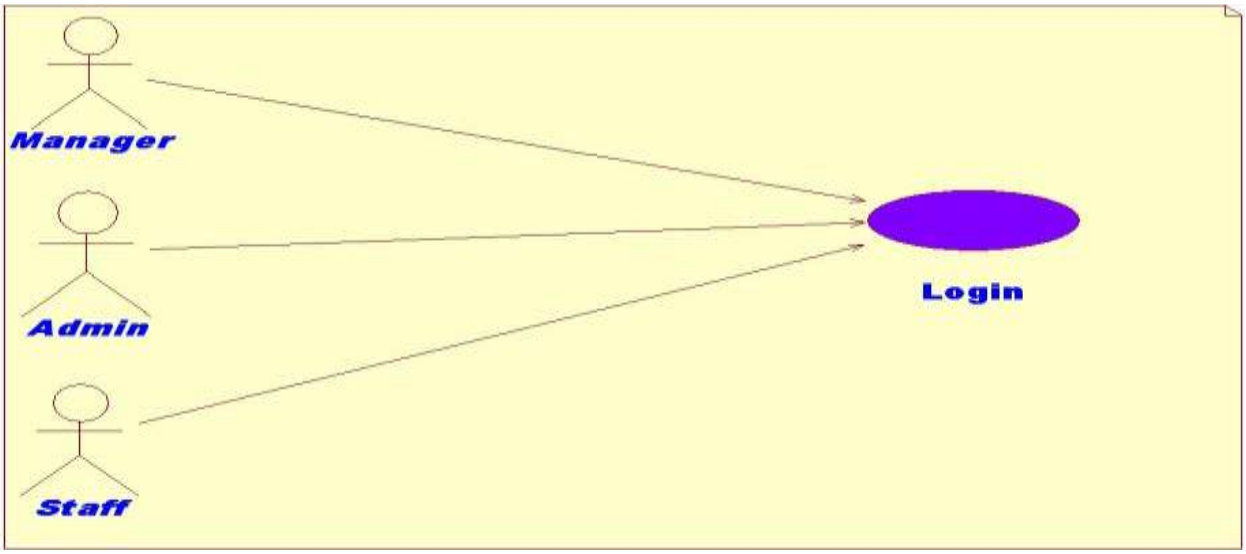
The actors for this use case can be defined as:

i. Manager – Refers to ANGKASA director.

ii. Admin – Refers to the administrator of DSRNCO.

iii. Staff – Refers to the clerk, data entry staff, and operational staff.

4.3.1.2.1 Use case: Log in Member:



- **Brief Description**

  This use case is initiated by the administrators, managers and end users. This use case enables users who have correct username and password to login into DSRNCO.

- **Pre-conditions**

The managers should enter the user name and password, and then press the ‘enter’ button.

- **Characteristic of activation**

The manager demand execution.

- **Flow Of Events**

  a. **Basic Flow**

  The managers view the main page.

  b. **Alternative Flow**

  Not applicable

  c. **Exceptional Flow**

  E1. The system shows error messages if the managers enter the wrong user name and / or password.

- **Post-Conditions**

View the system main page.

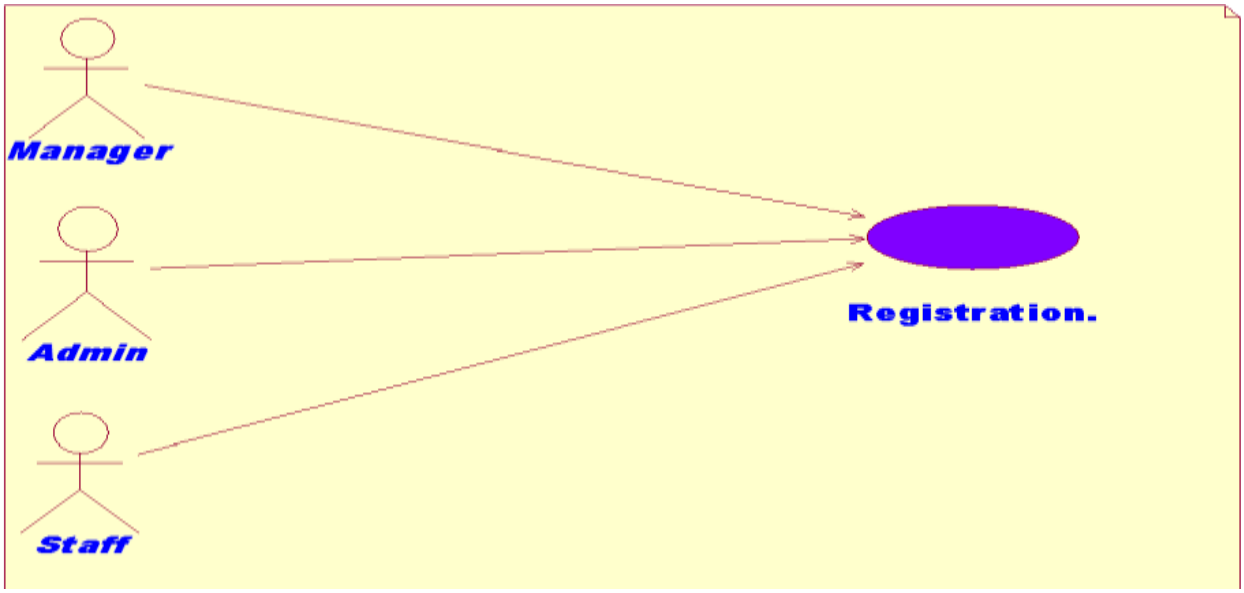
- **Rule(S)**

Not applicable.

- **Constraint(S)**

Not applicable.

4.3.1.2.2 Use Case: Register Member:



- **Brief Description**

This use case is initiated by the administrator to register new members into DSRNCO. This use case enables managers to add new members, delete the existing member, and edit member profiles.

- **Pre-conditions**

Not Applicable

- **Characteristic of activation**

Manager demand execution

- **Flow Of Events**
  - **i. Basic flow**
    a) This use case begins when the manager presses the “Register Member” button.
    b) The system will retrieve all available members’ information.
    c) The system will display all members in “Register Member” page.

d) The manager will press the “Add” button [A-1: Delete] [A-2: Update].

e) The system will display the Add form.

f) The manager will fill in all appropriate information.

g) The manager will press the “Save” button. [A-3: Cancel].

h) The system will retrieve all information about the member.

i) The system will verify if there is any member duplication.

j) The system will update the database.

k) The system will save the new member information.

l) The system will display”The data has been saved “message.

ii. Alternative flow

[A-1: Delete]

a) The manager will select a specific member from the list.
b) The manager will press the “Delete” button.
c) The system will display “Are you sure?” message.
d) The manager will press the “OK” button [A3: Cancel].
e) The system will delete all records of the specified member.
f) The system will update the database.
g) The system will display “The member has been deleted”message.

[A-2: Update]

a) The manager will select a specific member from the list.
b) The manager will press the “Update” button.
c) The system will display the Update form.
d) The manager will edit the member’s information.
e) The manager will press the “Update” button. [A3: Cancel].
f) The system will edit and update the database.
g) The system will show “Member profile has been updated”massage.

[A-3: Cancel]

a) The manager will press the “Cancel” button.

b) The system will stop the process.

c) The system will return back to Register Member page.

iii. Exceptional flow

Not applicable

- **Post-conditions**

The system will update the database.

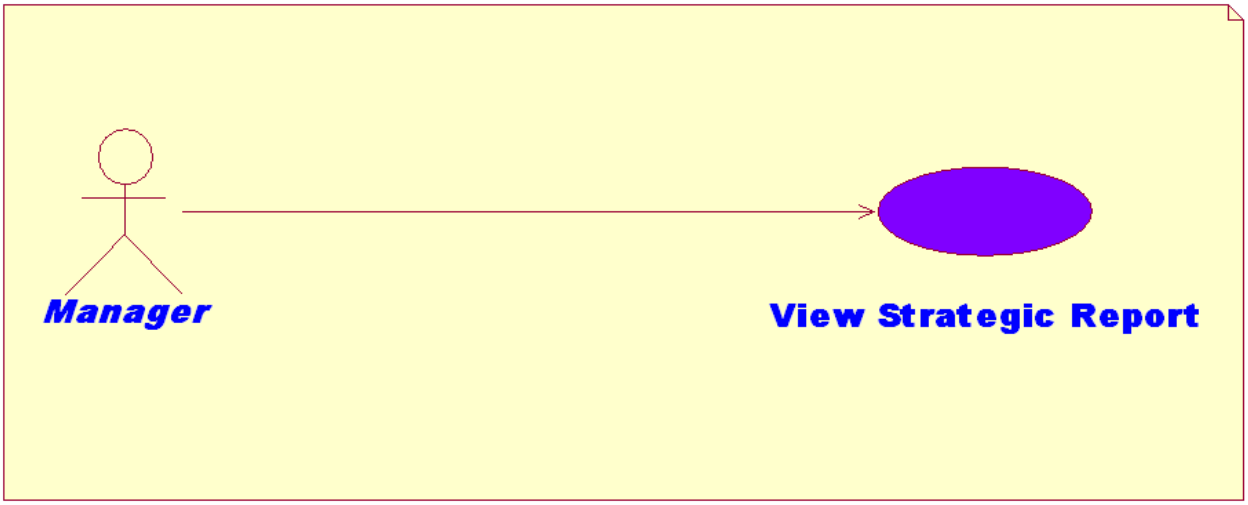
- **Rule(S)**

Not applicable

- **Constraint(S)**

Not applicable

4.3.1.2.3 Use case: View Strategic Report



- **Brief description**

This use case is initiated by the managers who are allowed to view the particular strategic report.

- **Pre-conditions**

Not applicable.

- **Characteristic of activation**

Managers demand

- **Flow of events**

  i. **Basic Flow**

  The managers view the main page.

  ii. **Alternative Flow**

  Not applicable

  iii. **Exceptional Flow**

  Not applicable

- **Post-Conditions**

  Not applicable

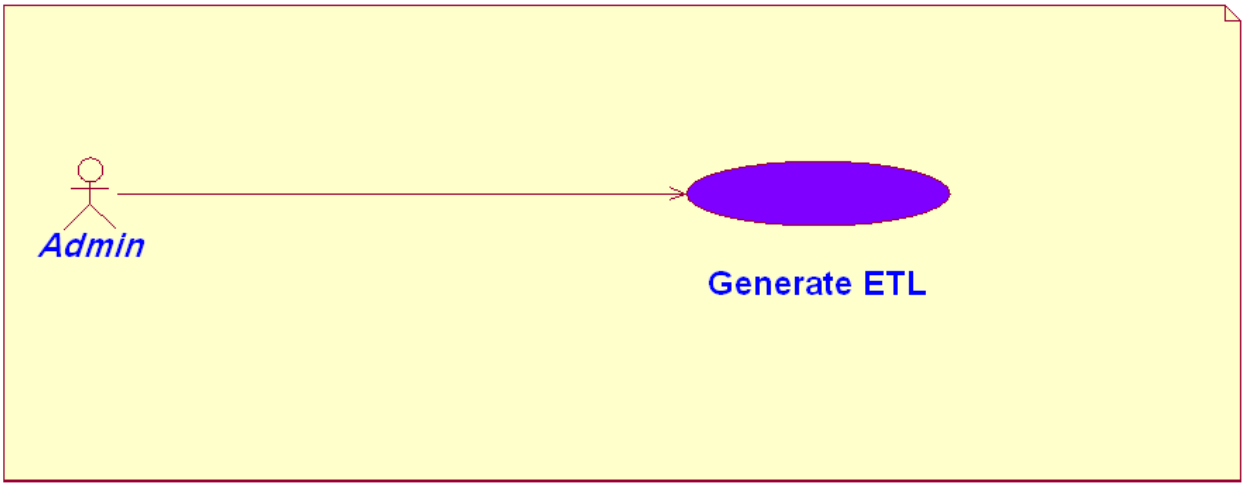
- **Rule(S)**

  Not applicable

- **Constraint(S)**

  Not applicable

4.3.1.2.4 Use case: Generate ETL



- **Brief description**

This use case is initiated by the DBMS to enable the ETL for reporting in DSRNCO.

- **Pre-conditions**

Data sources are available.

- **Characteristic of activation**

System demands.

- **Flow of events**

i. **Basic Flow**

The system extracts, transforms and loads data from the data source to the data target.

ii. **Alternative Flow**

Not applicable

iii. **Exceptional Flow**

Fail ignored

- **Post-conditions**

Updating the data ini DW tables for first time generation based on yearly/monthly basis.

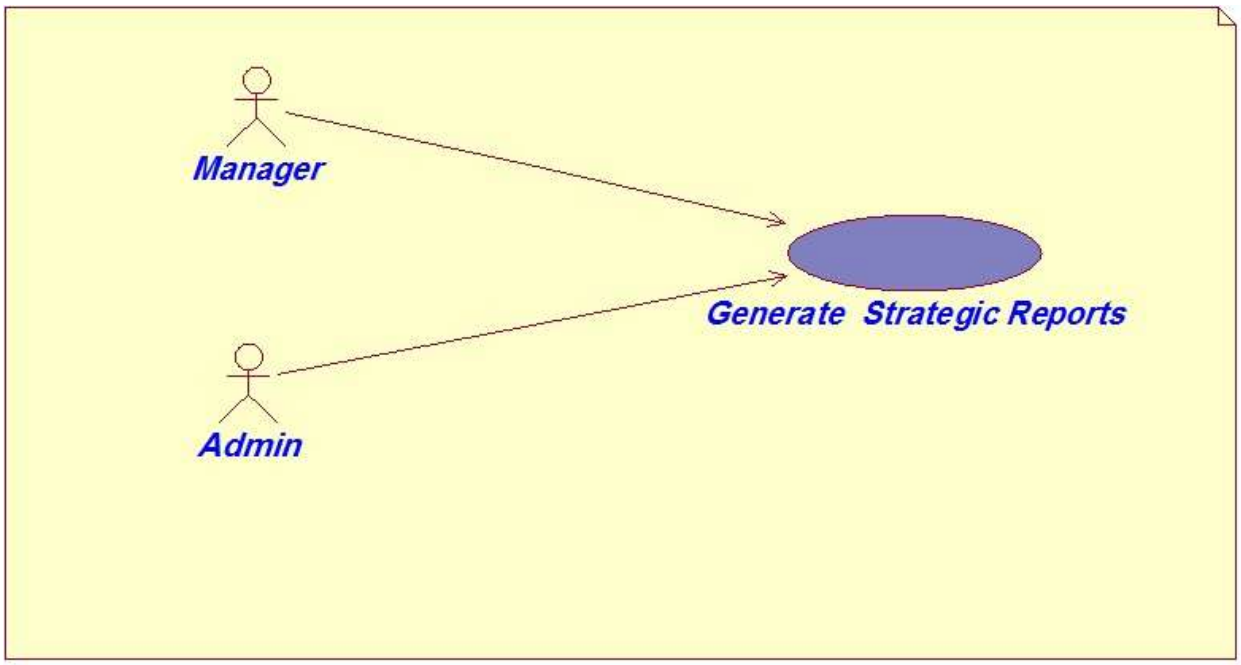
- **Rule(S)**

Not applicable

- **Constraint(S)**

Not applicable

4.3.1.2.5 Use case Generate Strategic Report (1 to n reports)



- **Brief description**

This use case is initiated by the managers who are allowed to generate particular strategic reports.

- **Pre-conditions**

Not applicable.

- **Characteristic of activation**

Managers demand.

- **Flow of events**

i. Basic Flow

The manager views the main page.

ii. Alternative Flow

Not applicable

iii. Exceptional Flow

Not applicable

- **Post-Conditions**

  Not applicable

- **Rule(S)**

  Not applicable

- **Constraint(S)**

  Not applicable

4.3.1.3 Activity Diagram

Activity diagrams are dynamic diagrams that show the activities and the events that cause certain objects to be in any particular state. They represent the business and operational workflows of DSRNCO. In this study, the examples of the activity diagrams are login, register member, view report, and show report as shown in Figure 4.4, Figure 4.5, Figure 4.6, and Figure 4.7.

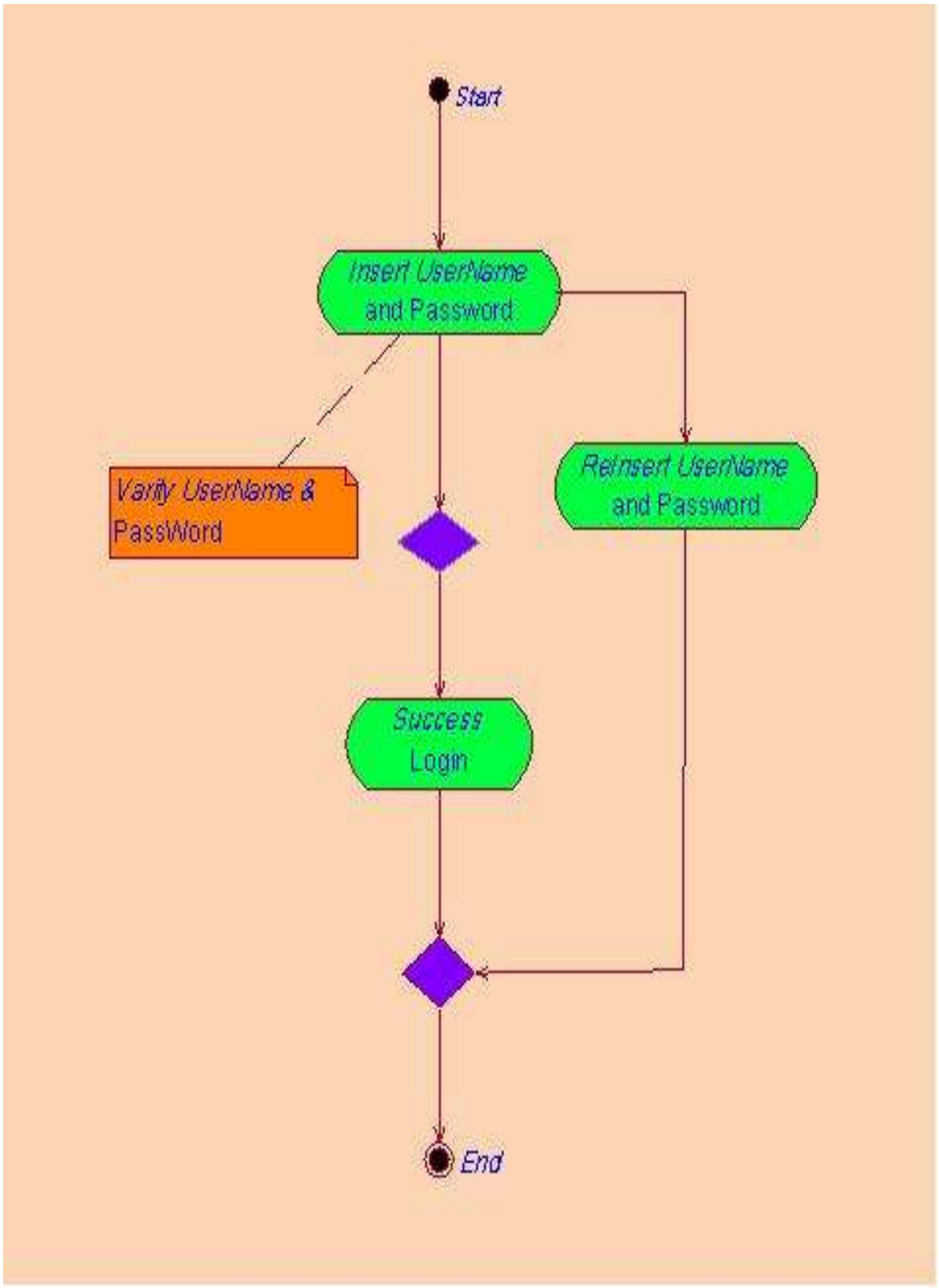


Figure 4.4: Activity Diagram – Login

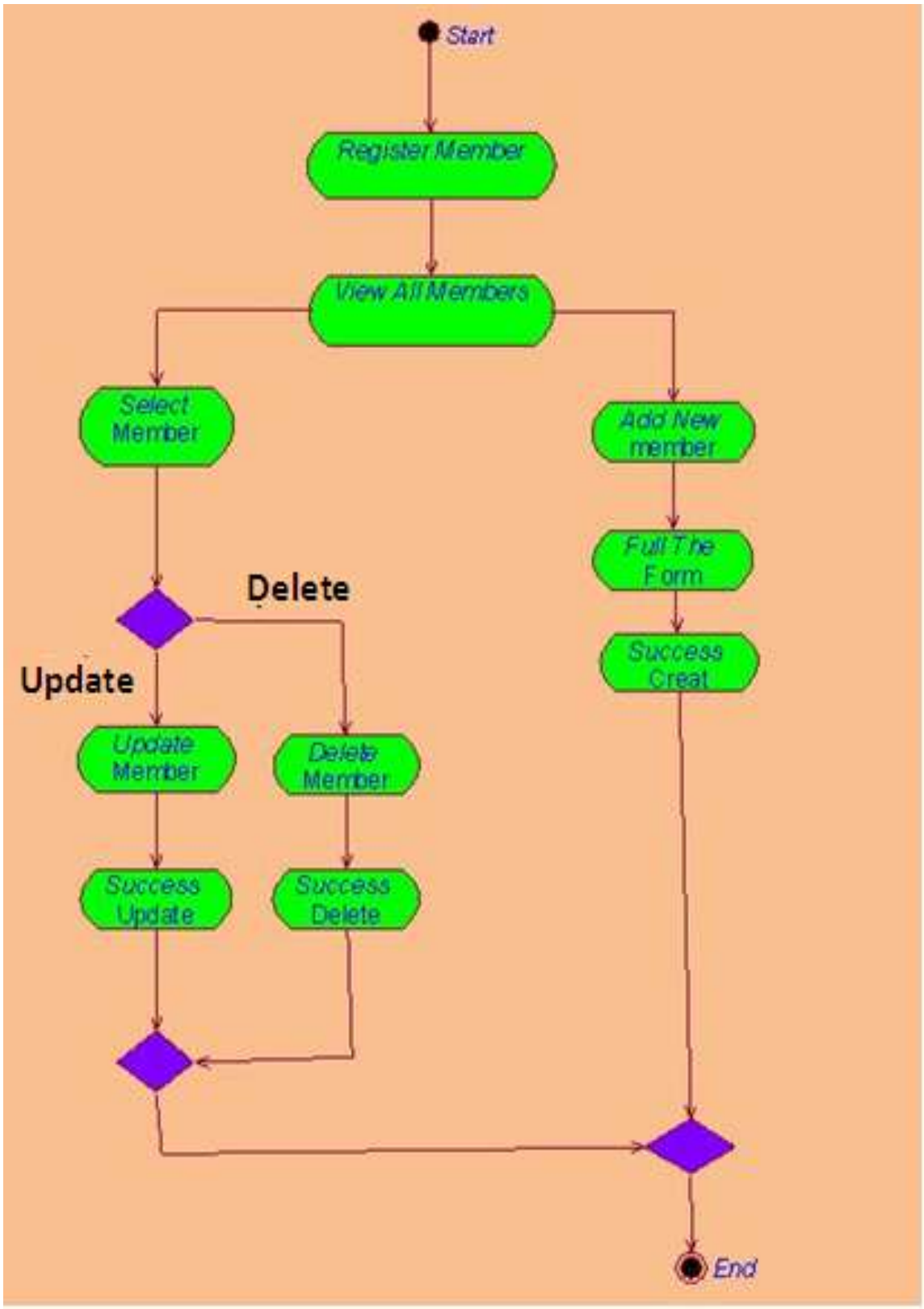


Figure 4.4: Activity Diagram –Registration

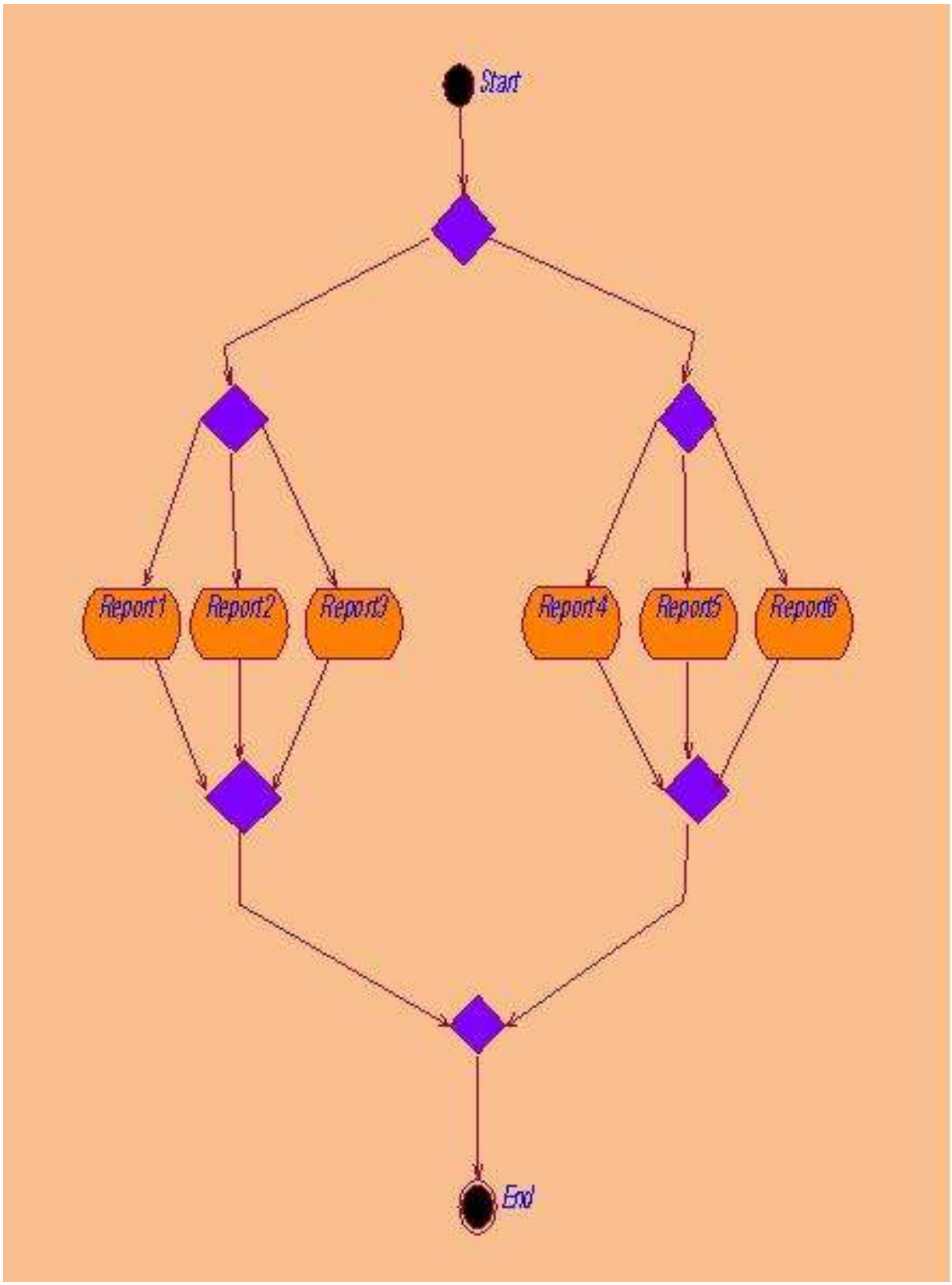


Figure 4.6: Activity Diagram – Show Report

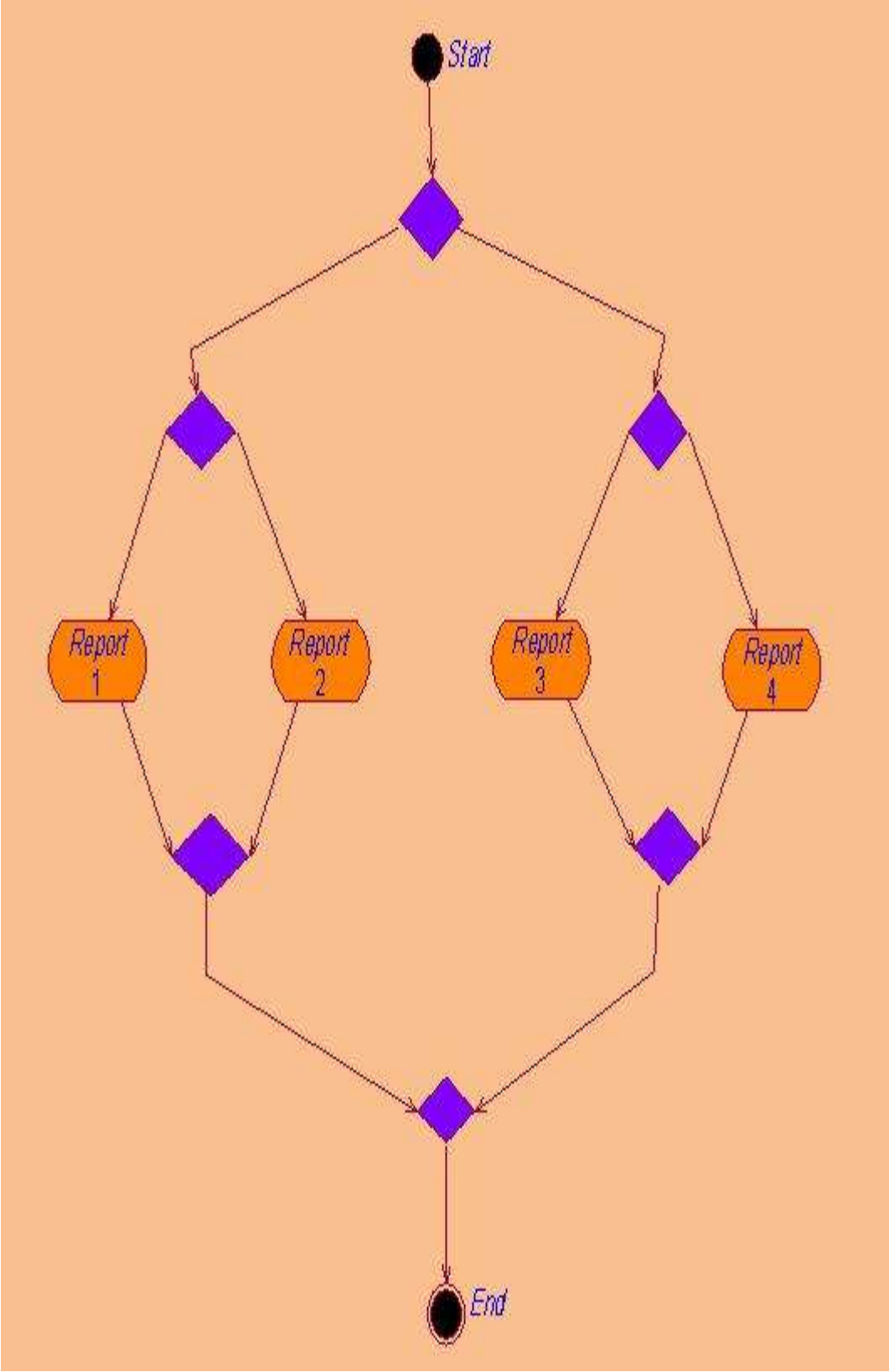


Figure 4.6: Activity Diagram – View Report

4.3.1.4 Sequence Diagram

To represent or model the flow of messages, events and actions among the objects or components of a system, UML sequence diagrams should be used. UML sequence diagrams are useful design tools because they offer a dynamic view of the system behavior which can be difficult to extract from static diagrams or specifications.Time is represented by the vertical lines showing the sequence of interactions of the header elements, which are displayed horizontally at the top of the diagram.

In simple words, sequence diagrams are used primarily to design, document and validate the architecture, interfaces and logic of the system by describing the sequence of actions that need to be performed to complete a task or scenario. The interaction processes involved in DSRNCO are system user, DSRNCO interface, DSRNCO controller and the management team of ANGKASA management as shown in Figures 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, 4.14, and 4.15.

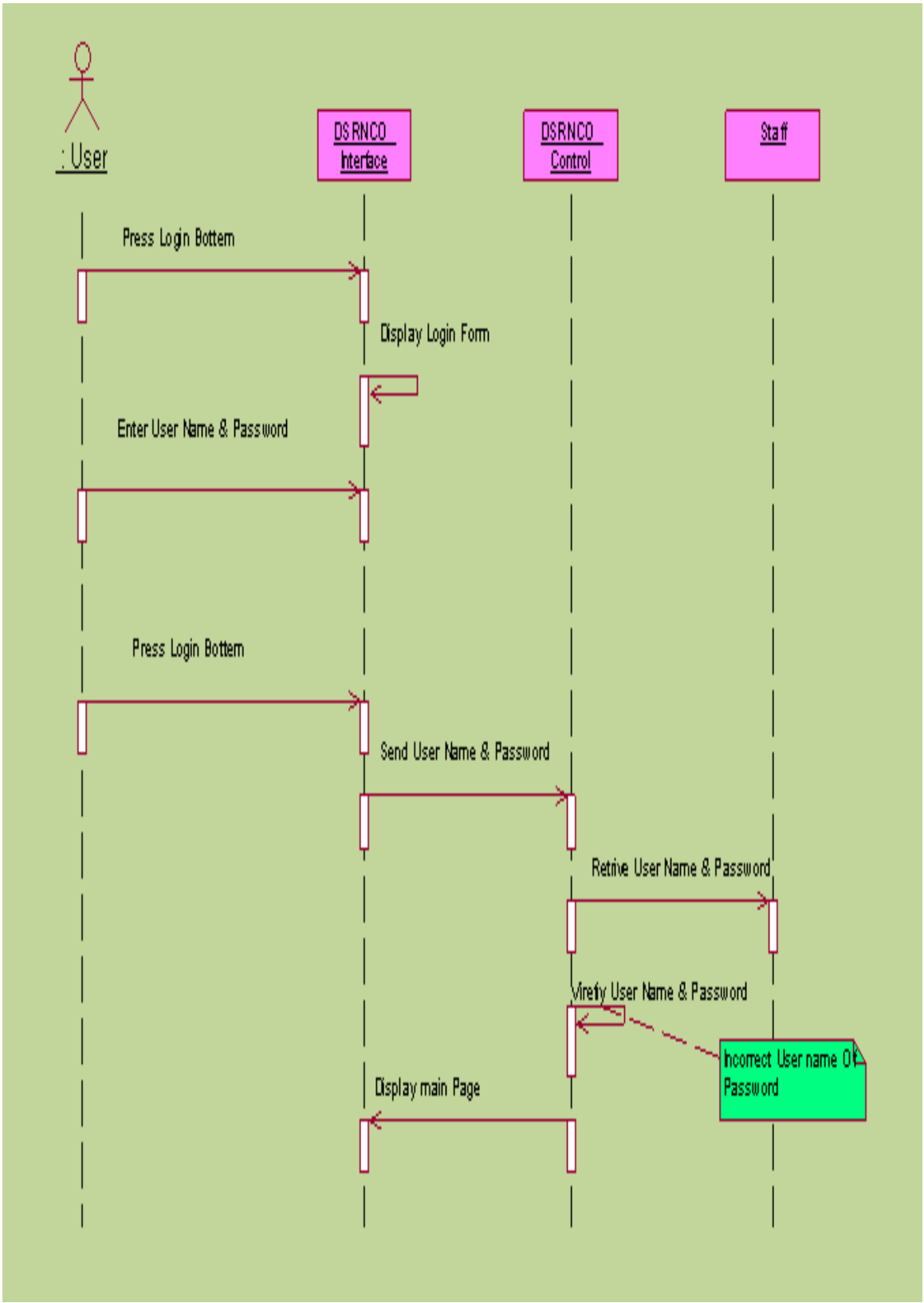


Figure 4.8: Sequence Diagram – Login (Basic Flow)

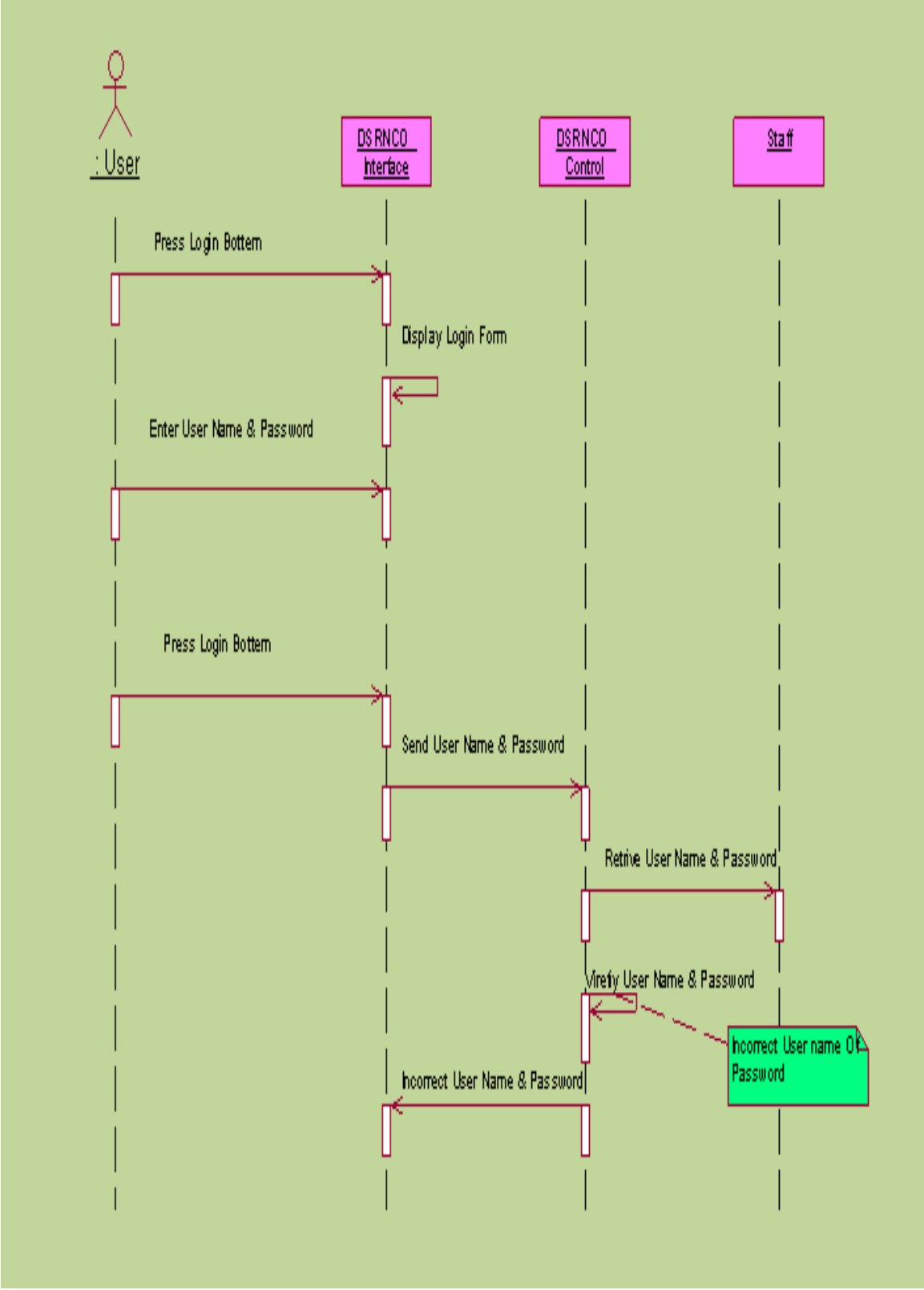


Figure 4.9: Sequence Diagram – Login (Exceptional flow)

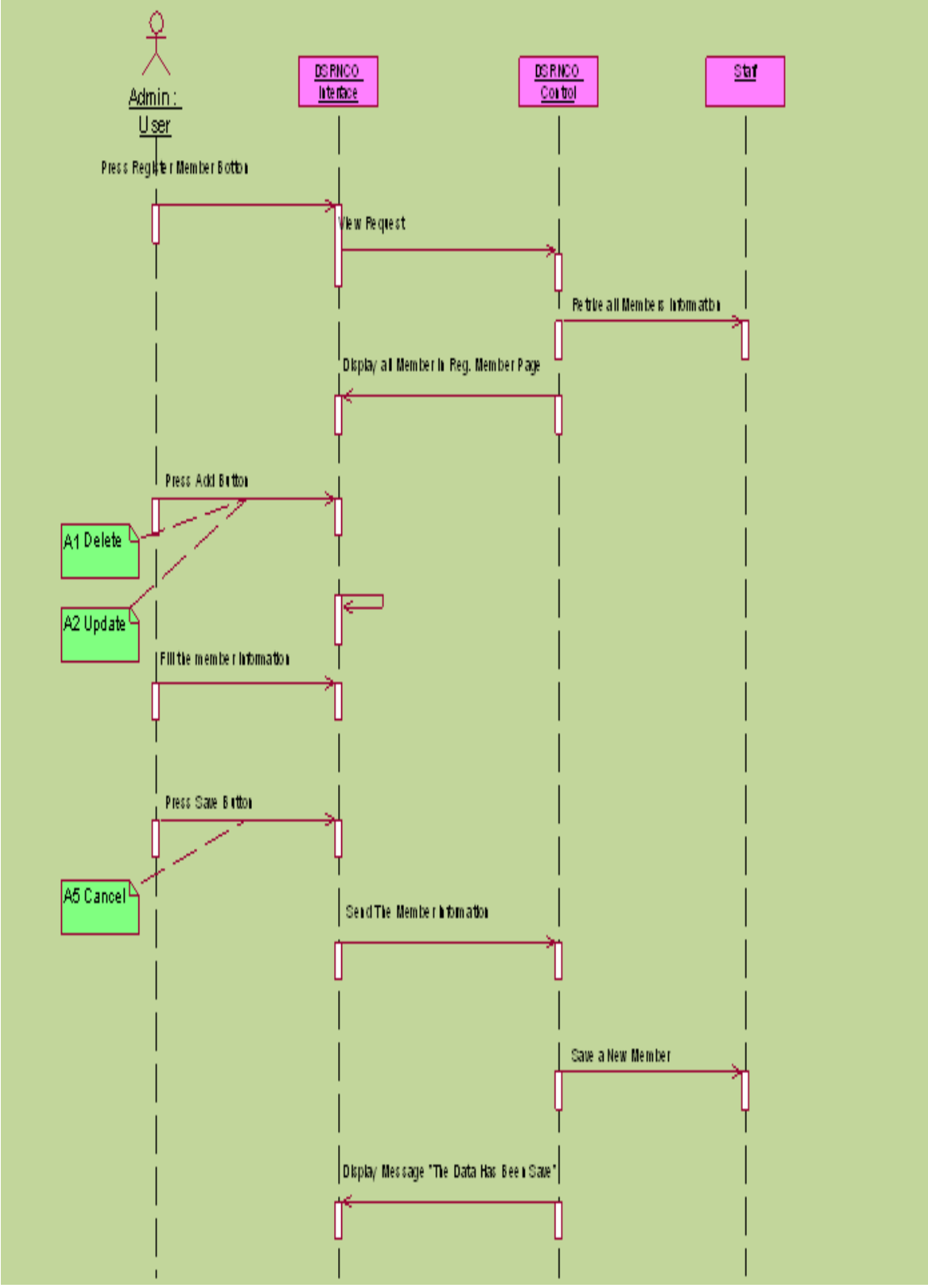


Figure 4.10: Sequence Diagram – Register Member (Basic Flow)

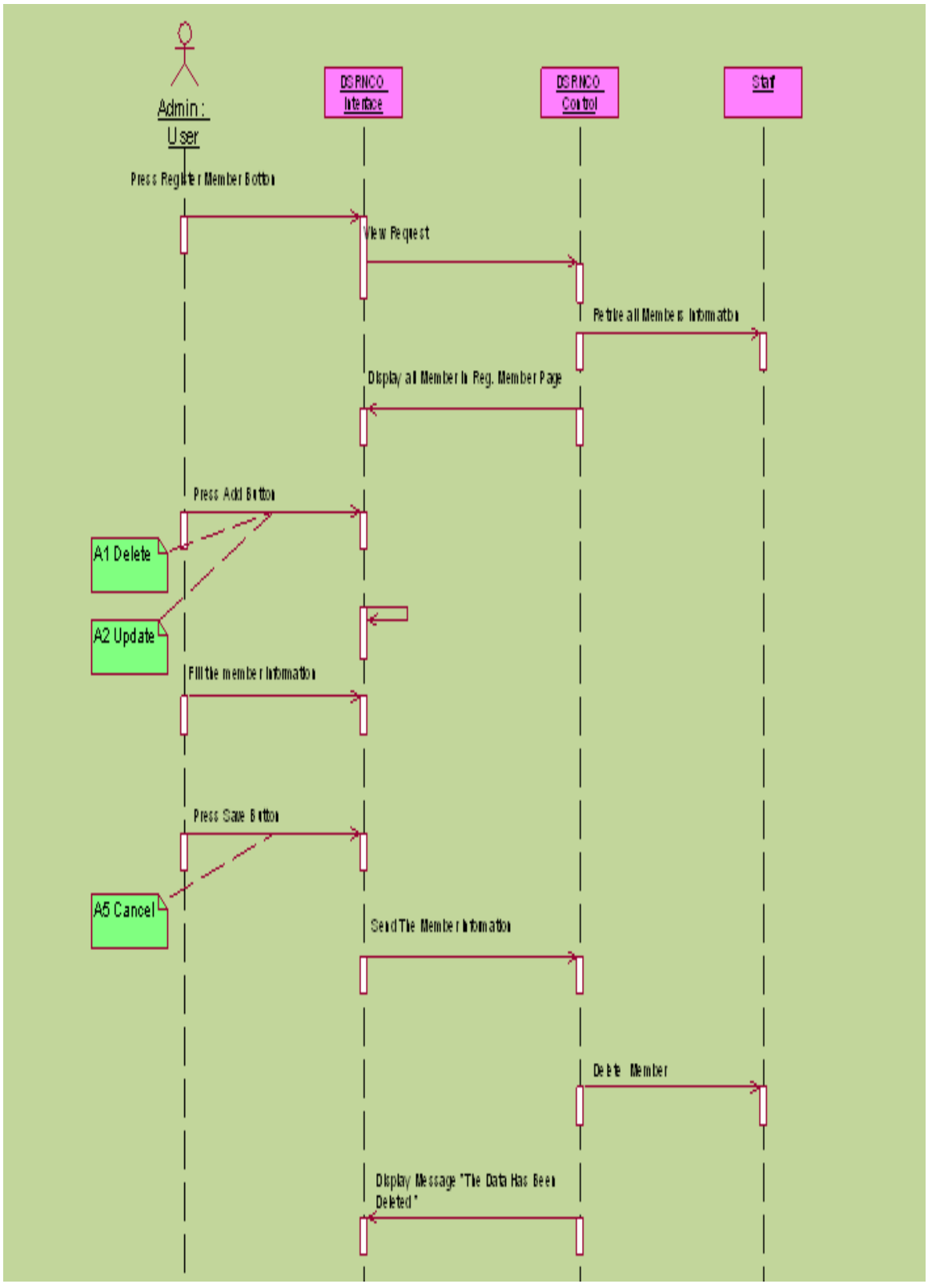


Figure 4.11: Sequence Diagram – Register Member **(**Alternative flow Delete**)**

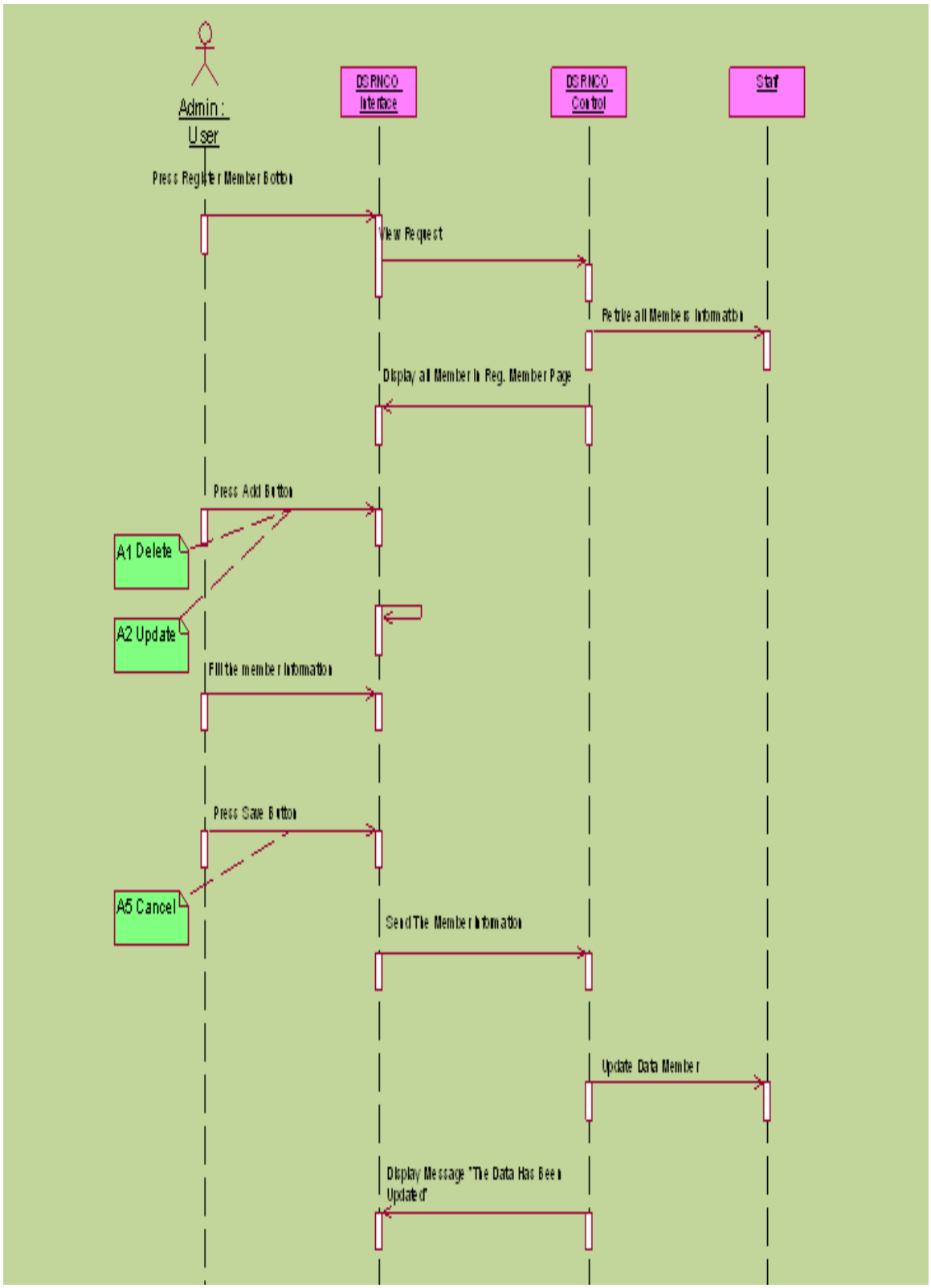


Figure 4.12: Sequence Diagram – Register Member (Alternative flow Update)

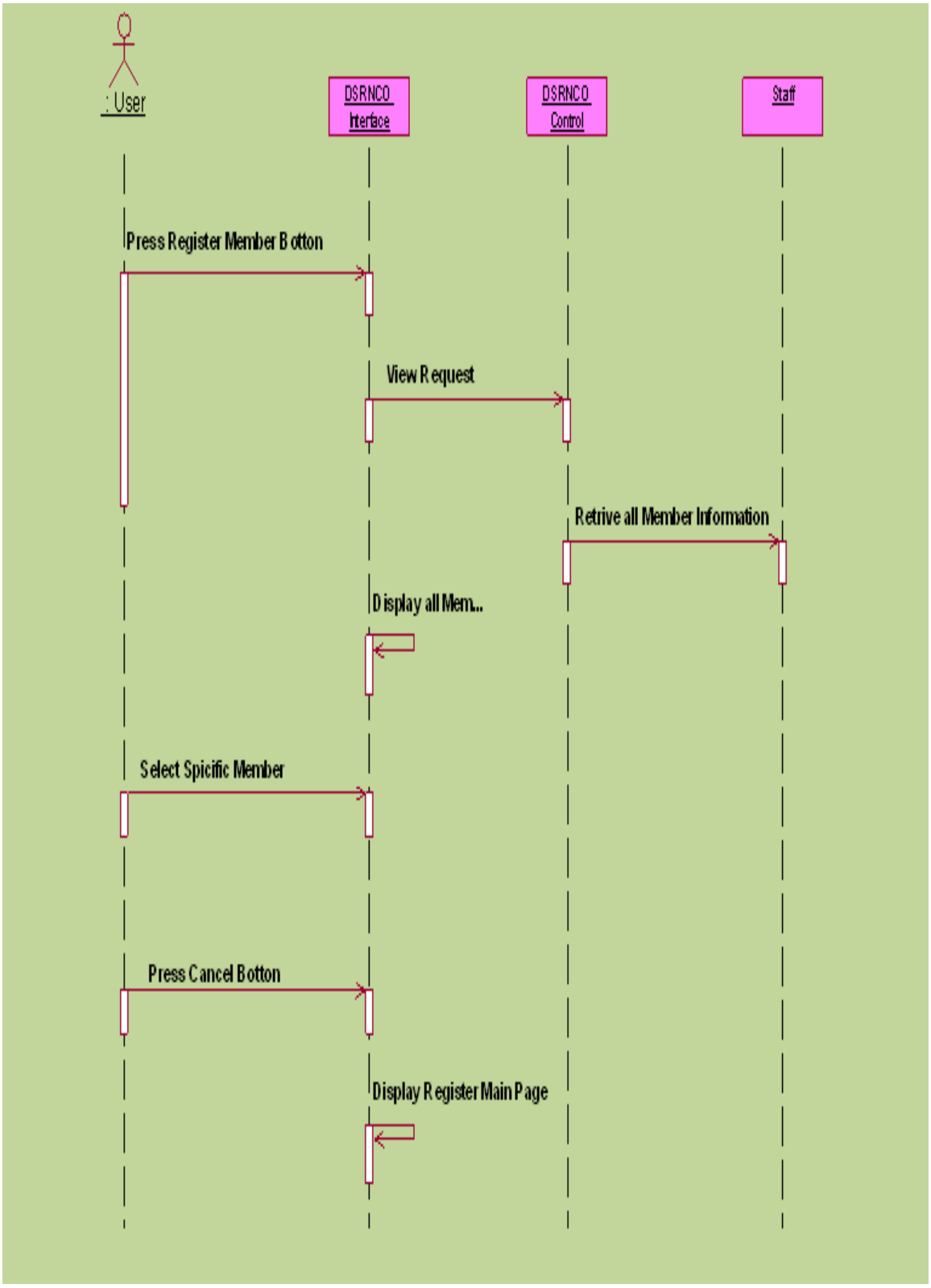


Figure 4.13: Sequence Diagram – Register Member **(**Alternative to flow Cancel**)**

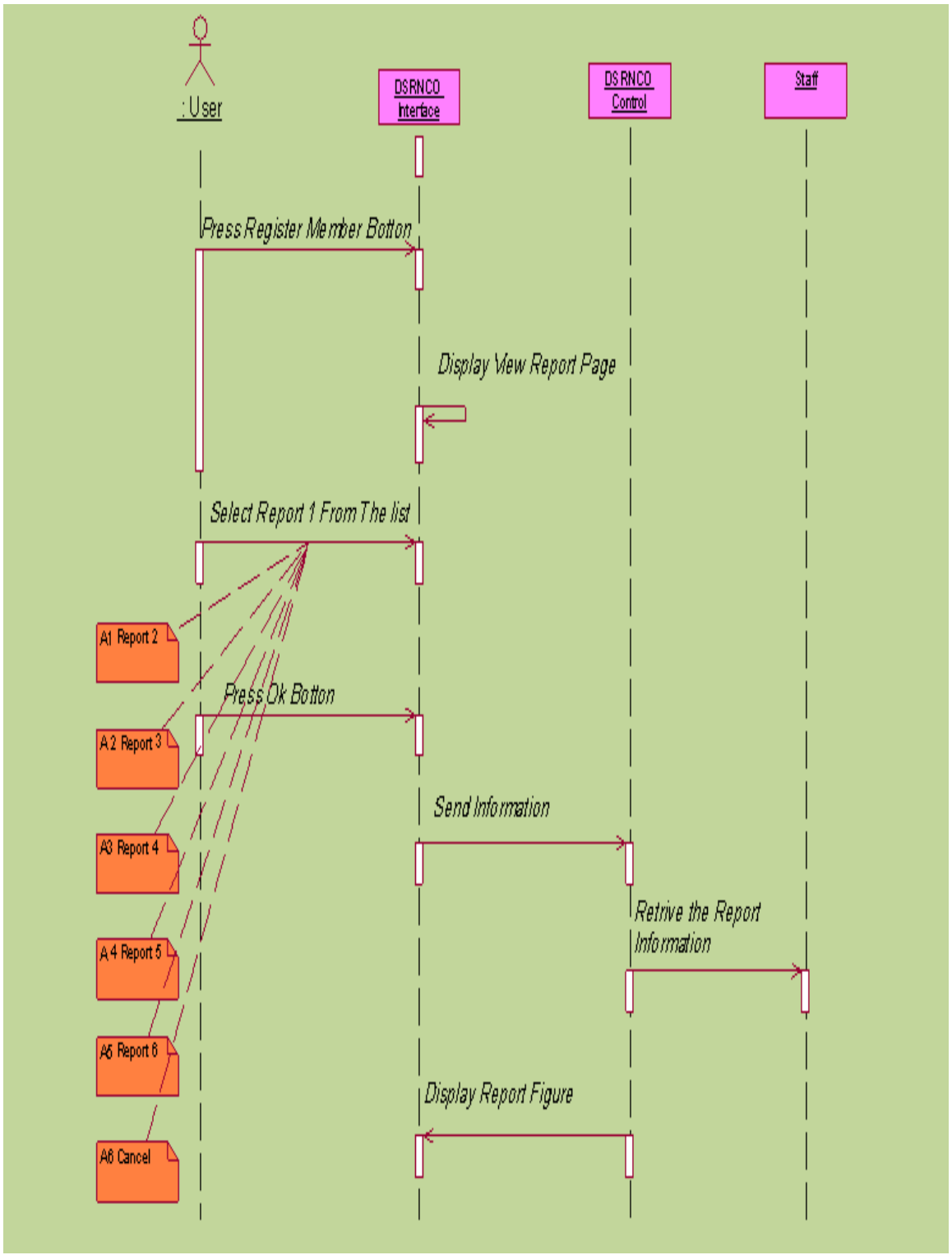


Figure 4.14: Sequence Diagram – View Report

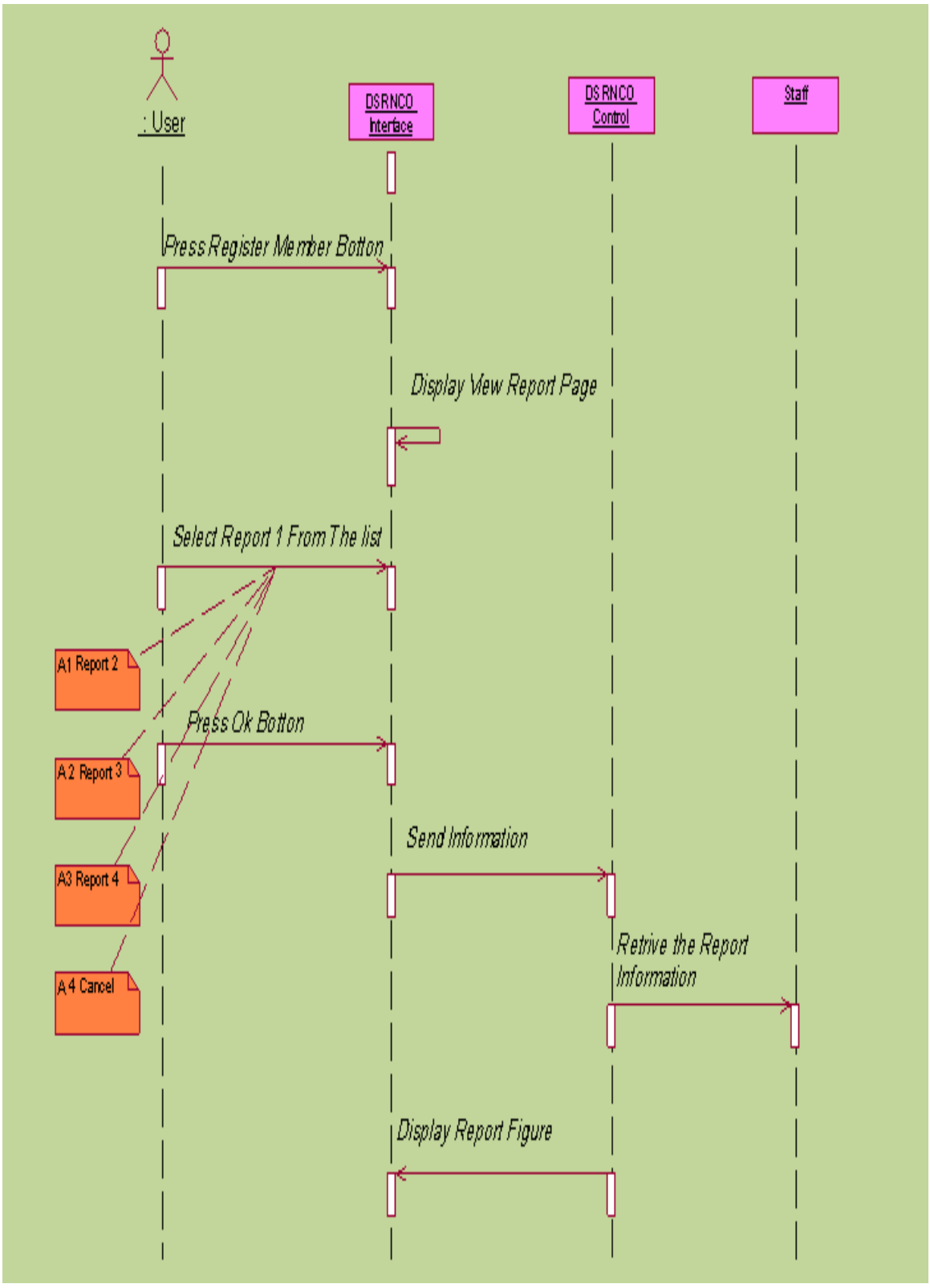


Figure 4.15: Sequence Diagram – Show Report

4.4 Data Design

Data design is about discovering and completely defining the application's data characteristics and processes. Data design is a process of gradual refinement, from the coarse what data does for application requireto the precise data structures and processes that provide it. With a good data design, the application's data access is fast, easily maintained, and can gracefully accept future data enhancements.The process of data design includes identifying the data, defining specific data types and storage mechanisms, and ensuring data integrity by using business rules and other run-time enforcement mechanisms. In this research, data design focused on developing of DW model, which is contained the fact and dimension table for analysis operational data in ANGKASA.

4.4.1 ANGKASA Operational Data

ANGKASA manages huge number of data to run their business activities and assist their management for making decisions. Figure 4.16 exhibits the Entity Relationship Diagram (ERD) for the business activities consists of transactional data in ANGKASA, used in developing the DSRNCO.

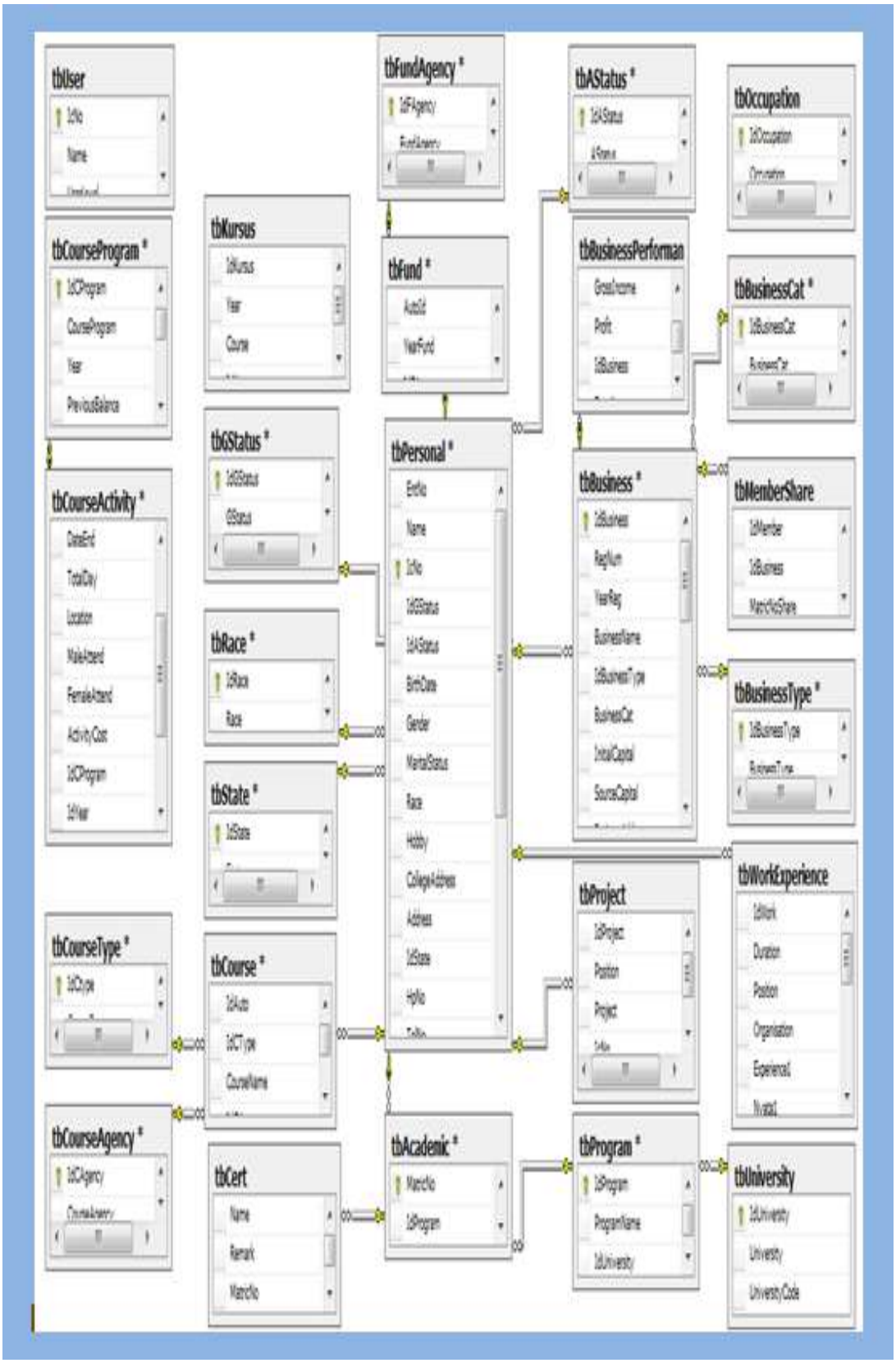


Figure 4.16: Operational Data ERD at ANGKASA

4.4.2 Data Mapping and Data Movement

4.4.2.1 Logical Data Model

The purpose of this step is to describe the activities needed to "start" the Project Logical Data Model. The activities describe steps to enter the model properties, locate reusable entities and attributes, understand the impacts of sharing existing data resources, and obtain approval on the planned project data architecture. Before descending into the details of the various sources the actual design of the logical data mapping document should be explored.The document contains the data dentition for the DW source systems throughout the enterprise, the target DWDM. Table 4.4 illustrates the Logical Data Map for DSRNCO, which is consisting of data destination, data sources, and transformation types.

Table 4.4: Logical Data Map

Destination Database Data Warehouse				Source Database				Transformation
Table Name	Column Name	Data Type	Table Type	DB Name	Table Type	Column Name	Data Type	
DimDateTime	DateTimeKey	int	Dimention	NA	NA	NA	NA	Identity
DimDateTime	YearPerformance	varchar(50)	Dimention	Usabunan	dbo.tbBusinessPerformance	YearPerformance	varchar(50)	Extract
DimBusinessCat	BusinessCatKey	int	Dimention	NA	NA	NA	NA	Identity
DimBusinessCat	BusinessCat	varchar(100)	Dimention	Usabunan	dbo.tbBusinessCat	BusinessCat	varchar(100)	Extract
DimOStatus	OStatusKey	int	Dimention	NA	NA	NA	NA	Identity
DimOStatus	OStatus	varchar(50)	Dimention	Usabunan	dbo.tbOStatus	OStatus	varchar(50)	Extract
DimRace	RaceKey	int	Dimention	NA	NA	NA	NA	Identity
DimRace	Race	varchar(50)	Dimention	Usabunan	dbo.tbRace	Race	varchar(50)	Extract
DimState	StateKey	int	Dimention	NA	NA	NA	NA	Identity
DimState	IdState	varchar(50)	Dimention	Usabunan	dbo.tbState	IdState	varchar(50)	Extract
DimState	State	varchar(50)	Dimention	Usabunan	dbo.tbState	State	varchar(50)	Extract
DimAStatus	AStatusKey	int	Dimention	NA	NA	NA	NA	Identity
DimAStatus	AStatus	varchar(50)	Dimention	Usabunan	dbo.tbAStatus	IdAStatus	varchar(50)	Extract
DimGender	GenderKey	int	Dimention	NA	NA	NA	NA	Identity
DimGender	Gender	varchar(50)	Dimention	Usabunan	tbPersonal	Gender	varchar(50)	Extract
Dim_University	UniversityKey	int	Dimention	NA	NA	NA	NA	Identity
Dim_University	IdUniversity	varchar(50)	Dimention	Usabunan	dbo.tbUniversity	IdUniversity	varchar(50)	Extract
Dim_University	University	varchar(50)	Dimention	Usabunan	dbo.tbUniversity	University	varchar(50)	Extract
DimBusinessType	BusinessTypeKey	int	Dimention	NA	NA	NA	NA	Identity
DimBusinessType	BusinessType	varchar(50)	Dimention	Usabunan	dbo.tbBusinessType	BusinessType	varchar(50)	Extract
Fact_profit_Performance	DateTimeKey	int	Fact	DivOraduate_Entrepreneurs	DimDateTime	DateTimeKey	int	Extract
	BusinessCatKey	int	Fact	DivOraduate_Entrepreneurs	DimBusinessCat	BusinessCatKey	int	Extract
	OStatusKey	int	Fact	DivOraduate_Entrepreneurs	DimOStatus	OStatusKey	int	Extract
	RaceKey	int	Fact	DivOraduate_Entrepreneurs	DimRace	RaceKey	int	Extract
	StateKey	int	Fact	DivOraduate_Entrepreneurs	DimState	StateKey	int	Extract
	AStatusKey	int	Fact	DivOraduate_Entrepreneurs	DimAStatus	AStatusKey	int	Extract
	GenderKey	int	Fact	DivOraduate_Entrepreneurs	DimGender	GenderKey	int	Extract
	UniversityKey	int	Fact	DivOraduate_Entrepreneurs	Dim_University	UniversityKey	int	Extract
	BusinessTypeKey	int	Fact	DivOraduate_Entrepreneurs	DimBusinessType	BusinessTypeKey	int	Extract
	profit	float	Fact	Usabunan	dbo.tbBusinessPerformance	profit	float	Extract

4.4.2.2 Extract Transform and Load (ETL)

ETL which is a process used to collect data from various sources, transform the data depending on business rules needs and load the data into a destination database. The need to use ETL arises from the fact that in modern computing business data resides in multiple locations and in many incompatible formats. As discussed earlier in Chapter 2, business data might be stored in the file system in various formats (such as Word, PDF, spreadsheets, plain text, etc), or can be stored as email files, or can be kept in a various database servers like MS SQL Server, Oracle and MySQL for example. Handling all this business data efficiently is a great challenge and ETL plays an important role in performing this. In DSRNCO, SSIS is the tool used to perform ETL operations. While ETL process is running in DW applications, SSIS transfer a data in DW. For example, when DSRNCO reports using SQL Server Management Studio (SSMS) is created, SSIS package is also created. At a high level, SSIS provides the ability to:

i. Retrieve data from any source.
ii. Perform various transformations on the data; e.g. convert from one type to another, convert to uppercase or lowercase, and perform calculations.
iii. Load data into any source.
iv. Define a workflow.

The steps of ETL are described in the following:

Extract – The first step is extracting the data from various sources. Each source may store its data in a completely different format from the rest. The sources are usually flat files or RDBMS, but almost any data storage can be used as a source for an ETL.

Transform – Once the data have been extracted and converted in the intended format, they could be transfromed according to the set of business rules. The data transformation may include various operations including but not limited to filtering, sorting, aggregating, joining, cleaning, generating calculated data based on the existing values, and validating data. **Load** – The final ETL step involves loading the transformed data into the destination target, which might be a database or data warehouse.

Figures 4.18 and 4.19 illustrate the ETL process for DSRNCO.

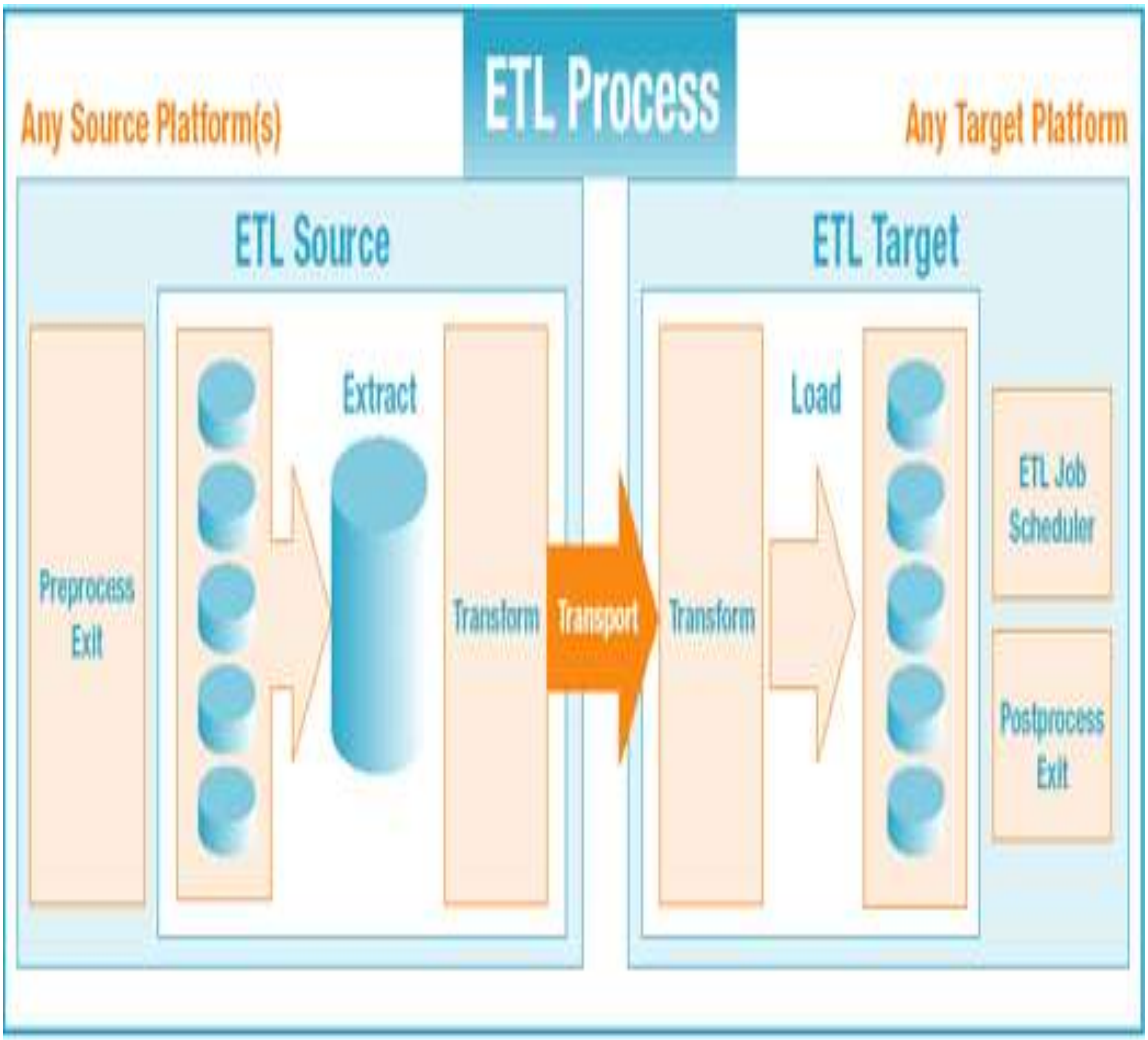


Figure 4.18: The ETL process

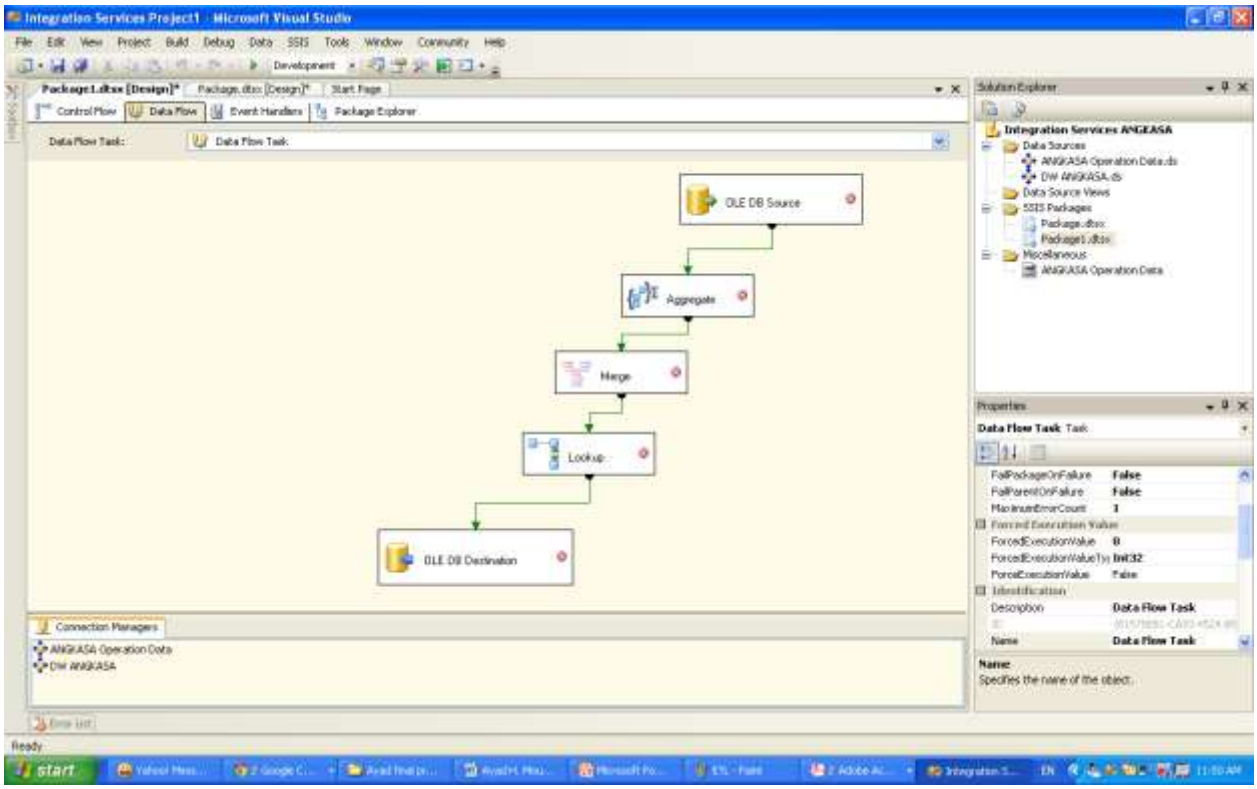


Figure 4.19: ETL Process for the Fact Table

4.4.2.3 ANGKASA Dimensional Model Design

Dimensional modeling is the design concept used by many data warehouse designers to build their data warehouse. Dimensional model is the underlying data model used by many of the commercial OLAP products available today in the market. In this model, all data are contained in two types of tables called **Fact** Table and **Dimension** Table.

4.4.2.3.1 Dimensional Modeling - Fact Table

In a Dimensional Model, Fact table contains the measurements or metrics or facts of business processes. If a business process is **Profit**, then the measurement of the business process such as

"monthly Profit number" is captured in the fact table. In addition the fact table contains are foreign keys for the dimension tables.

4.4.2.3.2 Dimensional Modeling - Dimension Table

In a DM, the measurement contexts are represented in dimension tables. It could be the characteristics such as *who, what, where, when,* and*how* of a measurement (subject). In a business process **profit**, the characteristics of the 'total monthly sales' measurement can be a location (w*here*), time (w*hen*), product sold (*what*). While, the **dimension attributes** are the various columns in a dimension table. In the Location dimension, the attributes can be Location Code, State, Country, Zip code. Generally the Dimension Attributes are used in report labels, and query constraints such as *where Country='IRAQ'*. Additionally, the dimension attributes also contain one or more hierarchical relationships. Before designing a DW, what DW contains should be decided. Say if a DW containing monthly sales numbers across multiple store locations, across time, and across products is to be built, then the dimensions are:

i. Location
ii. Time
iii. Product

Each dimension table contains data for one dimension. In the above example, all the information regarding store location should be put in one single table called **Location**. The store location data may span across multiple tables in the OLTP system (unlike OLAP), but denormalization should be done. In DSRNCO, The ANGKASA dimensional model is designed based on a star schema

which consists of dimension and fact tables. The fact table contains business facts or measures (business profits and a total number of businessmen) and foreign/surrogate keys, which refer to the primary keys in the dimension tables. A dimension table in DSRNCO holds descriptive data that reflect the dimensions or attributes of a business domain in entrepreneur profile such as a business type, business category, gender, state, race, and time dimensions as visualized in Figure 4.19.

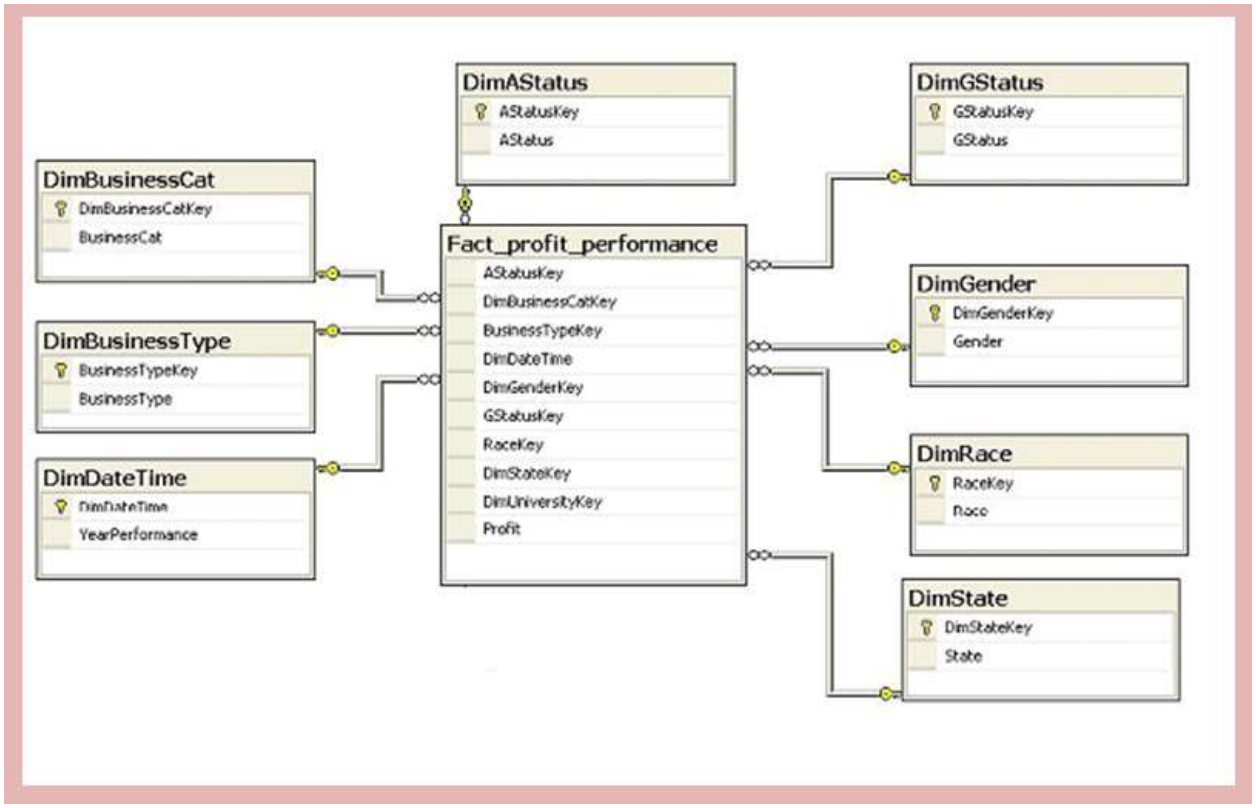


Figure 4.20: DW star schema of at ANGKASA

4.4.2.4 ANGKASA Online Analytical Processing (OLAP) Design

OLAP databases facilitate BI queries. OLAP is a database technology that has been optimized for querying and reporting, instead of processing transactions. The source data for OLAP is

OLTP databases that are commonly stored in DW. OLAP data is derived from this historical data, and aggregated into structures that permit sophisticated analysis. OLAP data is also organized hierarchically and stored in cubes instead of tables. It is a sophisticated technology that uses multidimensional structures to provide rapid access to data for analysis. Thus, OLAP allows ANGKASA staff to gain deeper understanding and knowledge about many aspects of their corporate data through fast, consistent, and interactive access with variety of possible data views. Figure 4.20 shows the OLAP at ANGKASA which has eight dimensional table and one fact table.

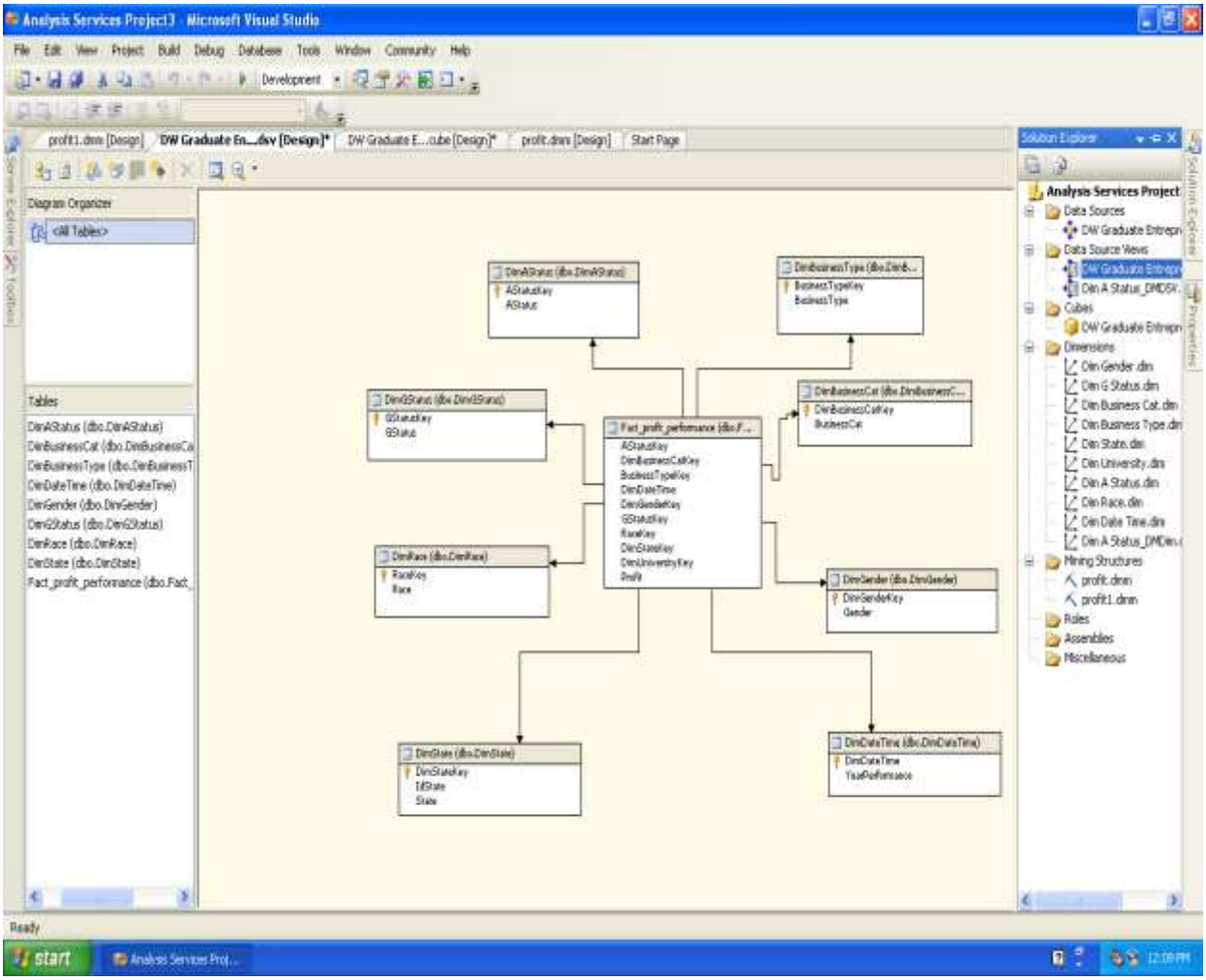


Figure 4.21 Design of OLAP at ANGKASA

4.4.2.5 Decision Trees

DT's are made of classification algorithms that produce human-readable descriptions of trends in the underlying relationships of a dataset and can be used for classification and prediction tasks. When making a decision based upon certain information, a decision tree can help identifying which factors to consider and how each factor has historically been associated with different outcomes of said decision.In DSRNCO, the DT is illustrated in Figure 4.20.

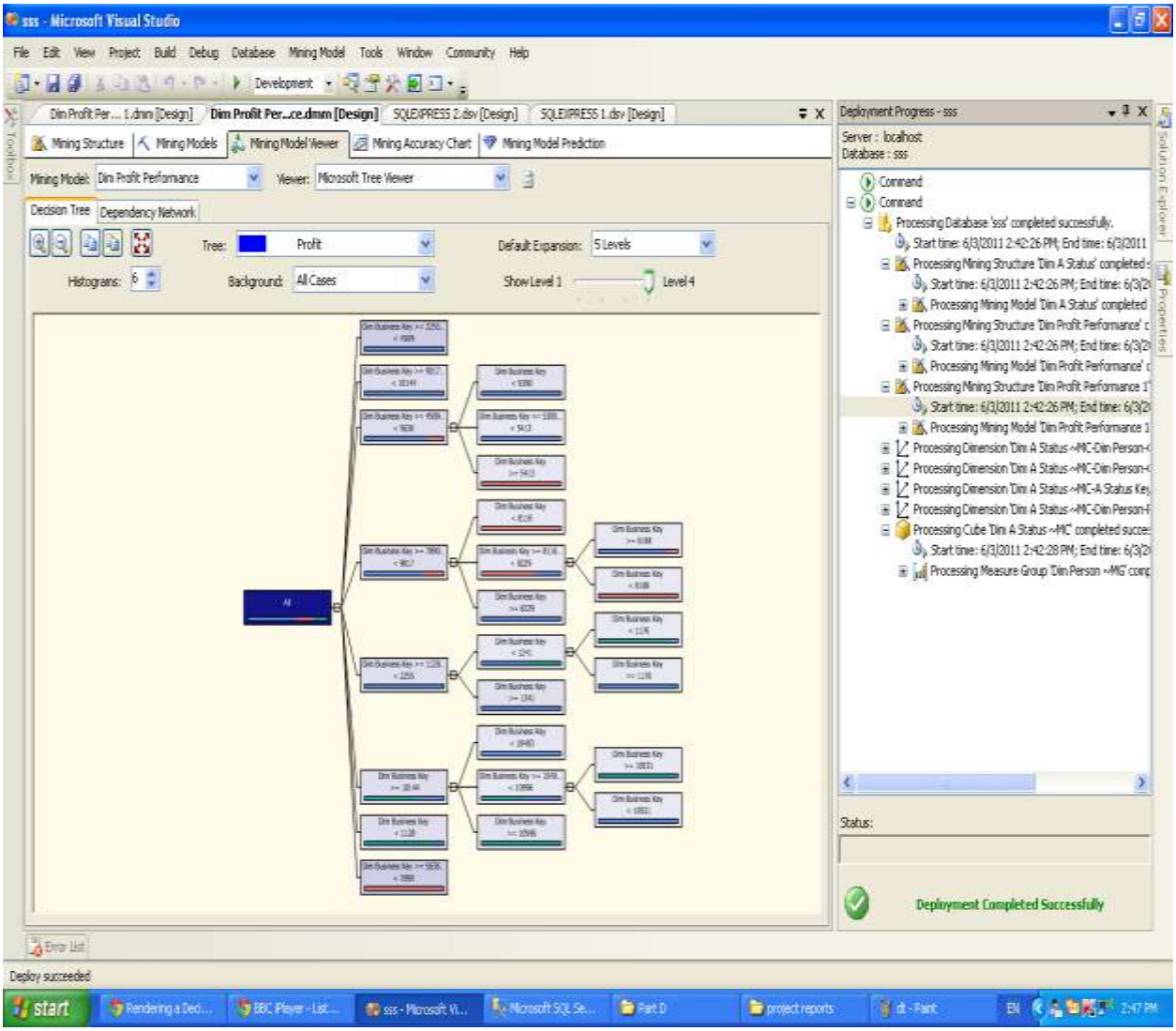


Figure 4.22: DT processing at ANGKASA

4.5 Report Design

Report Designer in Business Intelligence Development Studio is used for this project, which is a report authoring environment that is hosted in MicrosoftVisual Studio. The report design is based on the report requirements to fulfill the demand of ANGKASA management for their decision making.

4.5.1 Profit Performance based on Race and Gender

This report visualizes the performance for each category of business with different Gender and Race.A sample of the report is shown in Figure 4.23.

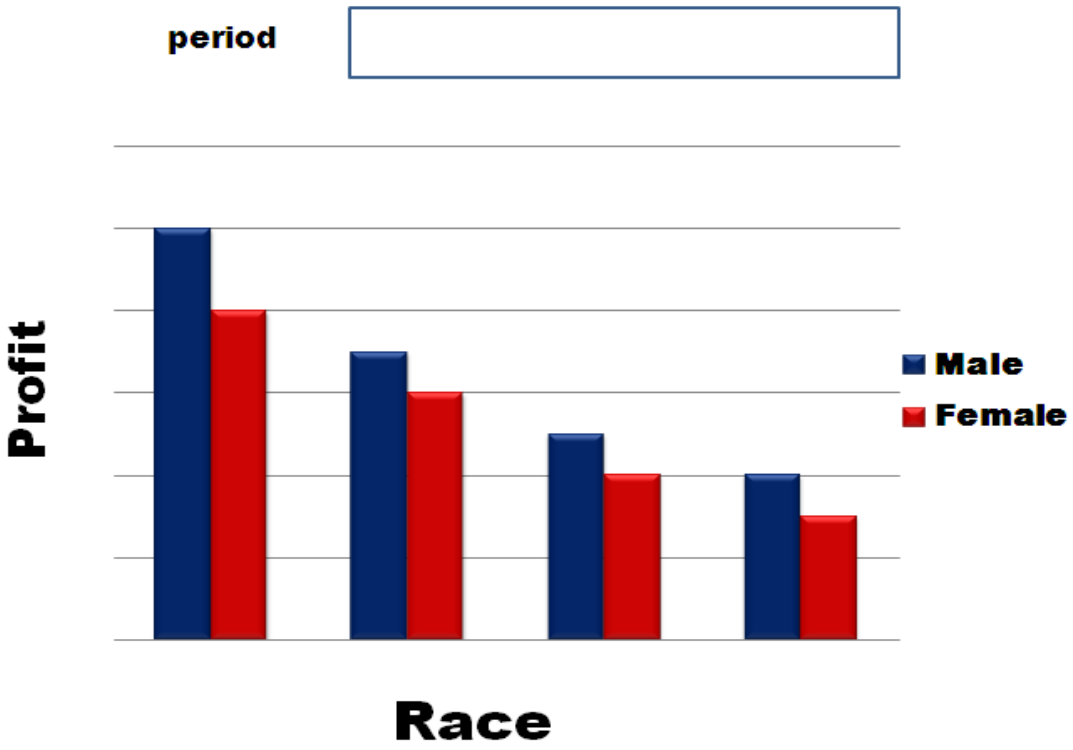


Figure 4.23: Performance subjected to race and gender

4.5.2 Profit Performance categorized by Race

This report shows the profit subjected torace. Figure 4:24 depictsa sample of the report.

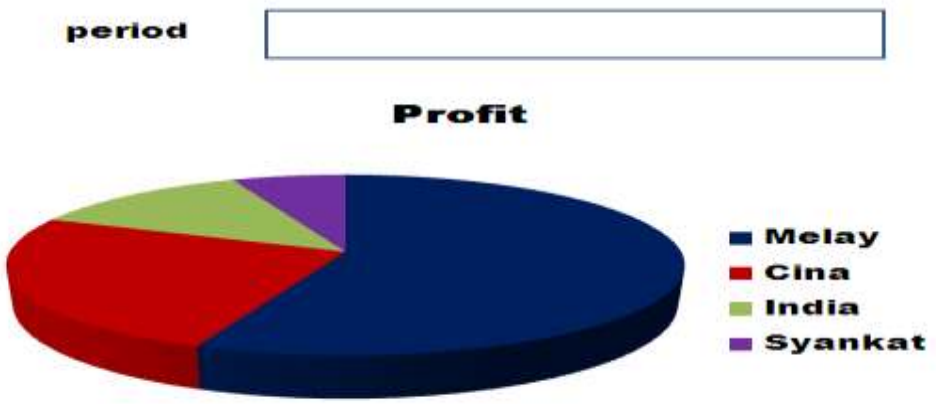


Figure 4.24: Profit categorized by Race

4.5.3 Profit Performance categorized by business category

This report explains the profits for each type of business category subjected in specific time.It is comparable through histograms as illustrated in Figure 4.25.

Figure 4.25: Profit categorized by business category

4.5.4 Profit performance based on business location

This report describes the differences in profit making for different business in variousstates. The information is presented in histograms as depicted in Figure 4.26.

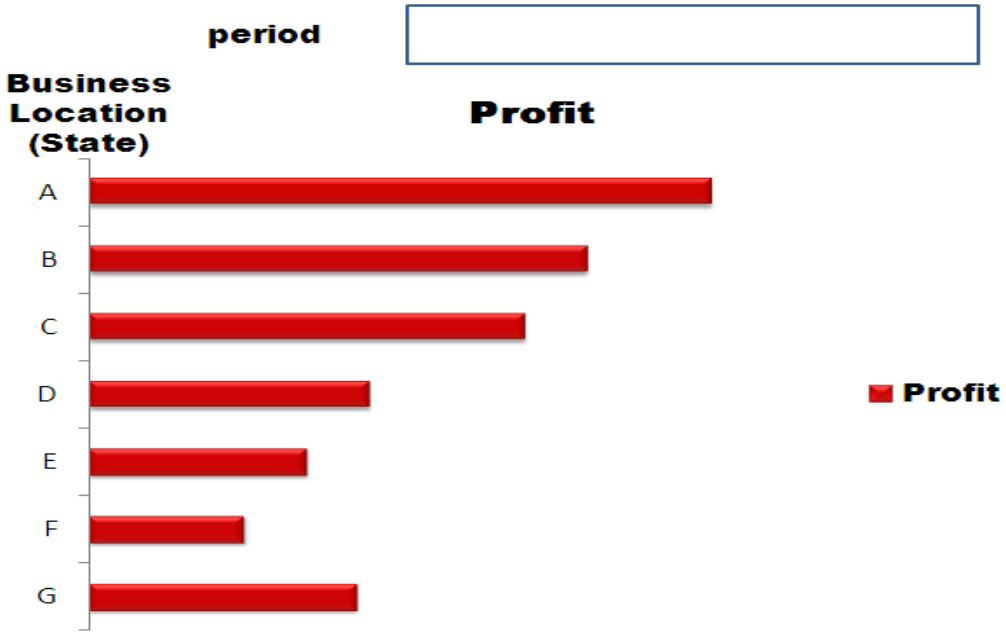


Figure 4.26: profits and state

4.5.5 Profit performance based on business type

This report visualizes information regarding the Profit performance based on business type. Figure 4.27 shows asample of the report.

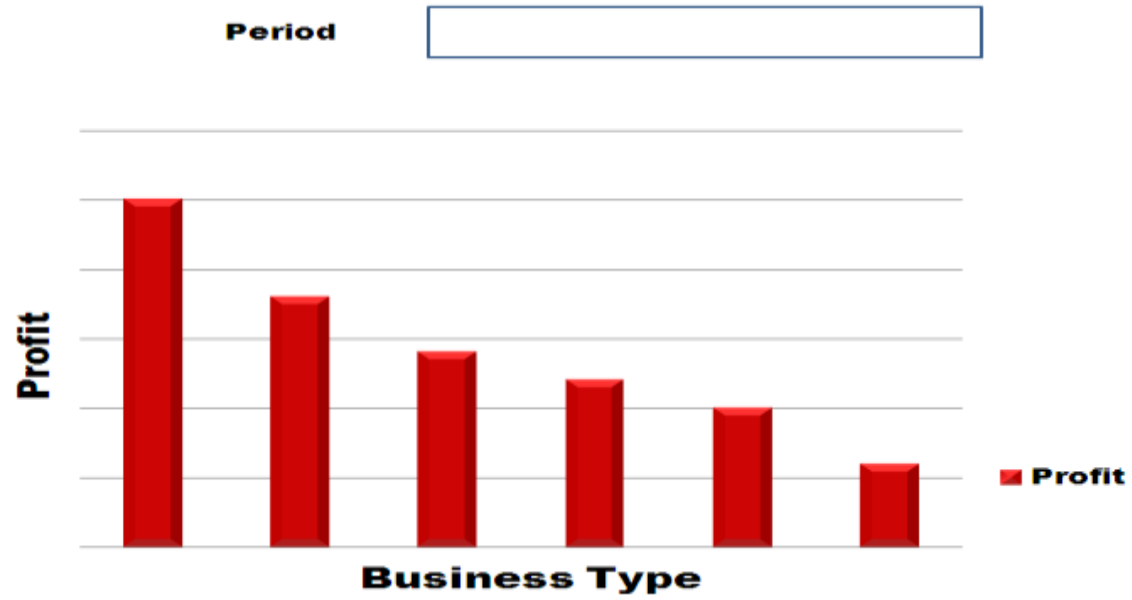


Figure 4.27: Business Vs business type

4.5.6 Analyst profit based on gender and race

This report enables comparison on number of business according to race is made. A sample of the report is provided in Figure 4.28.

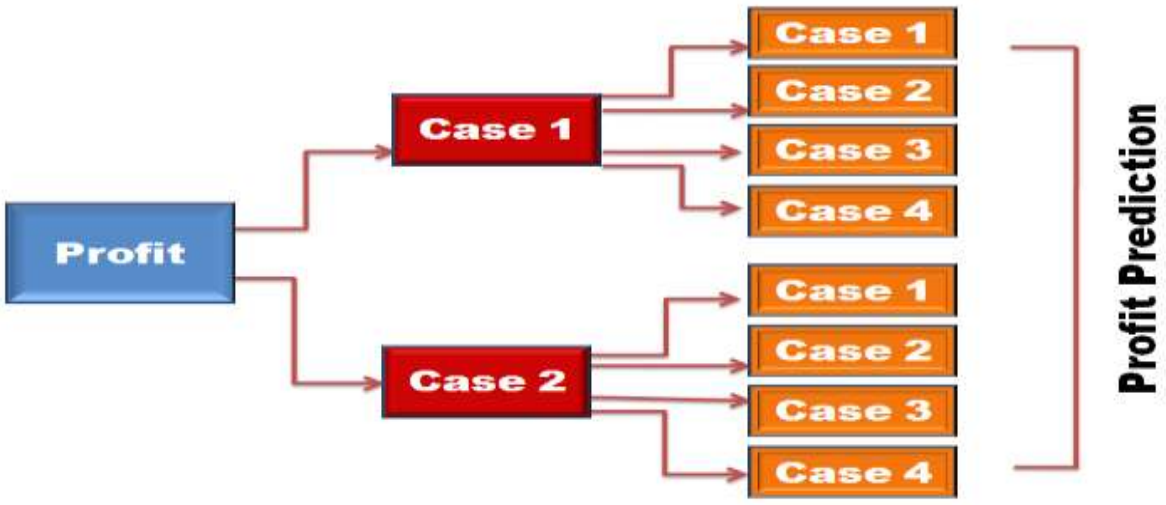


Figure 4.28: Analyst Profit Vs Race and Gender.

4.6 Prototype development

This section will explain about DSRNCO prototype development by using DW and DT Model. The prototype started with Log in page and end with the reports generation.

4.5.1 Log in page

In computer security, a login or logon (also called logging in or on and signing in or on) is a term referring to a situation where access to a computer system is controlled by certain identification.A user can log into a system to obtain access and can then log out or log off (perform a logout / logoff) when the access is no longer needed. To log out is to close off one's access to a computer system after having previously logged in.

The page as shown in Figure 4.29 allows the users (Admin, Manager, and Staff) to have their own username and password to enter into DSRNCO.

Figure 4.29: Login into DSRNCO

4.6.2 Main page

The main page is captured in Figure 4.30. This page provides options for the admin to insert new users, select all users, delete, update user profiles, and view report of the users. Also, it allows for doing ETL.

Figure 4.30: The Main Page

4.6.3 Add new User Page

The page as shown in Figure 4.31 is used for adding a new user. The user is given an id and password as well as other specific information. This information is stored in the database.

Figure 4.31: Add Page

4.6.4 Update User Page

If there is any information goes wrong, the specific profile could be updated as shown in Figure 4.32

Figure 4.32: Update Page

4.6.5 View Users Page

The administrators can view all registered users. The request is provided with a list as depicted in Figure 4.33.

Figure 4.33: View User Page

4.6.6 Delete User page

When a user is no longer with the organization, his/her profile can be deleted from the database. Hence, the form as depisted in Figure 4.34 can be used.

Figure 4.34: Delete User Page.

4.6.7 The manger Report Page

This page allows the managers to view important reports about ANGKASA and also able to change their password. Figure 4.35 presents the View Report Page.

Figure 4.35: List of report options – managers

4.5.8 Staff View Report Page

Not only the managers but also the staffs can view the reports about ANGKASA and they are allowed to change their password. Figure 4.36 presents the page where stass can view the list of reports

Figure 4.36: List of report options – staffs

4.7 ANGKASA Reports

4.7.1 Profit performance based on Race and Gender.

This report compares the performance based gender and race for a specific year. The manager must specify the state, gender, and year parameters first and then click the "view report" button. The system will then visualize the report based as shown in Figure 4.37.

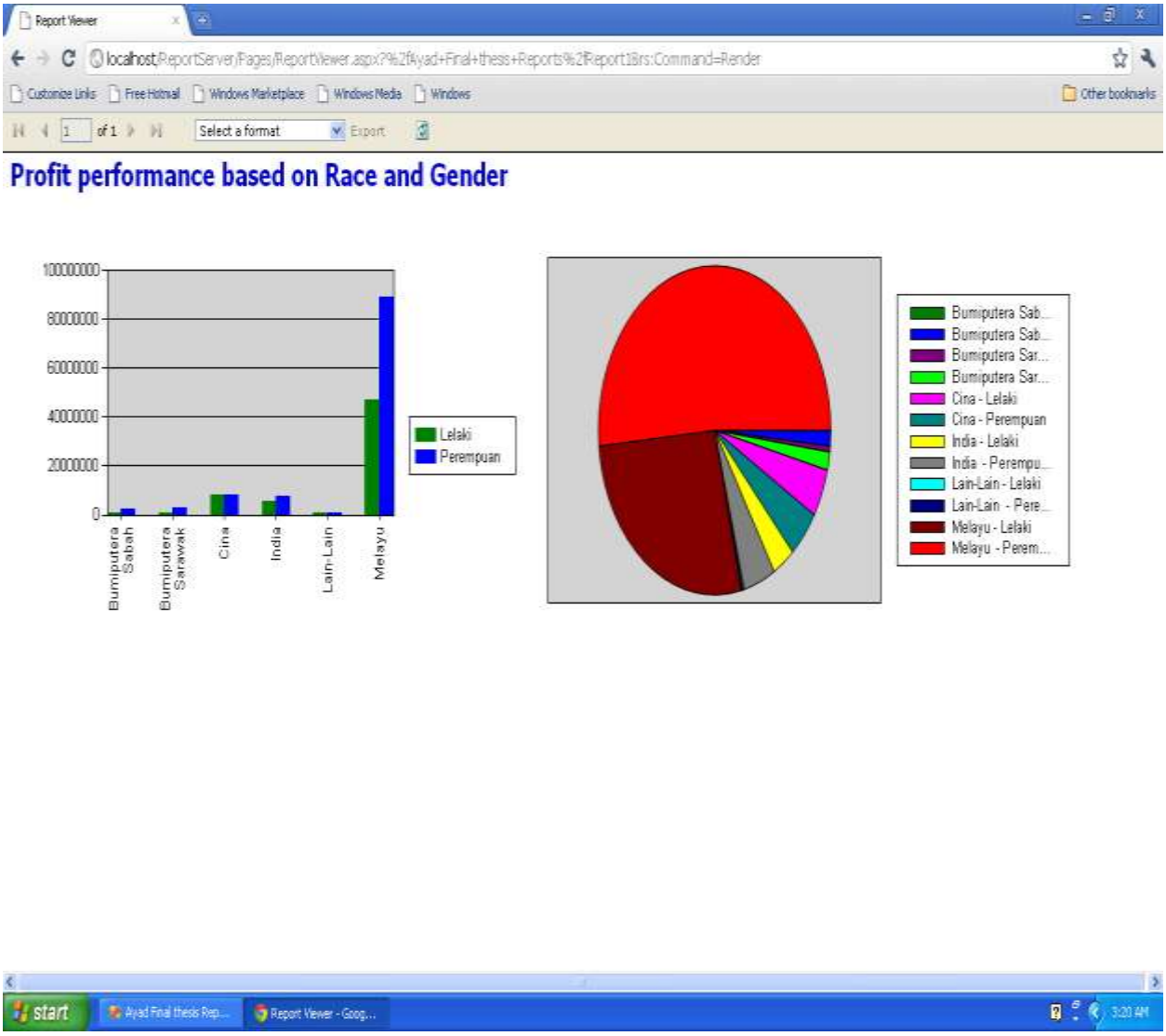


Figure 4.37: Performance Vs race and gender

4.7.2 Profit performance categorized by Race.

This report summarizes which Race produces successful businessmen. The performance could be compared through histograms as shown in Figure 4.38.

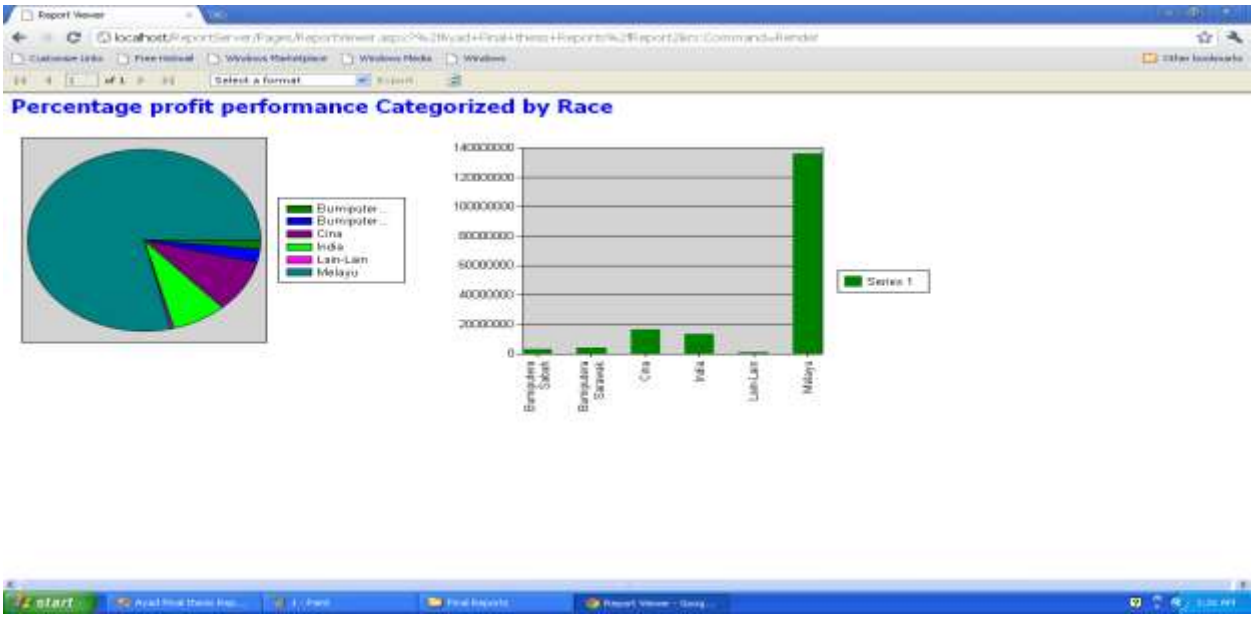


Figure 4.38: Performance based on Race

4.7.3 Profit performance categorized by business category

This report explains how different category of businesses performs in a specific year. The histograms as depicted in Figure 4.39 in dicate the differences.

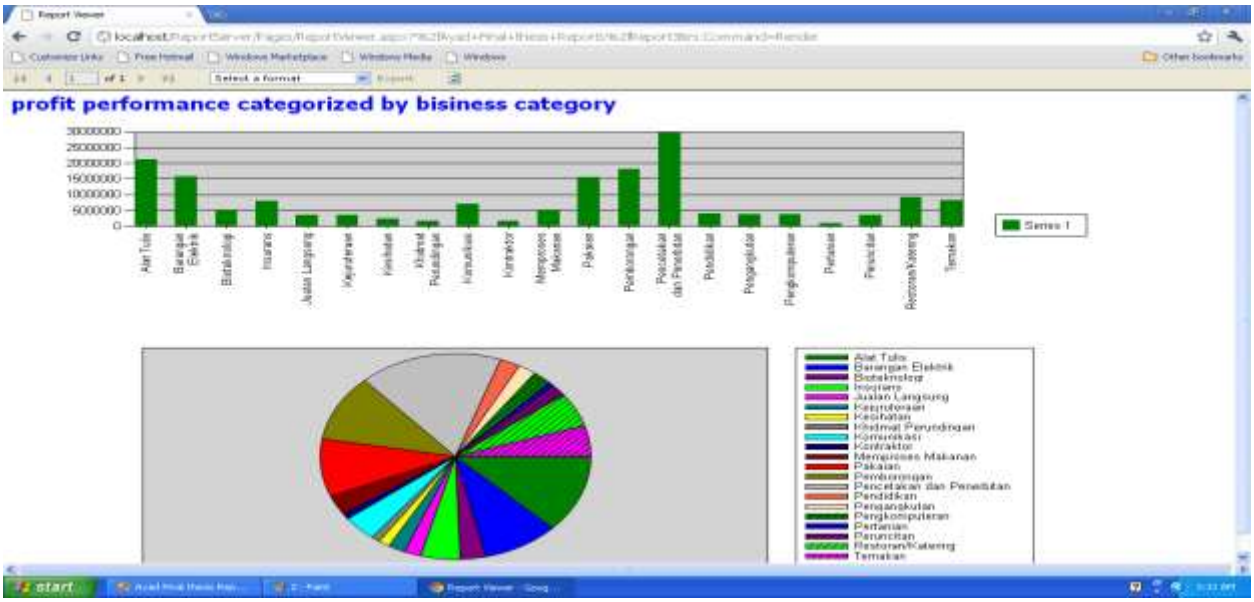


Figure 4.39: Prfit performanceVsbusiness category

4.7.4 Profit performance based on business location.

This report compares the performance of different states. The managers are required to specify the values for states, and year parameters and then press "view report" button. The system will present the report based on the parameters specified, as shown in Figure 4.40.

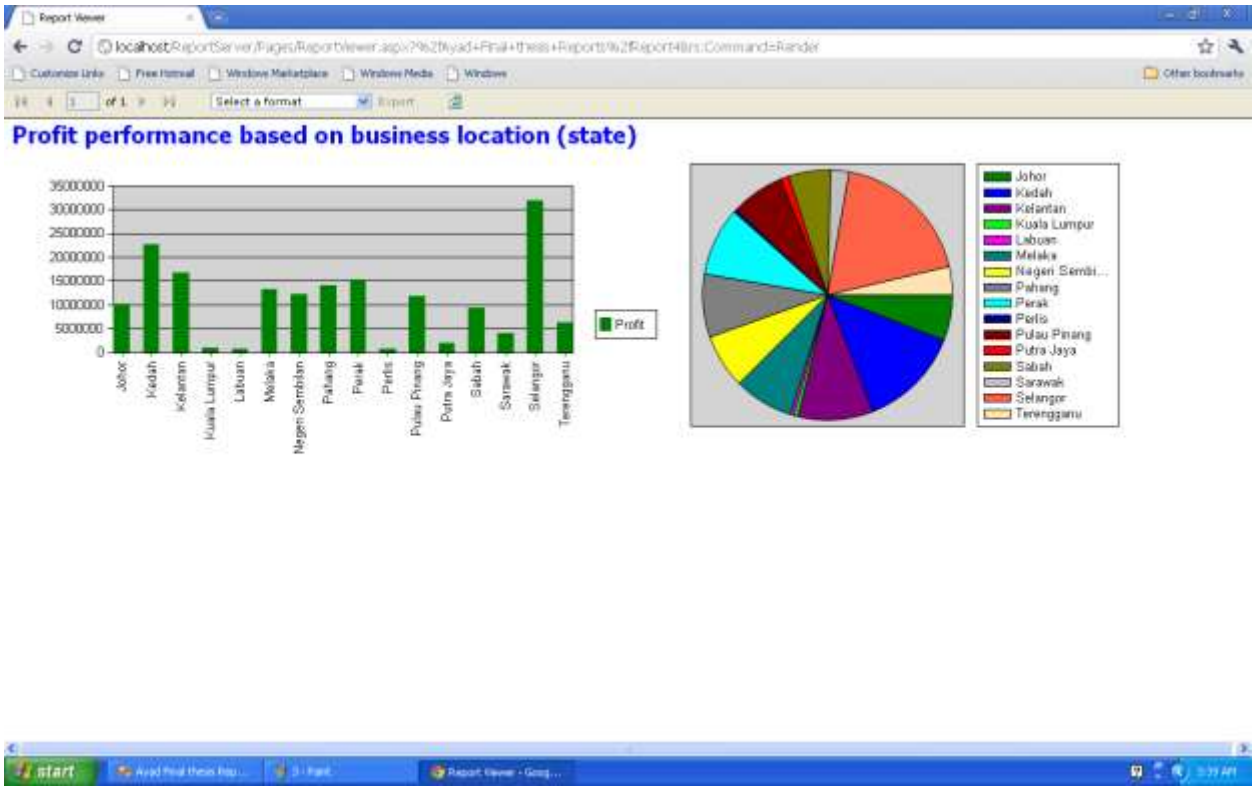


Figure 4.40: Profit Performance Vs state

4.7.5 Profit Performance based on business type

This report visualizes the differences between different business types. The differences can be observed through histograms as seen in Figure 4.41.

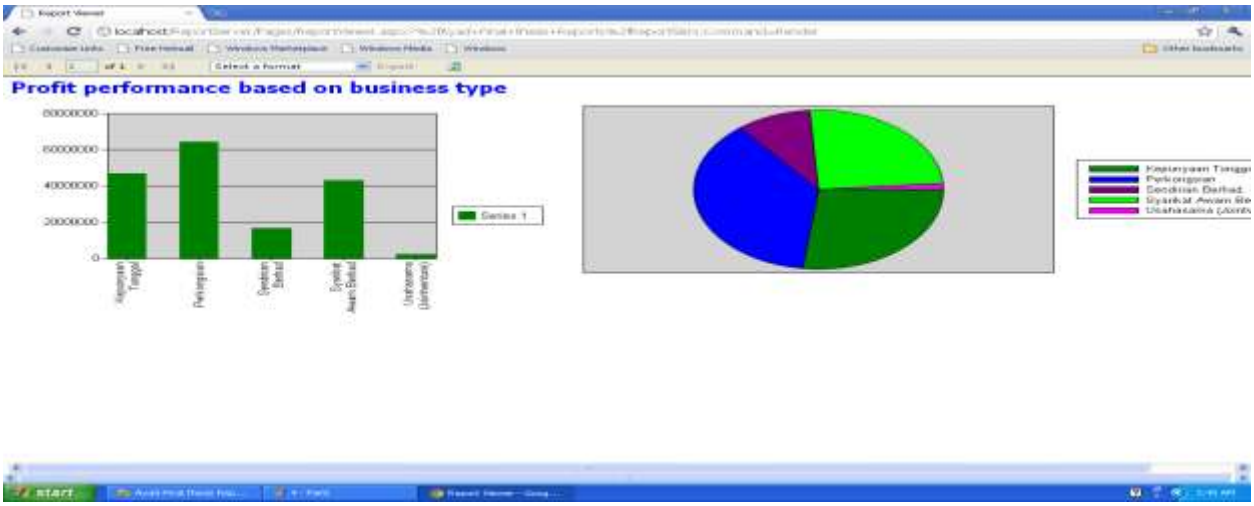


Figure4.41: Profit performance Vs business type

4.7.6 Profit Analyst based on gender and race.

This report summarizes the Analysis profit based on gender and racein Malaysia. The summary could be easily analyzed through the histograms as depicted in Figure 4.42.

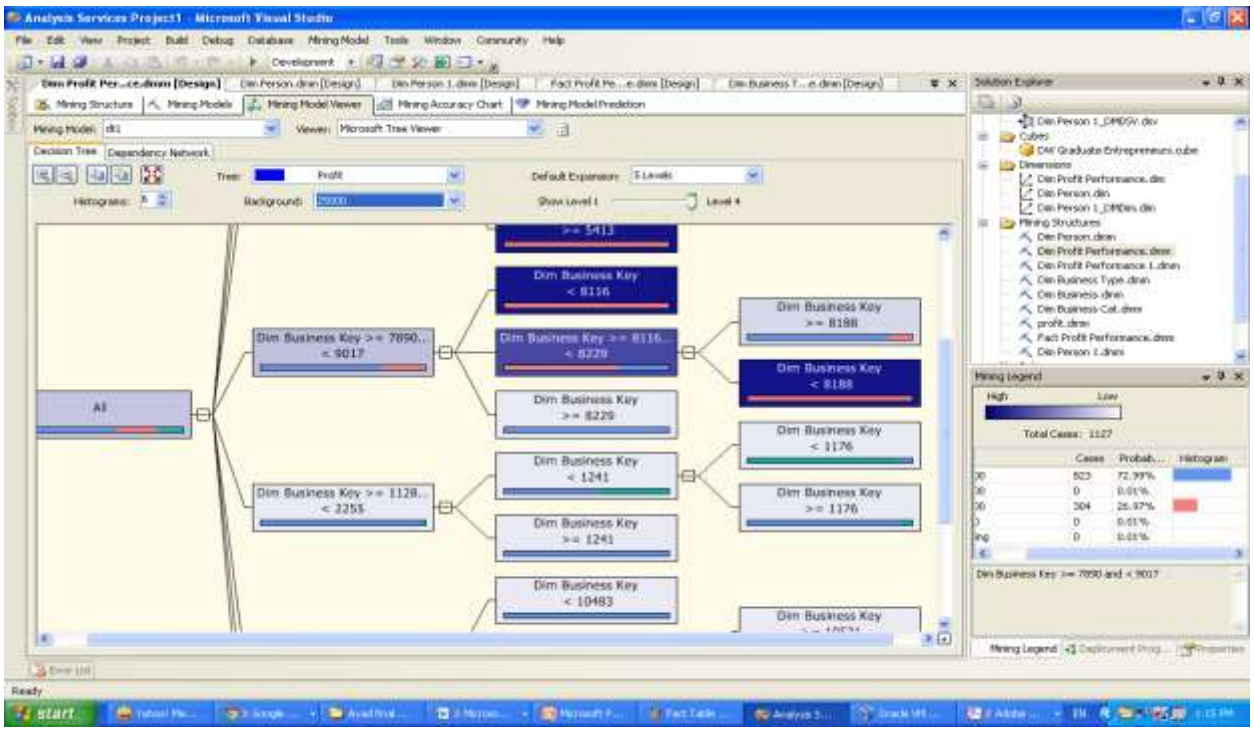


Figure 4.42: Profit Analyst based on Gender and Race

4.8 Conclusion

This chapter explains the process of developing the DSRNCO that presents analytical reports at ANGKASA. The development process of DSRNCO started at a requirement process, which is using CoDMODS model for gathering the requirement. The requirement in DSRNCO is divided to a functional and non-functional requirement. Then, UML was used for DSRNCO system design that is emphasized on the use case, activity and sequence diagram. For data design, Dimension Modeling consists of fact and dimension tables are developed. Next, ETL design is used to transform data from data sources to DW. The development of an analytical report is based on the requirements captured in required analysis phases and proposed design model. The end of this chapter is discuses about DSRNCO prototype development.

CHAPTER FIVE
PROTOTYPE TESTING AND RESULTS

5.1 Introduction

This chapter discusses and analyzes the data collected through prototype testing and questionnaire. The term evaluation refers to the system testing with the actual users. As mentioned in Chapter 3, this study uses questionnaire tests, which can be found in Appendix-A and Appendix-B. This chapter focuses on the two evaluation methods and the data analysis and findings.

5.2 Usability Testing

The ISO 9241 standard identifies the usability in terms of effectiveness, efficiency and satisfaction, which is precisely for users to achieve specified goals in a particular context of use (Bevan, 1995). The CSUQ was used to test the DSRNCO which measures three constructs of usability context. The usability contexts are divided into three categories;

i. The system usefulness (items no. 1 to 8)

ii. Information quality (items no. 9-15)

iii. Interface quality (items no. 16-18)

For each of the items, users were asked to provide an answer on 7-point Likert scale which is ranked from “Strongly Agree” to “Strongly Disagree” (Chow & Chan, 2009). According to Lewis (1995) the usability practitioners can use CSUQ (Appendix A) to aid the users in measuring the user satisfactions in context of scenario based usability studies.

5.2 Evaluation Results

Basically, the most important step is to evaluate the DSRNCO in terms of user satisfaction and system's usability:

i. The data collection from users feedbacks are used to determine users demographics and experiences such as race, gender and working experience,

ii. It is also validated through the CSUQ by user's feedbacks and the results are shown indescriptive statistics (Mean and Std. Deviation).

The DSRNCO was evaluated by 30 respondents from ANGKASA. Results of Section A (general information) are presented in Figure 5.1, Figure 5.2 and Figure 5.3. Generally, the information shows that 66.7% of the overall respondent's managers while 33.3% were supervisors. It is also indicated that 41.7% of the respondents were females, and 58.3% were males. In addition, 75% of them had less than five years of working experience, while 8.3% of the respondents had between 5 and 10 years working experience, and 16.7% of the respondents had worked more than 15 years.

Management Level	Frequency	Percent	Valid Percent	Cumulative Percent
Manager	20	66.7 %	66.7 %	66.7 %
Supervisor	10	33.3 %	33.3 %	33.3 %
Total	30	100 %	100 %	100 %

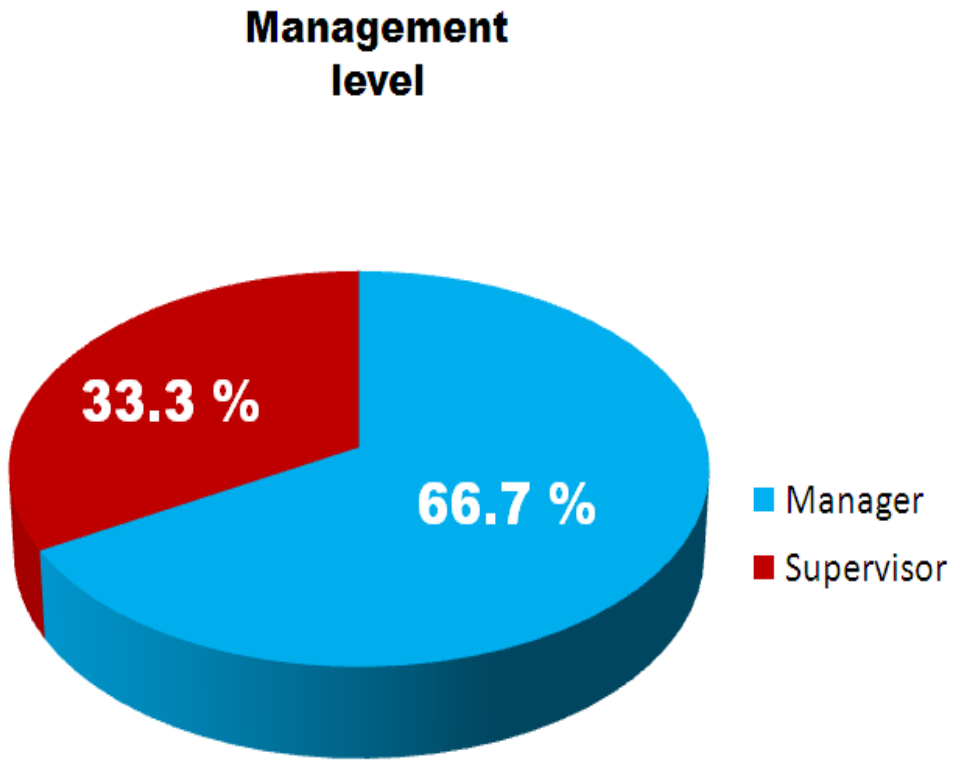


Figure 5.1: Management Ratio

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	12	40 %	40 %	40%
Male	18	60 %	60 %	60 %
Total	30	100 %	100 %	100 %

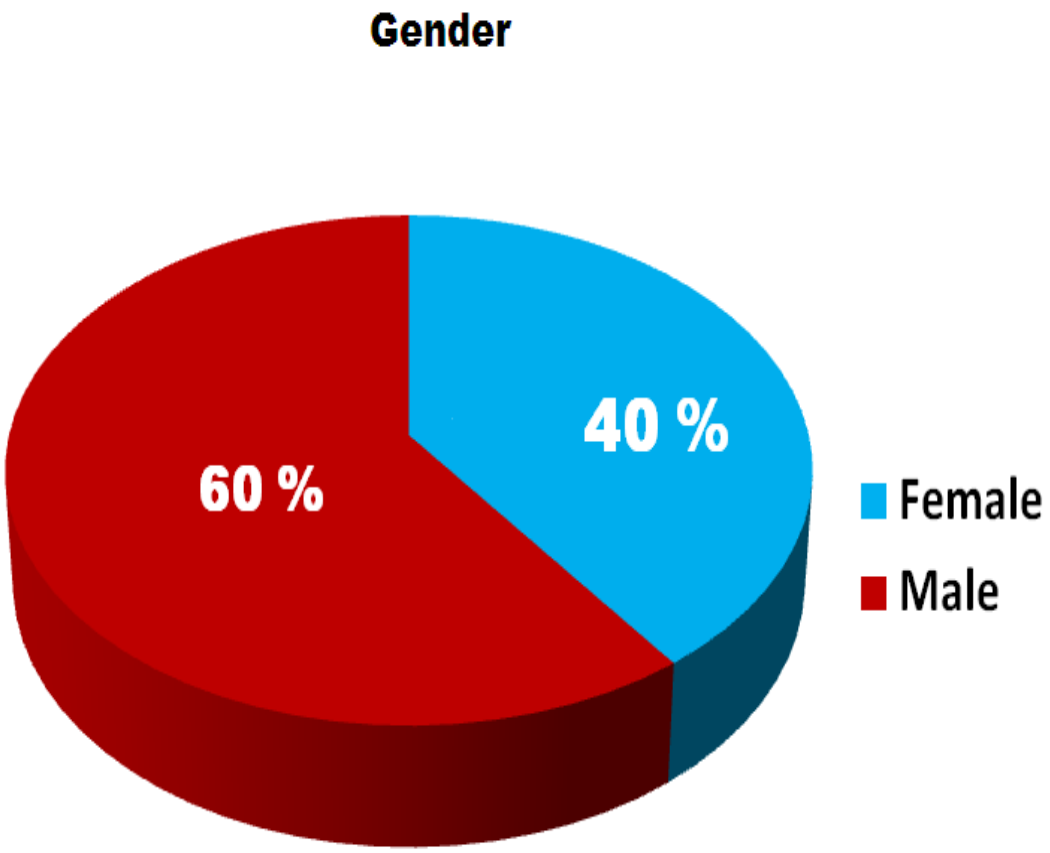


Figure 52: Gender Ratio

Work Experience	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 5 years	21	70.0 %	70.0 %	70.0 %
5 – 10 years	3	10.0 %	10.0 %	10.0 %
15-years and above	6	20.0 %	20.0 %	20.0 %
Total	30	100 %	100 %	100 %

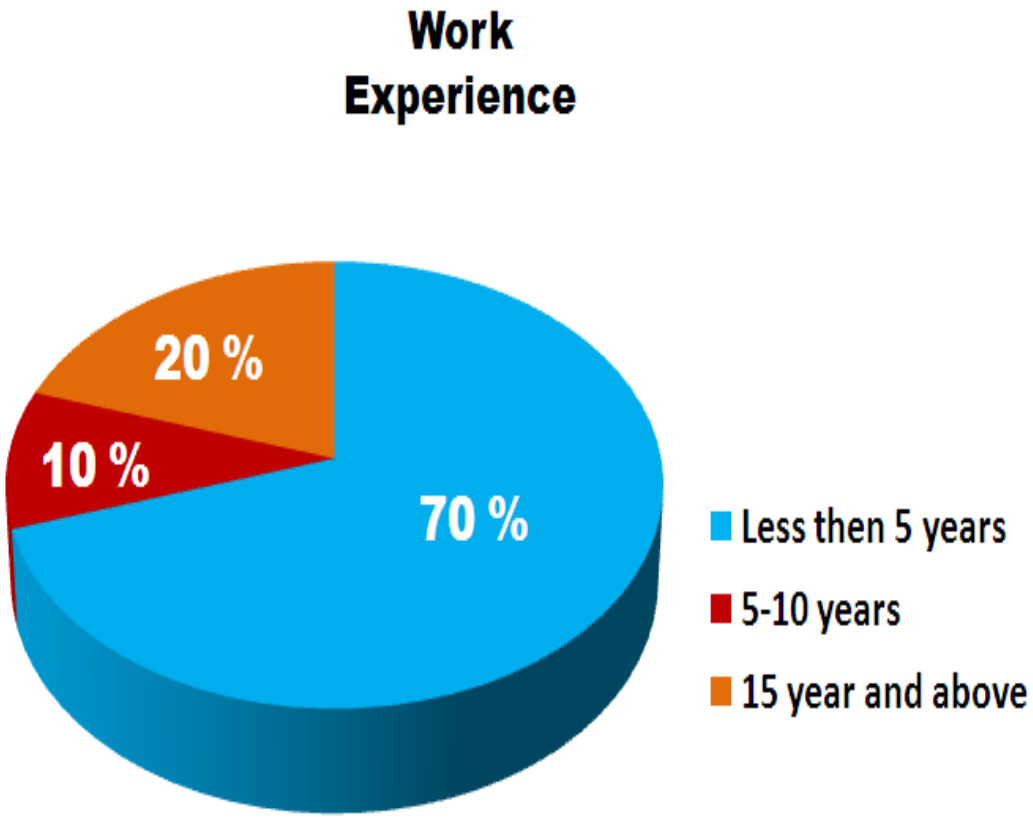


Figure 5.3: Work Experience Ratio

The results regarding the satisfaction of DSRNCO (in terms of usability) are presented in Section B. 30 respondents among ANGKASA staffs answered the questionnaires. Scores were used to calculate the means. As can be seen in Figure 5.4, all means are greater than 5. From the means, it could be understood that the DSRNCO is highly satisfied by the users.

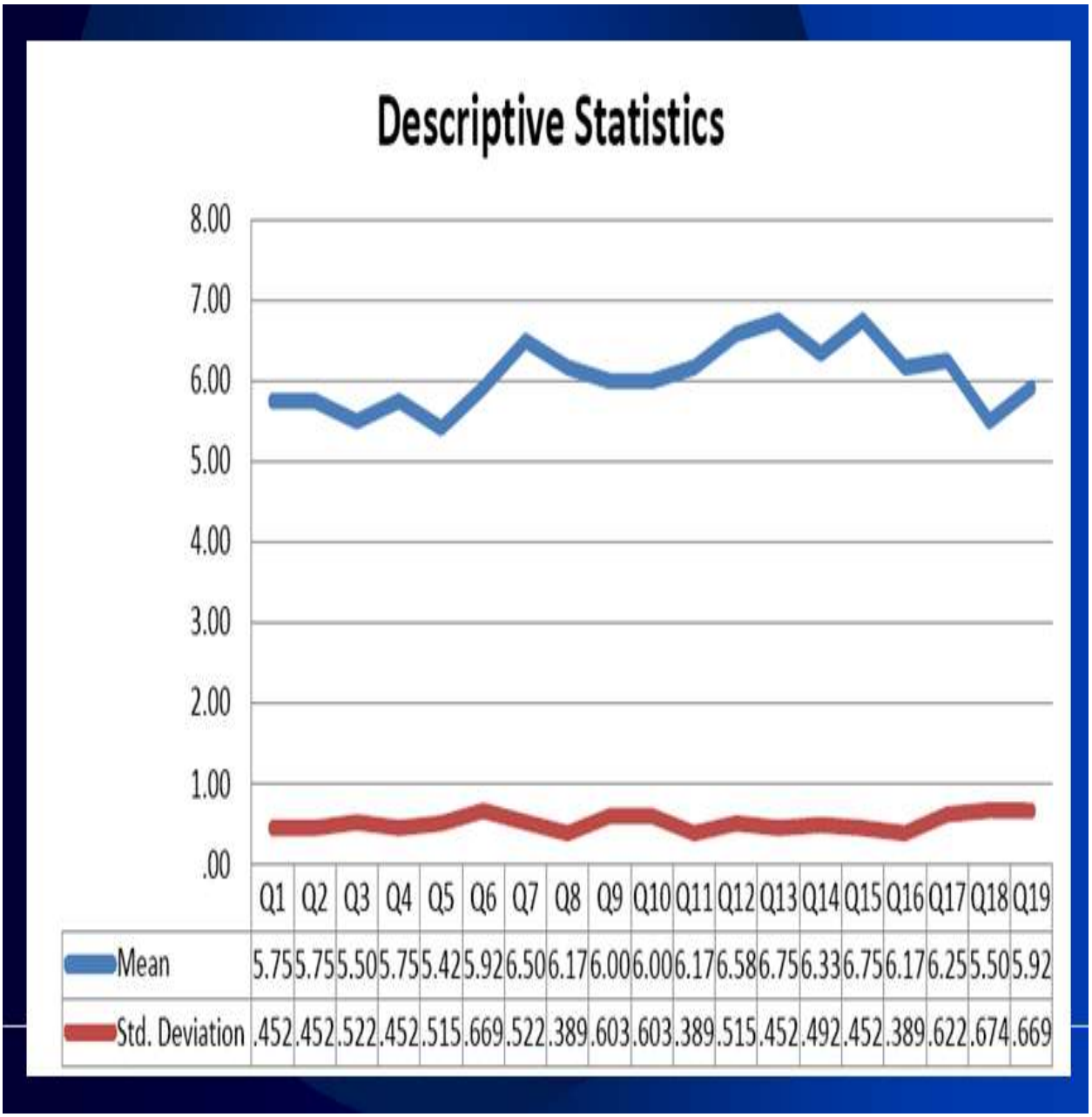


Figure 5.4: The descriptive statistics for Section B

5.3 Conclusion

This chapter discusses and illustrates the results and finding from CSUQ. From the data analysis, it is confirmed that the DSRNCO incorporating a DM model is satisfied by the ANGKASA management.DSRNCO has been tested through the system user feedback by using CSUQ, which measures satisfaction and consumer usability. The questionnaire is adopted from Lewis (1995), contains of 19 questions and 7 degrees of likert scale (1-strongly disagree – 7-strongly agree). There are 30 respondents participated in these questionnaires whichare, tested the DSRNCO prototype from ANGKASA staffs.

CHAPTER SIX
CONCLUSION AND DISCUSSION

6.1 Introduction

This chapter summarizes and reviews about the findings in the previous chapter. This chapter also discusses about the contributions of the study, some limitations of this study, and recommendations for future works. In conclusion, this study achieves the objectives as stated in Chapter 1 that are:

i. Requirement specification.

ii. DW and DT model for developing DSRNCO.

iii. DSRNCO usability.

The requirements for developing DSRNCO in ANGKASA was specified and illustrated in Chapter 4 including the determination of the right requirements for analytical reports and the system prototype. This study also includes the analysis for the prototype which is later used to design and develop the DSRNCO by using DW Model.The final objective is to evaluate the usability of DSRNCO, which was done by using IBM CSUQ questionnaires as explained in Chapter 5. The respondents who participated in the testing were in ANGKASA, who is the actual users.

6.2 Contribution of the Study

The prototype developed in this study allows users (admin, manager and staff) to gain a reliable, quality and updated information through analytical reports. In addition, the prototype utilizes web-based technologies, which allows users to access and present the reports at anytime anywhere. Finally, the model in this study can be used as guidelines by BI developers to design and develop analytical reports using DW Model in other domains.

6.3 Project Limitations

The project has encountered a few limitations which are described as follows:

i. Time limitation to develop DW Project (includes the requirement gathering, understanding DW, DW design, and prototype development)

ii. A lack of data in ANGKASA‟s database contributes a problem to create strategic report for the management in order to make decision by using DW model.

6.4 Recommendations for Future Works

A few projected works for the future listed in the following:

i. Building BI dashboard, which can represent the Key Performance Indicators (KPI) by using multi-dimensional analysis in the real time based on strategic analysis.

ii. Using the data mining in ETL, the quality of the data is one of the most important concerned in BI project by using data mining query transformation that allows users to modify,or redirect the records depending on the result of data mining prediction.

iii. Focusing on analysis service tools which give advance understanding via detailed strategic data in the organization.

6.5 Conclusion

Every organization such as university, company, banking and factory has huge operational data for decision making and analytical reports. An operational data comes from different locations, various operating systems and numerous types of databases that should be integrated into a single storage. Becoming a quality and meaningful information, the data should be cleaned, aggregated and summarized in the DW by using OLAP cube. And then, from the OLAP cube, the users (admin, managers and staff) can access into a strategic and analytical report without referring to the operational system. This study shows that the process on how to design and develop strategic reports by using DW, DT and BI applications. This model can give a guideline to develop other strategic reports in different domains. However, to develop a high-quality BI application, the requirements from users should be corresponding to the organizations' objectives. Then, OLAP can be developed by using dimensional modeling to produce strategic and analytical reports, especially for the top management to make quality decision-making process. Moreover, the DW is an appropriate and excellent technology to develop analytical reports for the management in the organizations.

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Appendix A
Questionnaire

COLLEGE OF ATRS AND SCIENCES

UNIVERSITY UTARA MALAYSIA

DEVELOPING STRATEGIC REPORTS FOR NATIONAL CO-OPERATIVE OF MALAYSIA (ANGKASA) USING DATA WAREHOUSE MODEL AND DECISION TREE MODEL

I am Master of Science (Information Technology) student at final semester in University Utara Malaysia.

The aims of this questionnaire

i. Gain information about prototype users.
ii. This is the most important step of which occurs after the prototype development that use with the right way in finalizing of the prototype, by test DSRNCO satisfied (in term of usability) for system users, base one the result that will help and make me better understand the requirements to finalizing Graduate Entrepreneur Analytical Reports (DSRNCO) Using Data Warehouse Model.

All your information will be held in strictest confidence and it will be used for research purpose only. Your insights a feedback in making this study successful is highly appreciated. If you have any queries, please do contact me at 010-5652237 Ayad H. Mousa Al- badri or through the e-mail: maryemayad@yahoo.com or Albadri_ayad@yahoo.com .

This questionnaire consists of two sections:

i. **Section A - General Information**
ii. **Section B - System Usability**

This questionnaire is adopted from Lewis, J. R. (1995) IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use.

Thank you for your valuable time and help in completing this questionnaire.

MSc. IT Candidate

Ayad H. Mousa Al- Badri

PLEASE RATE THE USABILITY OF THE SYSTEM.

- Please answer to all the items.
- Please tick one only, except question 4-Section A.

A. GENERAL INFORMATION

This section is about your background information. Please fill up the blanks and mark (√) the most appropriate

1. Gender [ ] Male [ ] Female

2. Working Experience [ ] Less Than 5 years [ ] 5 – 10 years

[ ] 11- 15 years [ ] 15-years and above

3. Management Level [ ] Manager [ ] Supervisor

[ ] Operational

4. What type of report did you used? (You can tick more than one)

[ ] Analytical

[ ] Tactical

[ ] Operational

B. SYSTEM USABILITY

(Refer to DSRNCO)

No	Items	Strongly agree	1	2	3	4	5	6	7	Strongly disagree
1	Overall, I am satisfied with how easy it is to use this system									
2	It was simple to use this system									
3	I can effectively complete my work using this system									
4	I am able to complete my work quickly using this system									
5	I am able to efficiently complete my work using									

	this system									
6	I feel comfortable using this system									
7	It was easy to learn to use this system									
8	believe I became productive quickly using this system									
9	The system gives error messages that clearly tell me how to fix problems									
10	Whenever I make a mistake using the system, I recover easily and quickly									
11	The information (such as online help, on-screen messages, and other documentation) provided with this system is clear									
12	It is easy to find the information I needed									
13	The information provided for the system is easy to understand									
14	The information is effective in helping me complete the tasks and scenarios									
15	The organization of information on the system screens is clear									
16	The interface of this system is pleasant									
17	I like using the interface of this system									
18	This system has all the functions and capabilities I expect it to have									
19	Overall, I am satisfied with this system									

Thank you for your commitment.

AppendixB
System coding

```
/****** Object:  Database [ANGKASA DW]    Script Date: 06/04/2011 02:48:25
******/
CREATEDATABASE [ANGKASA DW] ONPRIMARY
(NAME= N'ANGKASA DW',FILENAME= N'c:\Program Files\Microsoft SQL
Server\MSSQL.4\MSSQL\DATA\ANGKASA DW.mdf',SIZE= 6336KB ,MAXSIZE=
UNLIMITED,FILEGROWTH= 1024KB )
LOGON
(NAME= N'ANGKASA DW_log',FILENAME= N'c:\Program Files\Microsoft SQL
Server\MSSQL.4\MSSQL\DATA\ANGKASA DW_log.LDF',SIZE= 7616KB ,MAXSIZE= 2048GB
,FILEGROWTH= 10%)
COLLATE SQL_Latin1_General_CP1_CI_AS
GO
EXEC dbo.sp_dbcmptlevel @dbname=N'ANGKASA DW', @new_cmptlevel=90
GO
IF(1 =FULLTEXTSERVICEPROPERTY('IsFullTextInstalled'))
begin
EXEC [ANGKASA DW].[dbo].[sp_fulltext_database] @action ='enable'
end
GO
ALTERDATABASE [ANGKASA DW] SET ANSI_NULL_DEFAULT OFF
GO
ALTERDATABASE [ANGKASA DW] SETANSI_NULLSOFF
GO
ALTERDATABASE [ANGKASA DW] SETANSI_PADDINGOFF
GO
ALTERDATABASE [ANGKASA DW] SETANSI_WARNINGSOFF
GO
ALTERDATABASE [ANGKASA DW] SETARITHABORTOFF
GO
ALTERDATABASE [ANGKASA DW] SET AUTO_CLOSE ON
GO
ALTERDATABASE [ANGKASA DW] SET AUTO_CREATE_STATISTICS ON
GO
ALTERDATABASE [ANGKASA DW] SET AUTO_SHRINK OFF
GO
ALTERDATABASE [ANGKASA DW] SET AUTO_UPDATE_STATISTICS ON
GO
ALTERDATABASE [ANGKASA DW] SETCURSOR_CLOSE_ON_COMMITOFF
GO
ALTERDATABASE [ANGKASA DW] SET CURSOR_DEFAULT  GLOBAL
GO
ALTERDATABASE [ANGKASA DW] SETCONCAT_NULL_YIELDS_NULLOFF
GO
ALTERDATABASE [ANGKASA DW] SETNUMERIC_ROUNDABORTOFF
GO
ALTERDATABASE [ANGKASA DW] SETQUOTED_IDENTIFIEROFF
GO
ALTERDATABASE [ANGKASA DW] SET RECURSIVE_TRIGGERS OFF
GO
ALTERDATABASE [ANGKASA DW] SET  ENABLE_BROKER
GO
ALTERDATABASE [ANGKASA DW] SET AUTO_UPDATE_STATISTICS_ASYNC OFF
GO
ALTERDATABASE [ANGKASA DW] SET DATE_CORRELATION_OPTIMIZATION OFF
GO
ALTERDATABASE [ANGKASA DW] SET TRUSTWORTHY OFF
GO
```

```
ALTERDATABASE [ANGKASA DW] SET ALLOW_SNAPSHOT_ISOLATION OFF
GO
ALTERDATABASE [ANGKASA DW] SET PARAMETERIZATION SIMPLE
GO
ALTERDATABASE [ANGKASA DW] SET  READ_WRITE
GO
ALTERDATABASE [ANGKASA DW] SET RECOVERY SIMPLE
GO
ALTERDATABASE [ANGKASA DW] SET  MULTI_USER
GO
ALTERDATABASE [ANGKASA DW] SET PAGE_VERIFY CHECKSUM
GO
ALTERDATABASE [ANGKASA DW] SET DB_CHAINING OFF

************************************************************************************
USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimAStatus]    Script Date: 06/04/2011 02:23:59
******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimAStatus](
      [AStatusKey] [int] IDENTITY(1,1)NOTNULL,
      [AStatus] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [AStatusKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF

************************************************************************************

USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimBusinessCat]    Script Date: 06/04/2011
02:25:23 ******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimBusinessCat](
      [DimBusinessCatKey] [int] IDENTITY(1,1)NOTNULL,
      [BusinessCat] [varchar](100)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [DimBusinessCatKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]
```

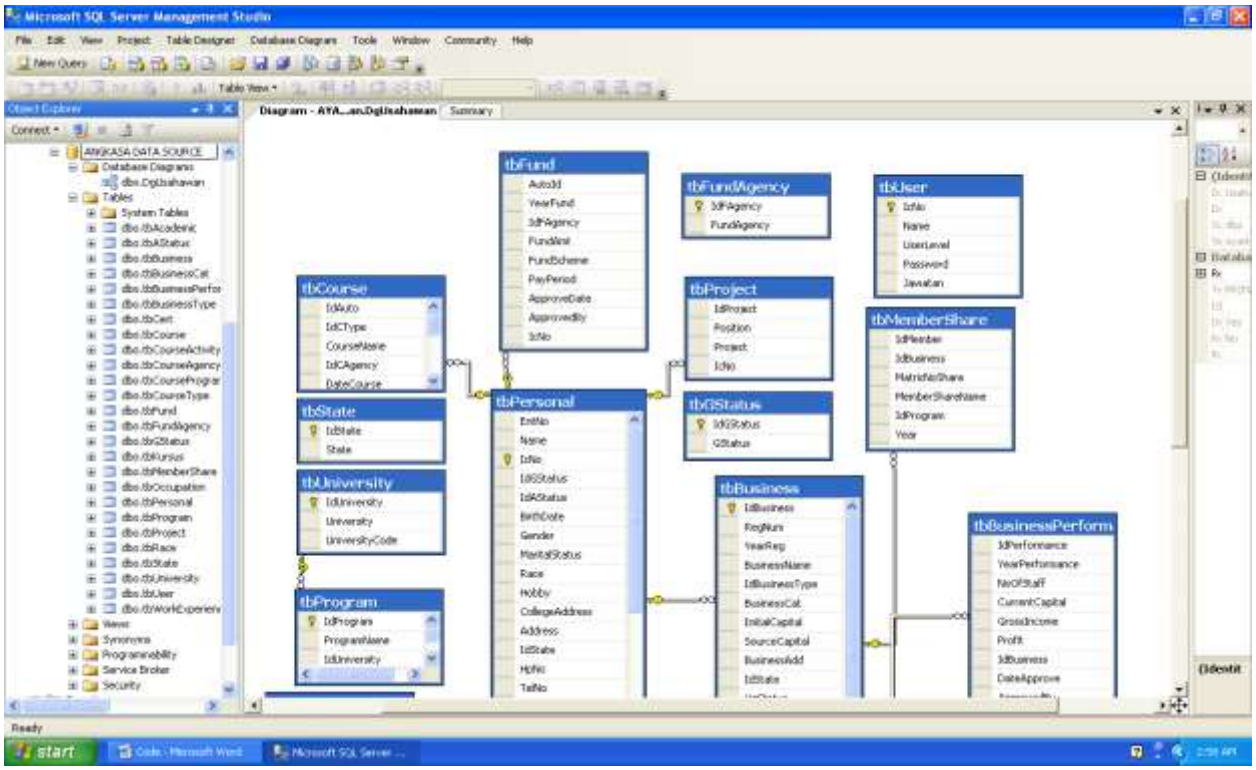
```
GO
SETANSI_PADDINGOFF
************************************************************************



USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimBusinessType]    Script Date: 06/04/2011
02:25:58 ******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimBusinessType](
      [BusinessTypeKey] [int] IDENTITY(1,1)NOTNULL,
      [BusinessType] [varchar](100)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [BusinessTypeKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF

************************************************************************
USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimDateTime]    Script Date: 06/04/2011
02:26:47 ******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimDateTime](
      [DimDateTime] [int] IDENTITY(1,1)NOTNULL,
      [YearPerformance] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS
NULL,
PRIMARYKEYCLUSTERED
(
      [DimDateTime] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF

************************************************************************
```

```
USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimGender]    Script Date: 06/04/2011 02:27:31
******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimGender](
      [DimGenderKey] [int] IDENTITY(1,1)NOTNULL,
      [Gender] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [DimGenderKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF


**************************************************************************


USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimGStatus]    Script Date: 06/04/2011 02:28:10
******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimGStatus](
      [GStatusKey] [int] IDENTITY(1,1)NOTNULL,
      [GStatus] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [GStatusKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF




**************************************************************************
```

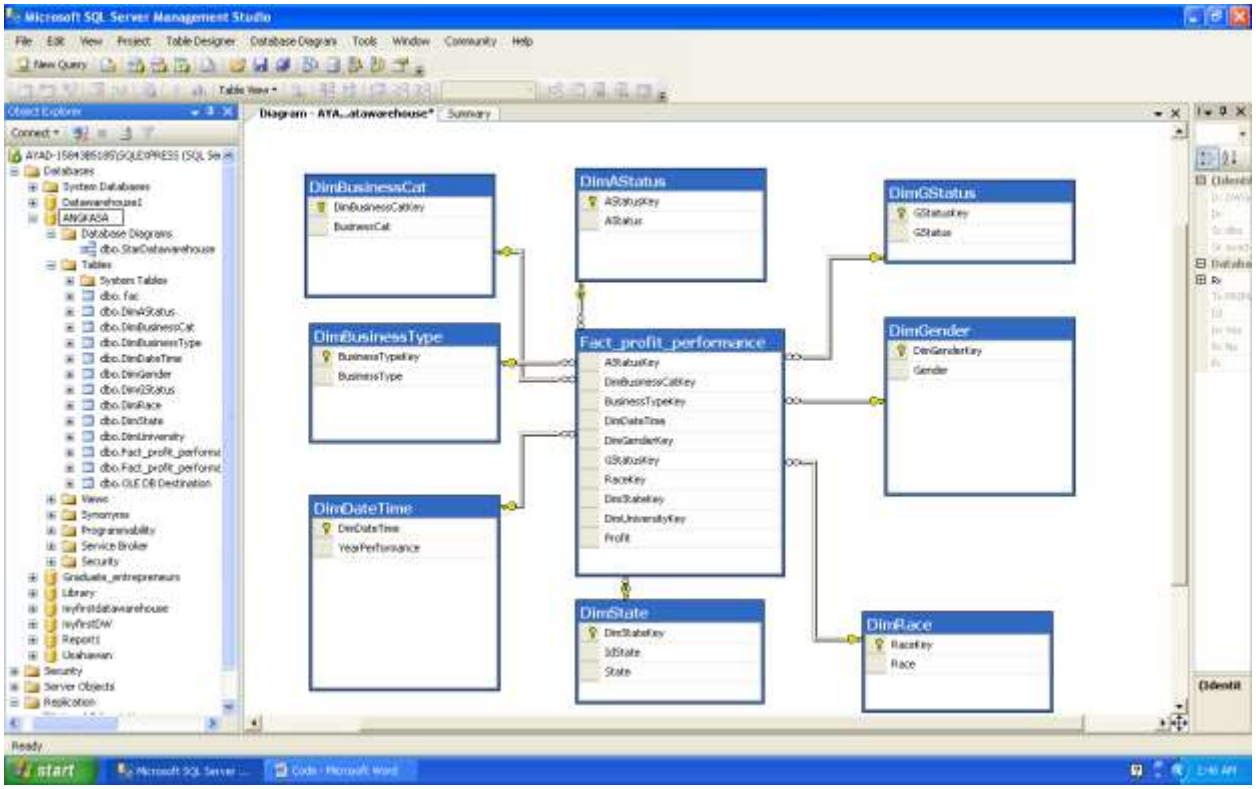
```
USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimRace]    Script Date: 06/04/2011 02:28:45
******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimRace](
      [RaceKey] [int] IDENTITY(1,1)NOTNULL,
      [Race] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [RaceKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF


**********************************************************************************


USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[DimState]    Script Date: 06/04/2011 02:29:29
******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[DimState](
      [DimStateKey] [int] IDENTITY(1,1)NOTNULL,
      [IdState] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [State] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
PRIMARYKEYCLUSTERED
(
      [DimStateKey] ASC
)WITH(IGNORE_DUP_KEY =OFF)ON [PRIMARY]
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF



**********************************************************************************
```

```
USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[Fact_profit_performance]    Script Date:
06/04/2011 02:30:08 ******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
CREATETABLE [dbo].[Fact_profit_performance](
      [AStatusKey] [int] NULL,
      [DimBusinessCatKey] [int] NULL,
      [BusinessTypeKey] [int] NULL,
      [DimDateTime] [int] NULL,
      [DimGenderKey] [int] NULL,
      [GStatusKey] [int] NULL,
      [RaceKey] [int] NULL,
      [DimStateKey] [int] NULL,
      [DimUniversityKey] [int] NULL,
      [Profit] [float] NULL
)ON [PRIMARY]

GO
USE [ANGKASA DW]
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimAStatus] FOREIGNKEY([AStatusKey])
REFERENCES [dbo].[DimAStatus] ([AStatusKey])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimBusinessCat] FOREIGNKEY([DimBusinessCatKey])
REFERENCES [dbo].[DimBusinessCat] ([DimBusinessCatKey])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimBusinessType] FOREIGNKEY([BusinessTypeKey])
REFERENCES [dbo].[DimBusinessType] ([BusinessTypeKey])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimDateTime] FOREIGNKEY([DimDateTime])
REFERENCES [dbo].[DimDateTime] ([DimDateTime])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimGender] FOREIGNKEY([DimGenderKey])
REFERENCES [dbo].[DimGender] ([DimGenderKey])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimGStatus] FOREIGNKEY([GStatusKey])
REFERENCES [dbo].[DimGStatus] ([GStatusKey])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimRace] FOREIGNKEY([RaceKey])
REFERENCES [dbo].[DimRace] ([RaceKey])
GO
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimState] FOREIGNKEY([DimStateKey])
REFERENCES [dbo].[DimState] ([DimStateKey])
GO
```

```
ALTERTABLE [dbo].[Fact_profit_performance]  WITHCHECKADDCONSTRAINT
[FK_Fact_profit_performance_DimUniversity] FOREIGNKEY([DimUniversityKey])
REFERENCES [dbo].[DimUniversity] ([DimUniversityKey])


******************************************************************************



USE [ANGKASA DW]
GO
/****** Object:  Table [dbo].[OLE DB Destination]    Script Date: 06/04/2011
02:31:06 ******/
SETANSI_NULLSON
GO
SETQUOTED_IDENTIFIERON
GO
SETANSI_PADDINGON
GO
CREATETABLE [dbo].[OLE DB Destination](
      [State] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [AStatus] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [GStatus] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [University] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [Race] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [Gender] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [YearPerformance] [varchar](50)COLLATE SQL_Latin1_General_CP1_CI_AS
NULL,
      [BusinessCat] [varchar](100)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [BusinessType] [varchar](100)COLLATE SQL_Latin1_General_CP1_CI_AS NULL,
      [AStatusKey] [int] NULL,
      [DimBusinessCatKey] [int] NULL,
      [BusinessTypeKey] [int] NULL,
      [DimDateTime] [int] NULL,
      [DimGenderKey] [int] NULL,
      [GStatusKey] [int] NULL,
      [RaceKey] [int] NULL,
      [DimStateKey] [int] NULL,
      [DimUniversityKey] [int] NULL,
      [Profit] [float] NULL
)ON [PRIMARY]

GO
SETANSI_PADDINGOFF
```



ANGKASA DATA SOURCE



ANGKASA DATA WAREHOUSE

// Login Page code

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;
using System.Data.SqlClient;

publicpartialclassLogin : System.Web.UI.Page
{
protectedvoid Page_Load(object sender, EventArgs e)
    {

    }
protectedvoid Button1_Click(object sender, EventArgs e)
    {
string id, PASS;
        id = TextBox1.Text;
        PASS = TextBox2.Text;
SqlConnection conn15 =
newSqlConnection(ConfigurationManager.ConnectionStrings["masterConnectionStri
ng"].ToString());

string str = "select * from Admin where UserName = '" + id + "'" + "and
PassWord='" + PASS + "'";
SqlCommand cmd = newSqlCommand(str, conn15);
        conn15.Open();
SqlDataReader red = cmd.ExecuteReader();
if (red.HasRows)
        {
           Response.Redirect("add.aspx");
        }

else
        {
            TextBox1.Text = "";
            TextBox2.Text = "";

            Label1.Visible = true;
            Label1.Text = "Wrong Username or Password , Try Again";
        }

        TextBox1.Text = "";
        TextBox2.Text = "";

        conn15.Close();

    }
}
```

//Insert Page code

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;
using System.Data.SqlClient;

publicpartialclassInsert : System.Web.UI.Page
{
publicString text1;
publicString text2;
publicString text3;
publicString text4;
protectedvoid Page_Load(object sender, EventArgs e)
    {

    }
protectedvoid Button1_Click(object sender, EventArgs e)
    {
SqlConnection conn =
newSqlConnection(ConfigurationManager.ConnectionStrings["masterConnectionStri
ng"].ToString());


        text1 = TextBox1.Text;
        text2 = TextBox2.Text;
        text3 = TextBox3.Text;
        text4 = TextBox4.Text;
string str1 = "insert into Admin (UserName,PassWord,Email,Position) values('"
+ text1 + "','" + text2 + "','" + text3 + "','" + text4 +"' )";
SqlDataAdapter db1 = newSqlDataAdapter(str1, conn);
DataTable dt1 = newDataTable();
SqlCommand cmd = newSqlCommand(str1, conn);
        conn.Open();
        db1.Fill(dt1);

        TextBox1.Text = "";
        TextBox2.Text = "";
        TextBox3.Text = "";
        TextBox4.Text = "";
        conn.Close();
    }
}
```

//Update Page code

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;
using System.Data.SqlClient;

publicpartialclassUpdate : System.Web.UI.Page
{
protectedvoid Page_Load(object sender, EventArgs e)
    {

    }
protectedvoid Button1_Click(object sender, EventArgs e)
    {
SqlConnection conn =
newSqlConnection(ConfigurationManager.ConnectionStrings["masterConnectionStri
ng"].ToString());


if (TextBox1.Text == null || TextBox1.Text == "")
        {
            Label2.Visible = true;
            Label2.Text = " Please input The name you want to Delete";
        }
else
        {
string str1 = "UPDATE Admin SET UserName='"+TextBox1.Text+ "',PassWord='"+
TextBox2.Text+"',Email='"+ TextBox3.Text+"',Position='"+TextBox4.Text+"'where
UserName='" + TextBox1.Text + "'";
SqlDataAdapter db1 = newSqlDataAdapter(str1, conn);
DataTable dt1 = newDataTable();
SqlCommand cmd = newSqlCommand(str1, conn);
            conn.Open();
            db1.Fill(dt1);


            conn.Close();
        }
    }
}
```

//Delete Page code

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;
using System.Data.SqlClient;
publicpartialclassDelete : System.Web.UI.Page
{
string text1;
protectedvoid Page_Load(object sender, EventArgs e)
    {

    }
protectedvoid Button1_Click(object sender, EventArgs e)
    {
SqlConnection conn =
newSqlConnection(ConfigurationManager.ConnectionStrings["masterConnectionStri
ng"].ToString());


if (TextBox1.Text == null || TextBox1.Text == "")
        {
            Label2.Visible = true;
            Label2.Text = " Please input The name you want to Delete";
        }
else
        {

string str1 = "Delete From Admin where UserName='" + TextBox1.Text + "'";
SqlDataAdapter db1 = newSqlDataAdapter(str1, conn);
DataTable dt1 = newDataTable();
SqlCommand cmd = newSqlCommand(str1, conn);
            conn.Open();
            db1.Fill(dt1);


            conn.Close();
        }
    }
}
```

// Select Page code

```
using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;
using System.Data.SqlClient;

publicpartialclassADD_Admin : System.Web.UI.Page
{
protectedvoid Page_Load(object sender, EventArgs e)
    {
        GridView1.Visible = false;

    }
protectedvoid Headerl1_Load(object sender, EventArgs e)
    {

    }
protectedvoid Button2_Click(object sender, EventArgs e)
    {

SqlConnection conn =
newSqlConnection(ConfigurationManager.ConnectionStrings["masterConnectionStri
ng"].ToString());

string str = "select * from Admin ";
SqlCommand cmd = newSqlCommand(str, conn);
        conn.Open();

        GridView1.DataSource = cmd.ExecuteReader();

if (GridView1.HasAttributes != (null))
        {
            Label1.Visible = false;
            GridView1.DataBind();
            GridView1.Visible = true ;
            conn.Close();
        }

        conn =
newSqlConnection(ConfigurationManager.ConnectionStrings["masterConnectionStri
ng"].ToString());

       str = "select * from Admin ";
        cmd = newSqlCommand(str, conn);
        conn.Open();
SqlDataReader red = cmd.ExecuteReader();
if (!red.HasRows)
```

```
        {

            Label1.Visible = true;
            Label1.Text = "Not Found";
        }

        conn.Close();
    }
```

//Web configration code

```
<?xmlversion="1.0"?>
<!--
    Note: As an alternative to hand editing this file you can use the
    web admin tool to configure settings for your application. Use
    the Website->Asp.Net Configuration option in Visual Studio.
    A full list of settings and comments can be found in
    machine.config.comments usually located in
    \Windows\Microsoft.Net\Framework\v2.x\Config
-->
<configuration>
      <appSettings/>
      <connectionStrings>
<addname="masterConnectionString"connectionString="Data Source=UUM-
4E453220D25\SQLEXPRESS;Initial Catalog=master;Integrated Security=True"
providerName="System.Data.SqlClient" />
</connectionStrings>
      <system.web>
            <!--
            Set compilation debug="true" to insert debugging
            symbols into the compiled page. Because this
            affects performance, set this value to true only
            during development.
-->
            <compilationdebug="true"/>
            <!--
            The <authentication> section enables configuration
            of the security authentication mode used by
            ASP.NET to identify an incoming user.
-->
            <authenticationmode="Windows"/>
            <!--
            The <customErrors> section enables configuration
            of what to do if/when an unhandled error occurs
            during the execution of a request. Specifically,
            it enables developers to configure html error pages
            to be displayed in place of a error stack trace.
<customErrors mode="RemoteOnly" defaultRedirect="GenericErrorPage.htm">
<error statusCode="403" redirect="NoAccess.htm" />
<error statusCode="404" redirect="FileNotFound.htm" />
</customErrors>
-->
      </system.web>
</configuration>
```