

Bill of Materials Report Management System

by

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the requirement for the
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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Business Information System Programme
Universiti Teknologi PETRONAS
in partial fulfillment of the requirement for the
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(BUSINESS INFORMATION SYSTEM)

Approved by,

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September 2013

CERTIFICATION OF ORIGINALITY

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

MUHAMMAD MUNZIR BIN SHAFIE

ABSTRACT

In any manufacturing company, Bill of Materials (BOM) is like their backbone or secret recipe to manufacture their product. It is very crucial to have a very accurate data of BOM and the way the BOM are handled is one of the main challenges faced by the team or department that handle it. Scomi Rail Berhad (SRB) Engineering Services Department right now is facing some difficulties to manage BOM where their main task is to analyze the BOM report before it goes to purchasing department. Currently their approach is just by using manual checking which leads to human error thus, inaccuracy of data. So there is a need for a system that can manage and simplify their task. The objective of this project is to develop a computer-based system, Bill of Materials Report Management System for Engineering Services Department in SRB to analyze and manage their BOM reports. Besides, this system also has a picture of the part where it can benefit the newcomers of the company. This system will be developed as a standalone (executable) system using Microsoft Visual Basic and Microsoft Access as the database. As a result, this system will help SRB Engineering Services Department staff to improve the way they analyze and manage the BOM reports which lead to the accuracy of their BOM.

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TABLE OF CONTENTS

ABSTRACT.....	iv
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	vi
LIST OF FIGURES.....	vii
LIST OF ABBREVIATIONS	viii
CHAPTER 1: INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem Statement	1
1.2.1. Problem Identification	2
1.2.2. Significant of the Project.....	3
1.3 Objective & Scope of Study.....	4
1.4 Feasibility of the Project within the Scope and Time Frame	5
CHAPTER 2: LITERATURE REVIEW	6
Bill of Materials (BOM).....	6
Computer Based Management System	7
Usefulness of Computer Based Management System.....	8
CHAPTER 3: RESEARCH METHODOLOGY	10
System Development Life Cycle.....	15
3.1 Planning & Requirement.....	15
3.2 Analysis & Design	17
3.3 Implementation & Deployment.....	18
3.4 Testing & Evaluation	19
Tools Required	19
CHAPTER 4: RESULT AND DISCUSSION	20
CHAPTER 5: CONCLUSION.....	28
Relevancy to the Objective	28
Suggested Future Work for Expansion and Continuation	28
Conclusion.....	29
REFERENCES	30

LIST OF FIGURES

Figure 1: Scope of Study	4
Figure 2: Project Feasibility	5
Figure 3: Monorail on Straddle Beam	11
Figure 4: Monorail on Suspended Beam.....	11
Figure 5: Maglev Monorail.....	12
Figure 7: Train configuration.....	13
Figure 8: BOM Report	14
Figure 9: Process to produce BOM	14
Figure 10: Iterative Development Model.....	15
Figure 11: Gantt Chart	16
Figure 12: Flow Chart	18
Figure 13: Splash Screen	20
Figure 14: Login Dialog Box.....	21
Figure 15: Login Successful!	21
Figure 16: Login Fail	22
Figure 17: Task selection.....	22
Figure 18: View analyzed BOM reports	23
Figure 19: User selection	23
Figure 20: Upload new BOM reports	24
Figure 21: Browse file in PC	25
Figure 22: File Selected	25
Figure 23: Read File.....	26
Figure 24: Save File	27

LIST OF ABBREVIATIONS

<u>Abbv</u>	<u>Definitions</u>
BOM	Bill of Materials
ECA	End Car Assembly
ES	Engineering Services
ICA	Intermediate Car Assembly
ICR	Intercar
PBS	Product Breakdown Structure
SRB	Scomi Rail Berhad
TC	Teamcenter

CHAPTER 1: INTRODUCTION

1.1 Background of Study

This project is developed to simplify and improve the current method of Scomi Rail Bhd. (SRB) Engineering Services Department in handling and analyzing the Bill of Materials (BOM) reports that are extracted from Teamcenter (TC) application by developing the Bill of Materials Report Management System, a computer based management system that will manage the BOM reports well and in an organized way. The system also will help the company as a training material to their newcomers.

Currently, SRB Engineering Services Department is still using the spreadsheet function approach in managing and analyzing the BOM reports. The staff that is in charge of the operation will have to backup which mean to extract the BOM reports from the Teamcenter (TC) application weekly to be analyzed by just using basic spreadsheet functions. The staff later on will simplify the analyzed data to be presented to the upper management.

So, the overall aim of this project is to simplify and improve the SRB Engineering Services department in handling and analyzing the BOM reports and also to measure how this Bill of Materials Report Management System will benefit the company in term of efficiency and productivity of the staff while on the same time helping the company during the introductory of the company to the newcomers.

1.2 Problem Statement

Engineering Services Department at Scomi Rail Bhd. (SRB) is facing some difficulties with their current method in managing and analyzing the BOM reports. Sometimes they are not sure which one is the latest one and which one has been analyzed so it is very hard for them to keep track of the BOM development progress. By using human effort to

analyze the data sometimes it can lead to human error thus affecting the accuracy of the BOM data.

As it is very important in future for them to keep track the BOM reports, so there is a need to improve the SRB Engineering Services department current method by developing a computer based management system that will keep their data in a systematic way.

1.2.1. Problem Identification

Below are some of the problems caused by using the current method to analyze and managing the BOM reports.

Scomi Rail Berhad Engineering Services Department

Efficiency

Basic spreadsheet functions (filter, sort, color code etc.) to analyze the BOM reports is not efficient due to the manual process by the staff and the tendency of them doing mistake is there whether it is high or low and the accuracy of data is very important.

Time Consuming

Due to the manual process by the staff which is not very efficient, the time consumed to analyze the data is also high because the staff has to check manually each and single of the data using human ability.

Systematic

Every time the staff has done analyze the data, it will be saved in some folder, somewhere inside the computer used the staff and some other time, the data will be just saved anywhere and it is not consistent and this kind of system eventually will bring trouble to them in the future.

SRB Engineering Services Staffs

Time Consuming

The current method takes a lot of their time as they need to manually analyze the BOM reports and this job is not the only job they have to do every day because they also have to attend any meeting and other stuffs.

Difficulty to Keep Track

Since the current method has no systematic ways to save the analyzed data, they just save in locally in their hard drive and sometimes it bring trouble to those who want the file but the only one who know the location of the file is the one who save it in the hard drive.

Newcomer Problem

Aside from the major problem, newcomers in the department also have difficulty to blend in with the company's work. The author also have the same problem when joining the company where there is no simpler method to explain what is the company's major business.

1.2.2. Significant of the Project

This system provides features to solve all the problems mentioned. The ES Department staff can analyze the BOM reports in a better way to eliminate human errors. Besides, the system will store all the analyzed data so it is accessible by anyone rather than only one staff know where he/she keep it.

The less time consumed is better and this is what this system will act so the staff can finish their work quicker and continue with other task which lead to better productivity rate. This system also can help newcomer to understand better how the company's product is being manufactured where it can save cost of the company to train their new staff.

1.3 Objective & Scope of Study

The main objective in this project:

1. To conduct a study on how Engineering Services department could improve their productivity and efficiency in handling and analyzing BOM reports.
2. To propose a system that can manage the BOM reports systematically.
3. To develop a computer based system for the Engineering Services department that can manage the BOM reports efficiently and boost the productivity of the staff.

The scope of study for this project will cover two major areas which are Bill of Materials (BOM) and Information System (Computer Based System).

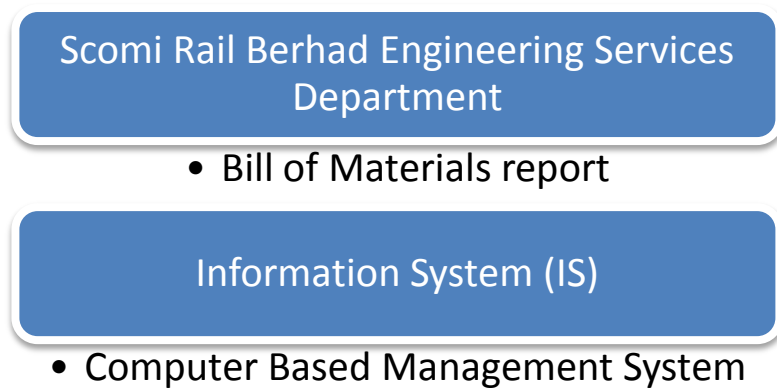


Figure 1: Scope of Study

1.4 Feasibility of the Project within the Scope and Time Frame



Figure 2: Project Feasibility

The time that allocated for this project is within two semesters (two phases) or to be exact 8 months duration. During the first phase, this project will start with the data gathering and system requirement. Some technical research will also be covered on how to implement the idea. The analysis also will be covered during first phase so first phase is more on paperwork but the objective for the first phase is to come out with a basic interface.

The remaining 4 months (second phase) will be focusing on the full development and implementation of the system. First 3 months will be focusing on the developing the system that meets all the requirements and the remaining 1 month will be on implementing and testing the system. In this phase also, the system will be fully tested, documented; operational and procedure are completed and approval is obtained from user and management. The objective for the second phase is to be able to complete the system without missing any important features.

CHAPTER 2: LITERATURE REVIEW

Bill of Materials (BOM)

Engineering Bill of Materials (BOM) always compared to a cake recipe. Both have a list of components of a finished product. While cake recipe has flour, sugar and eggs, BOM has raw materials list, subassemblies and intangibles that sum up to the costs of manufacturing a product. Wrong ingredient in a cake recipe may worsen the final product. [Jon Clancy (1997)]

Bill of Material (BOM) and manufacturing process both are the most important production information in modern manufacturing enterprises and if they neglect those two fundamental data, an enterprise could fall. [Chong Jing Yan (2011)]

Bill of Materials (BOM) such an important data where it covers almost all departments in a manufacturing enterprise. Different departments established different views of BOM in different databases making it hard to keep consistency. So there is a need to satisfy different requirements in various departments. [Chong Jin Yan (2011)]

BOM is a list of raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product. Bill of Materials should include:

- BOM Level
- Part Number
- Part Name
- Phase
- Description
- Quantity
- Unit of Measure
- Procurement Type
- Reference Designators

- BOM Notes

BOM created should consider who will be using it because it may be used for communication between manufacturing partners or to a single manufacturing plant. BOM can define products as they are designed (Engineering Bill of Materials - EBOM), as they are ordered (Sales Bill of Materials), as they are built (Manufacturing Bill of Materials - MBOM) or as they are maintained (Service Bill of Materials).

All of this BOM information should be documented because it will keep the company's business activities and manufacturing tasks on target.

The proposed solution for this research project is to develop an effective computer based management system to manage and help the staff of the Engineering Services department to analyze the BOM report within a short period of time and with less human error.

Computer Based Management System

Based on O'Brien & Marakas (2007), information systems is a combination in an organized way between people, hardware, software, communications networks, data resources and policies and procedures that stores, retrieves, transforms and disseminates information within an organization.

Computer based management system is an information system that uses computer technology to perform some or all tasks and such system can include as little as personal computer and software. It also may include several thousand computers in various sizes that contains hundred of printers, plotters and other devices as well as communication networks and databases. [Turban, Leidner, Mclean & Wetherbe (2008)]

O'Brien & Marakas (2007) in their book list out basic component of information systems which are:

- **Hardware:** Physical layer of the information systems. The examples are computers, video monitors, printers and optical scanner.
- **Software:** Set of programs that instruct the hardware to process the data such as operating system, spreadsheet programs and any other programs.
- **Data:** A database, collections of data, product description
- **Network:** Communication media, communication processors and network access.
- **People:** An individual that uses information systems. It can be anyone, system analysts, software developer and such.

This project will use all of these basic components. Besides, all information systems should have a purpose and it should provide a solution to a business problem. [Turban, Leidner, McLean & Wetherbe (2008)]

Usefulness of Computer Based Management System

Any computer based system nowadays provide a lot of advantages compared to manual process in term of efficiency and the number of error made by human. The benefit of computer based management system consists of:

Less time consuming

Manual job consume a lot of time especially when the data is very confusing and human being cannot stand the ability to remember everything at a single time, not to mention the previous day's job but computer can do that in a blink of an eye.

The stored data is not only saved for storage but to also make them easily accessible. Any document in computer based system is automatically indexed so that user can access the documents without having difficulty to remember where the data stored earlier.

Reduce human error

As mentioned earlier, computer can hold a massive amount of data at a single time but not all human have that ability so by using computer based system, the human error can be left aside.

Document Sharing

One document in computer based system can be shared with anyone else with just a few mouse clicks and there is no need to print or fax to other recipient. Furthermore, nowadays the awareness to go paperless is very high and it is such a good practice to reduce the amount of paper usage within the organization.

CHAPTER 3: RESEARCH METHODOLOGY

Basically, any manufacturing company in this world must have a proper Bill of Materials (BOM) or else, they cannot do anything without it because there is no guideline on how to produce their product. So in this case, SRB is a local Malaysian company that design and manufacture monorail by themselves.

Scomi Rail Berhad (SRB) is a leading provider of urban transit systems. It is only one of only two integrated monorail system providers in the world to offer end-to-end solutions including design, fabrication and integration of the monorail rolling stock (the travelling component in a rail system).

The monorail is a vehicle that operates on a single concrete or steel beam, hence the word 'mono' – which means one. This beam is also known as a guide way. In monorails, the guide way is always narrower than the train it supports (around 0.6-0.9 meters wide). This is one of the fundamental features of the monorail which gives it a competitive advantage over other rail systems. Most monorail are elevated (run above ground) and are electricity powered.

They can be classified into three versions:

- i. Straddle Beam: This version is the most common type of monorail all around the world. The train straddles the single concrete or steel guide way. A rubber-tired carriage contacts the beam on top and both sides for fraction and to stabilize the vehicle.



Figure 3: Monorail on Straddle Beam

- ii. Suspended: This version has the train supported from the top. The train and rolling stock are suspended beneath the wheel carriage with the wheels riding within the single beam.



Figure 4: Monorail on Suspended Beam

- iii. Maglev (Magnetic Levitation): This version of monorail, the train is connected through the use of magnetic levitation. The magnetic effect keeps the train on track. When moving, maglev trains hover over the track. The advantage of this technology is this kind of monorail version can reach top speed exceeding 500km/h.



Figure 5: Maglev Monorail

Currently, there are 20 main components of Product Breakdown Structure (PBS) that are used to develop a complete set of train and every PBS is managed by individual engineers at SRB. For every PBS component contains their own BOM, or in other word is the list of materials that must have in that particular PBS so that the purchasing department can purchase the material thus production team can manufacture the train.

A complete set of train is basically consists of three major part which is first, the head of the train, End Car Assembly (ECA). The second part is the body of the train, Intermediate Car Assembly (ICA) and the last part is Intercar (ICR) to connect both ECA and ICA.

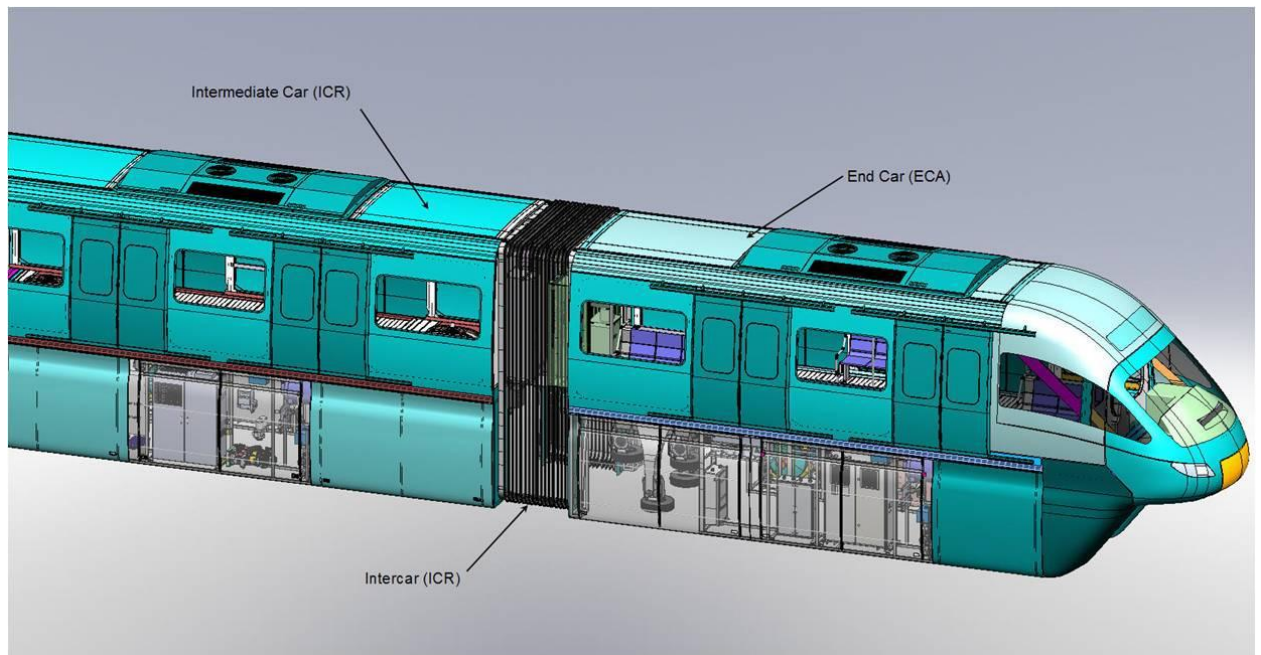


Figure 6: Train configuration

All 20 main PBS components are responsible to build a complete set of train and that is why the BOM must be analyzed to check their accuracy and their structure so that there will not be any problem in production process.

As for now the data which is BOM reports that are extracted from TC is purely in spreadsheet file.

Figure 7: BOM Report

To produce a BOM for each PBS, first engineers have to produce design and drawing of the component and the BOM will be generate the attributes inside the drawing which is part name, part number, quantity and such into the Teamcenter (TC) application.



Figure 8: Process to produce BOM

So once a week, there will be a process of extracting the BOM report from TC and then it will be analyzed in term of accuracy and the structure of the BOM. This is where the Bill of Materials Report Management System will be useful and helpful to this department.

System Development Life Cycle

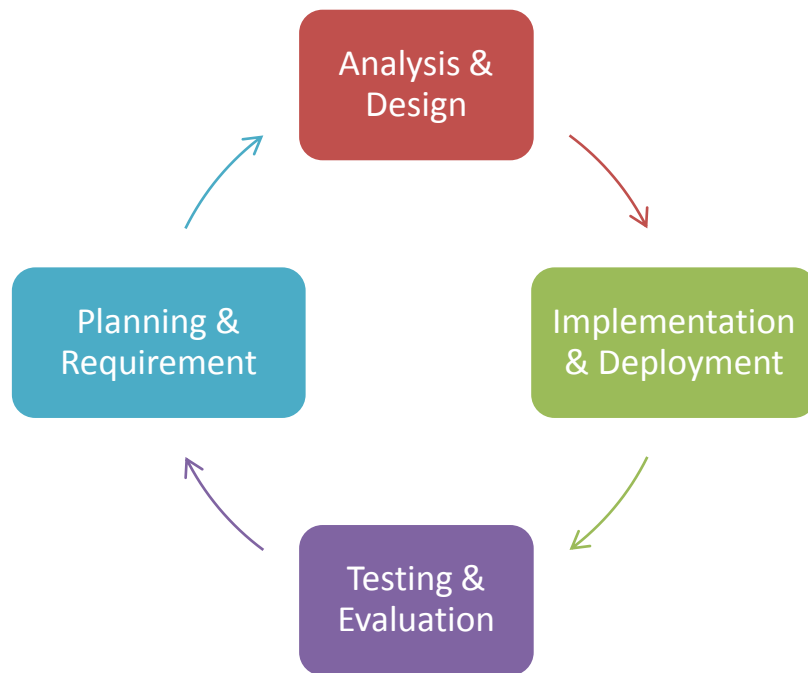


Figure 9: Iterative Development Model

This type of methodology has been chosen because it is the most effective ways to develop such system. It is the easiest and less expensive process if there are any changes in design. This process based on cyclic of prototyping, planning, analyzing, designing and testing of the system. The process will go back to the first stage, planning if there are any changes on the system.

3.1 Planning & Requirement

In planning phase, the author has identified the problem faced by the SRB Engineering Services department and their need for such system exists in their department is very high. So the author has clearly identified the scope of study and conduct a feasibility study in order to further this project. The author has developed a Gantt chart that to keep track the development of the project.

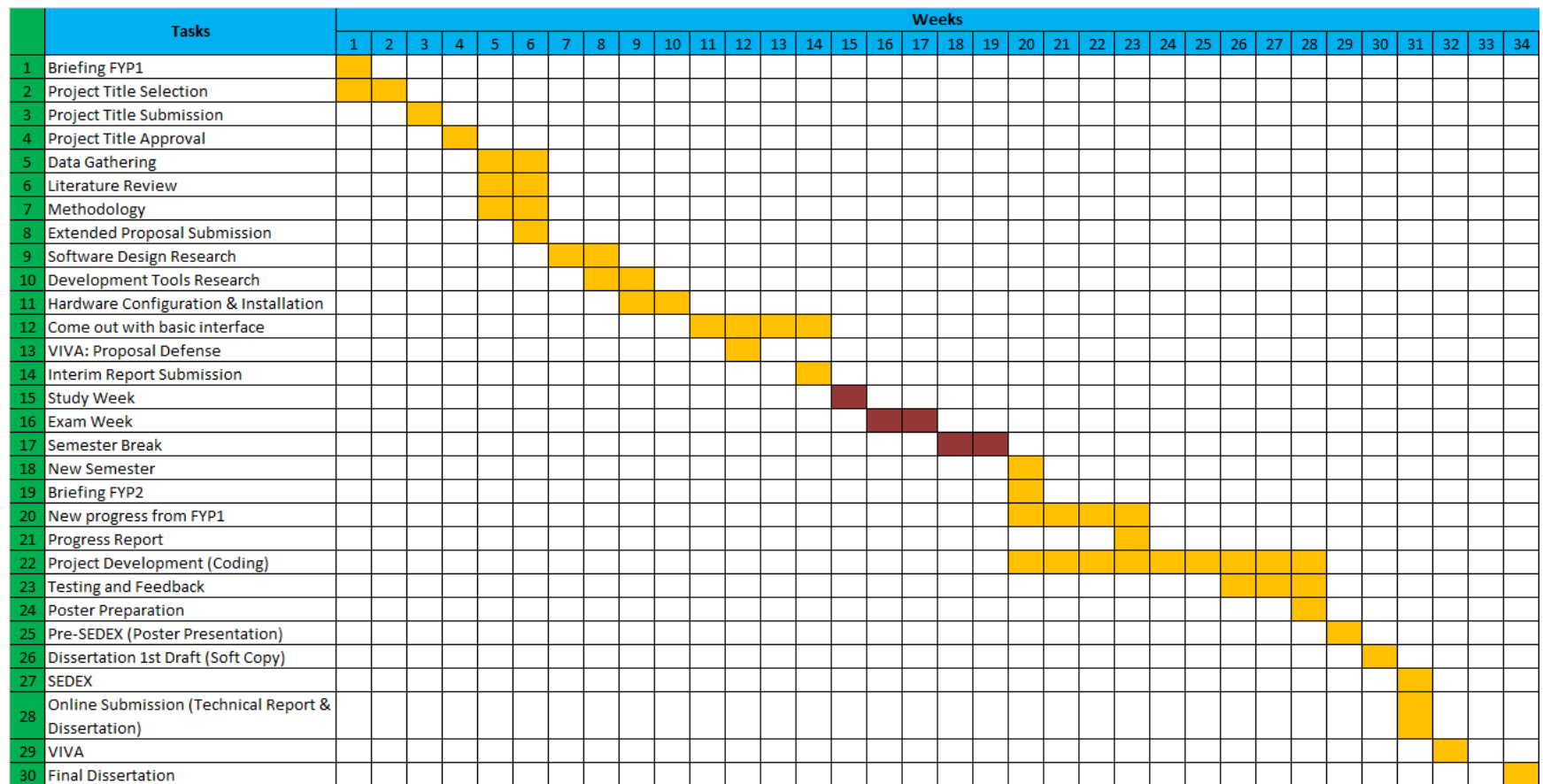


Figure 10: Gantt Chart

3.2 Analysis & Design

The author has visited and conducted an interview with Engineering Services staff to get the detail information to get the clearer picture of the system's needs as the purpose of this project is to learn the current method and how to solve or at least reduce the problem faced by the department.

The author also has sketched a flowchart to make it easier to develop the system later based on the story board.

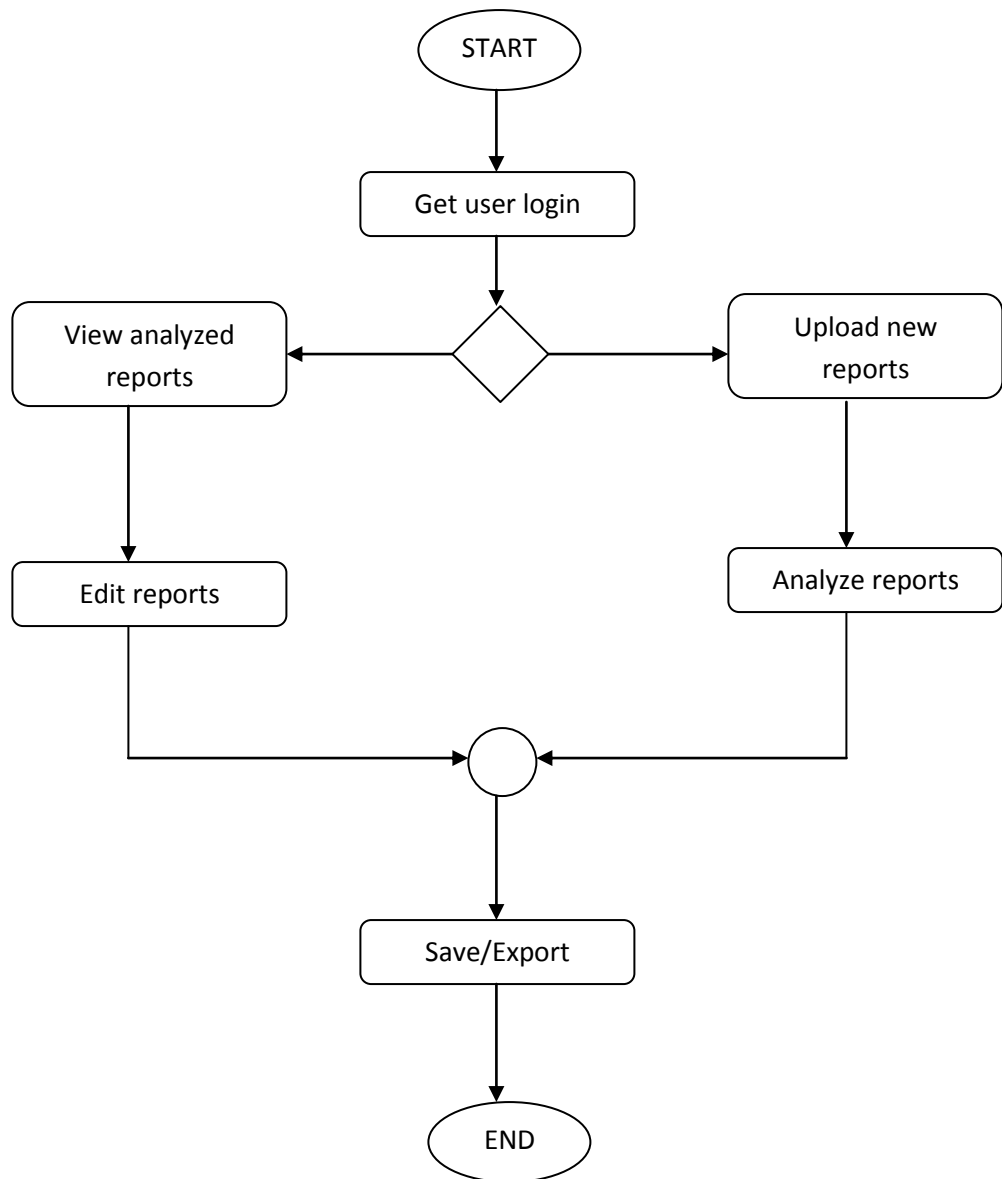


Figure 11: Flow Chart

3.3 Implementation & Deployment

The author has identified the programming language and tools that are going to be used in developing the system. Next phase, the author will focus on the development of this system before testing it on the company thus deploy the final product.

3.4 Testing & Evaluation

The implementation phase will take place during the last period of second phase where it will be installed on the company. The proper documentation; procedure and operational document also will be done during this phase

Tools Required

- Microsoft Visual Basic
- Microsoft Excel
- Microsoft Access

CHAPTER 4: RESULT AND DISCUSSION

The author has continue the system development from previous semester. Currently the author managed to established connection with the database using Microsoft Excess. The database are used to store the login information of the selected user only. This is because this system contains a private and confidential data and even though only the employee of the company itself will use it, there are still a probability of leakage of data from inside the company itself. Thus, not all employee will have access to this system.



Figure 12: Splash Screen

Figure 14 below shows the Bill of Materials Report Management System's Login interface. This will be the login interface for the employee whenever they want to use this system. The staff need to obtain username and password created by IT Department first before they can use this system. Besides, for security purpose, 3 times login failure will lead to system termination.

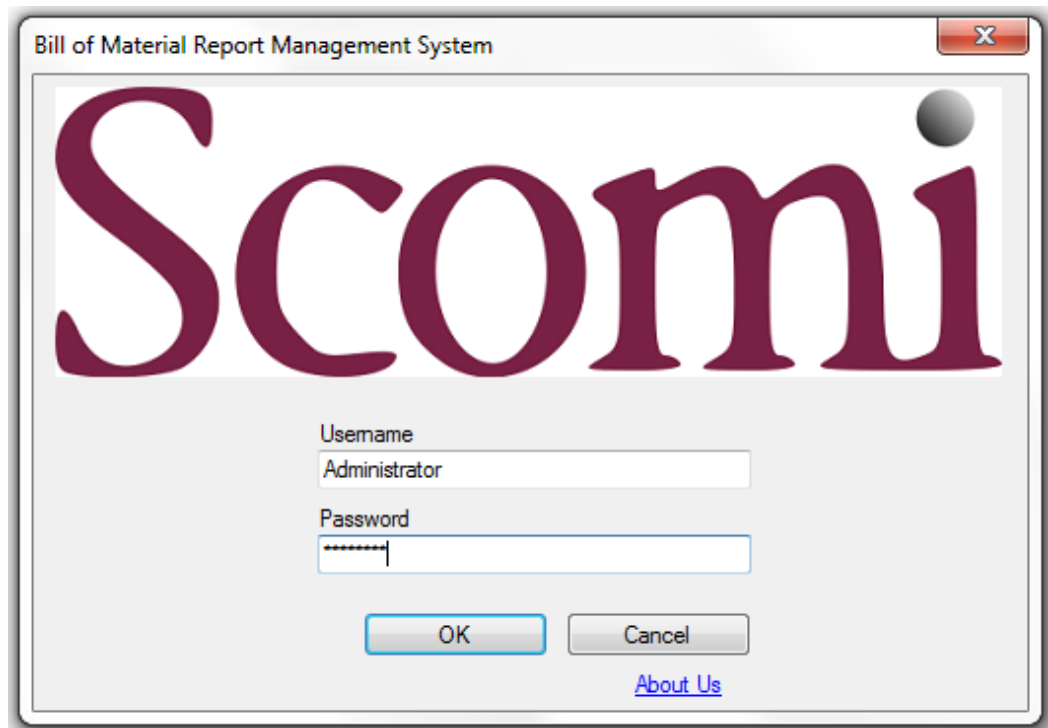


Figure 13: Login Dialog Box

Figure 15 and figure 16 below show the message alert when user manage to login into the system or not.



Figure 14: Login Successful!

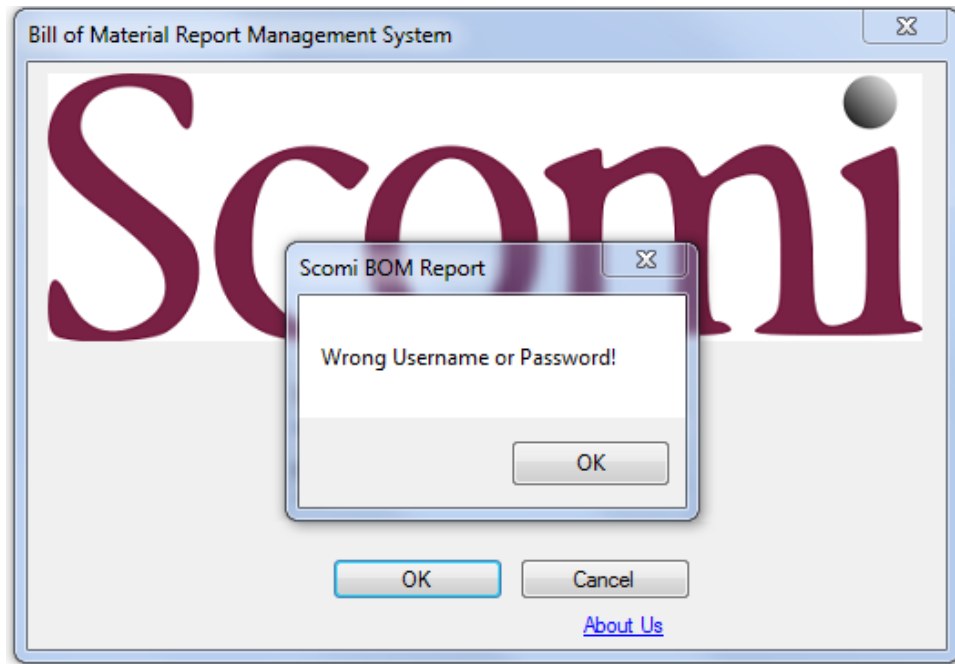


Figure 15: Login Fail

Figure 17 below show the Home interface which is the first interface when user manage to login into the system. There are two main buttons which is the main task of the system; view the stored BOM report from their previous work and also create a new BOM report. Then there is a 'Log Out' button if the user want to exit from the system.

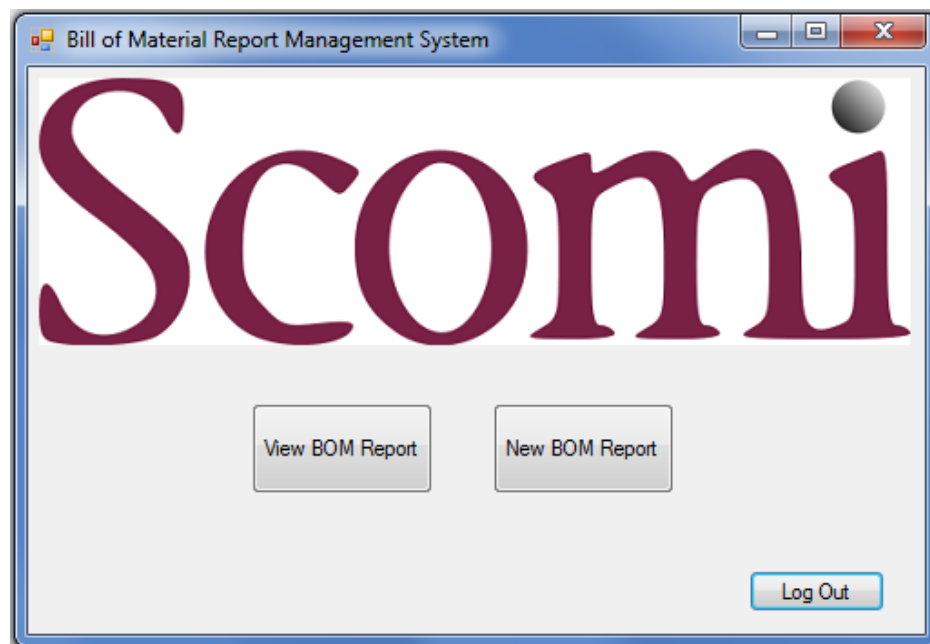


Figure 16: Task selection

If user clicks on the 'View BOM Report' button the next interface would be like shown below where user can choose the saved BOM on any week according to the BOM report saved by them from previous work and next they can edit back the report as they wish.

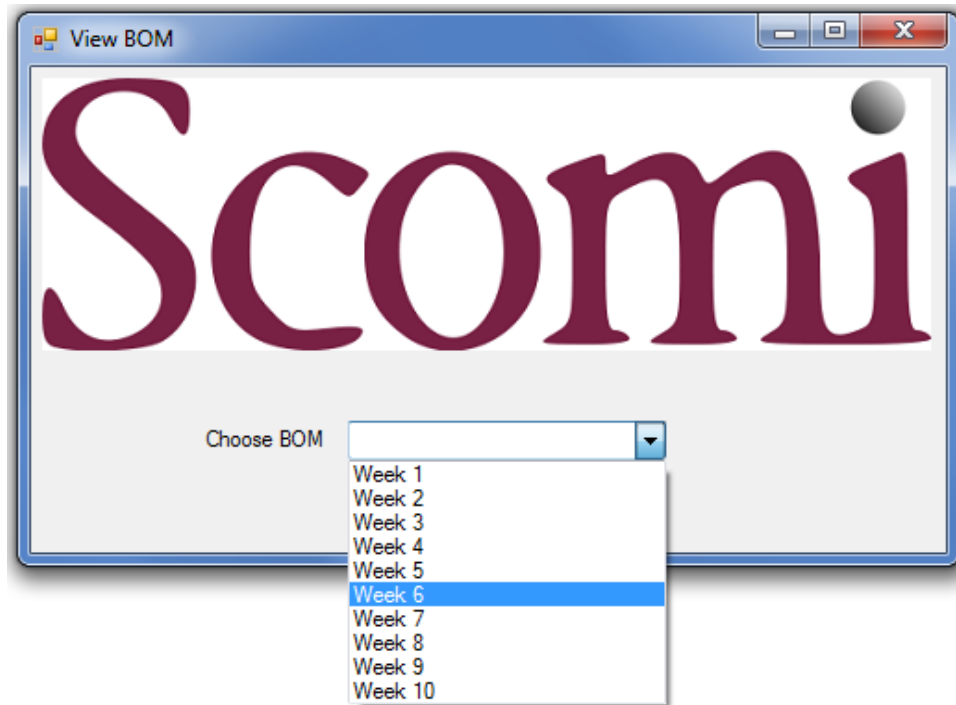


Figure 17: View analyzed BOM reports

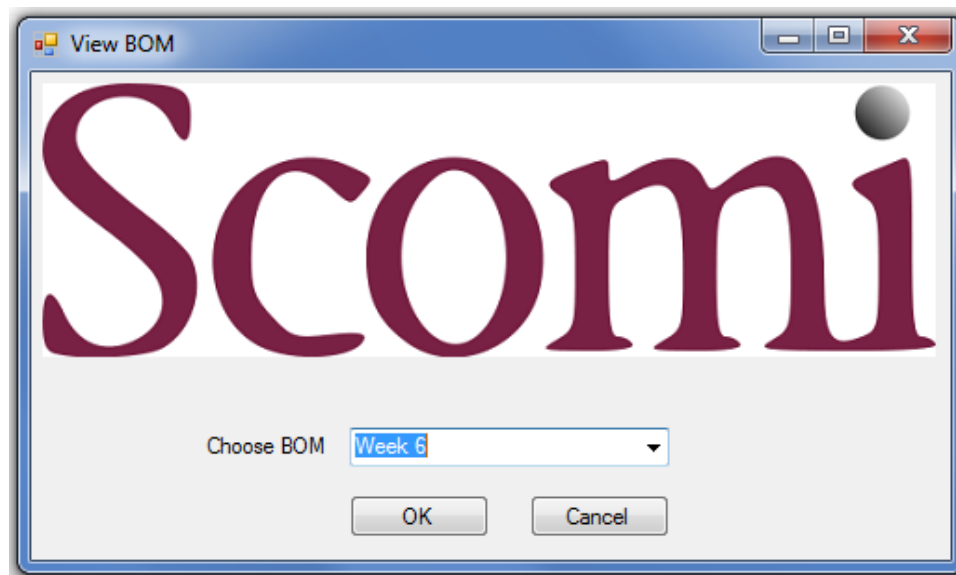


Figure 18: User selection

Next, if user clicks on the second button which is the 'New BOM Report' the upload BOM report interface will appear

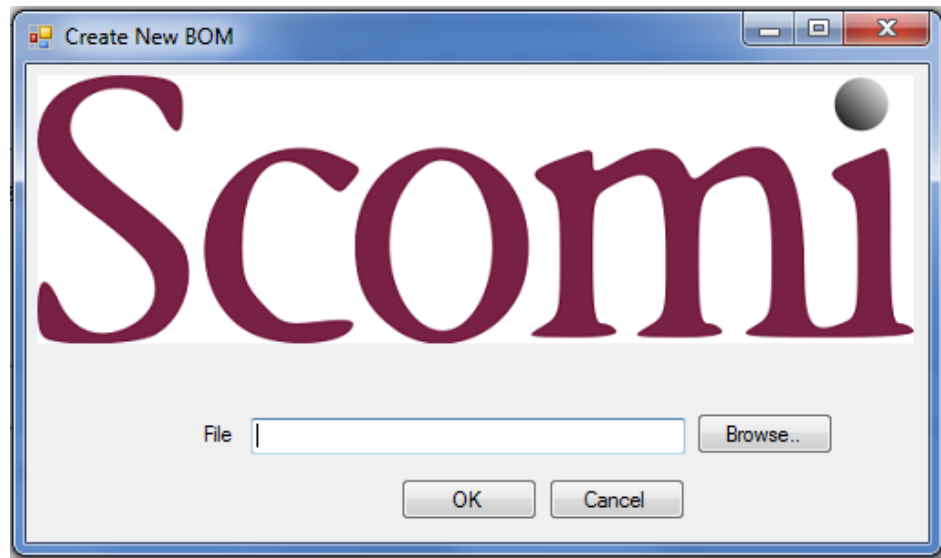


Figure 19: Upload new BOM reports

Then user can choose the file contains data from their local personal computer that previously exported from Teamcenter which is in spreadsheet format but for the time being the author still working out on the coding to read file from spreadsheet file thus for the testing purpose and to present the idea, the author use a simple coding to just read file from text file only. The examples are shown below.

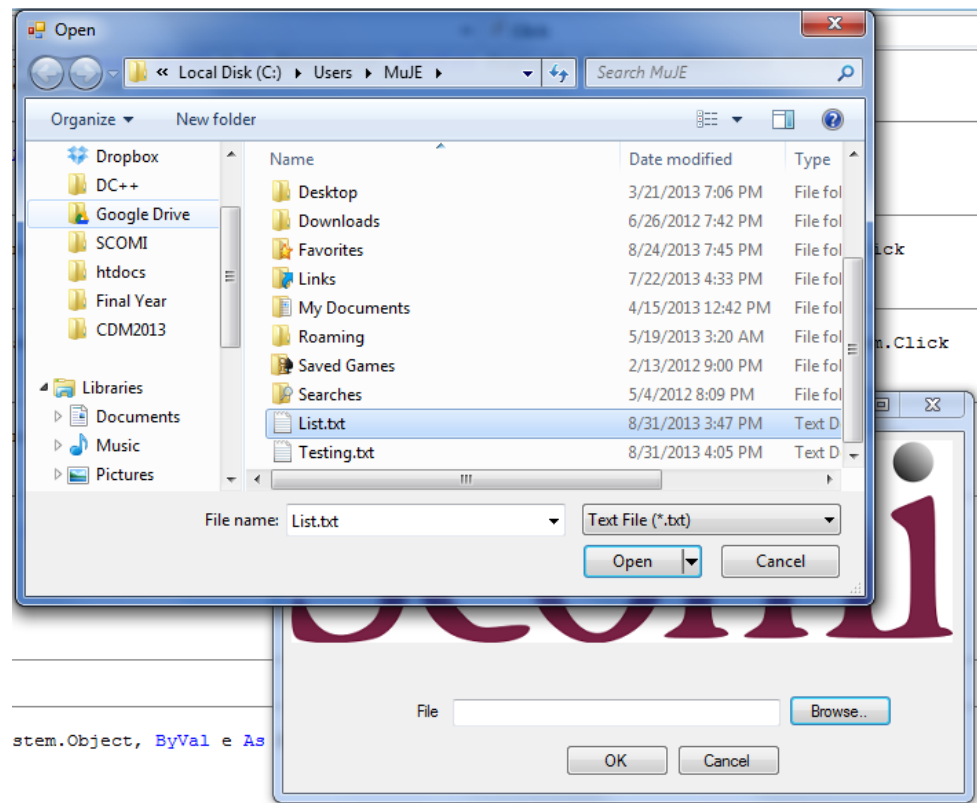


Figure 20: Browse file in PC

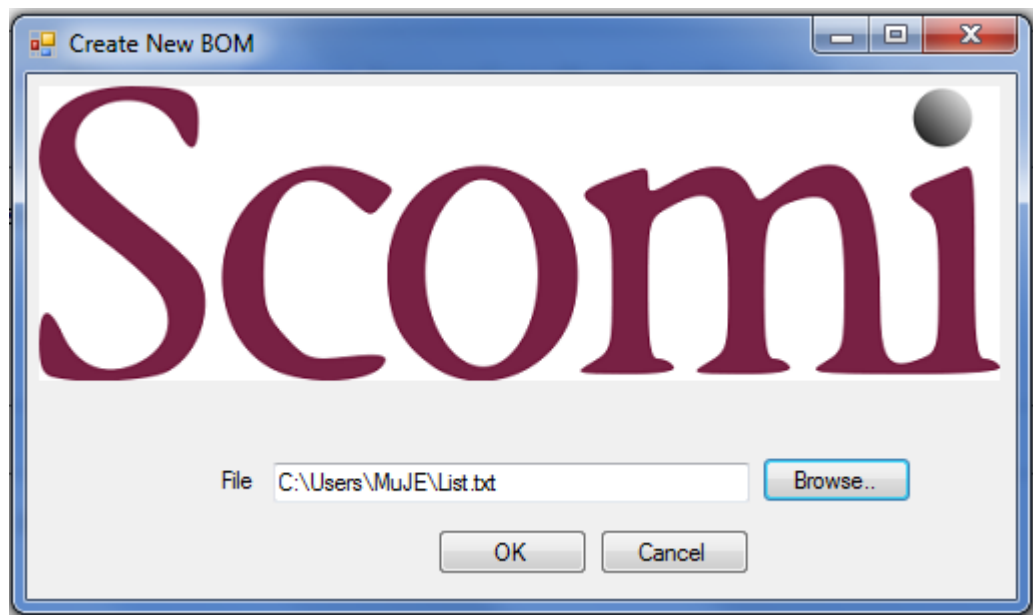


Figure 21: File Selected

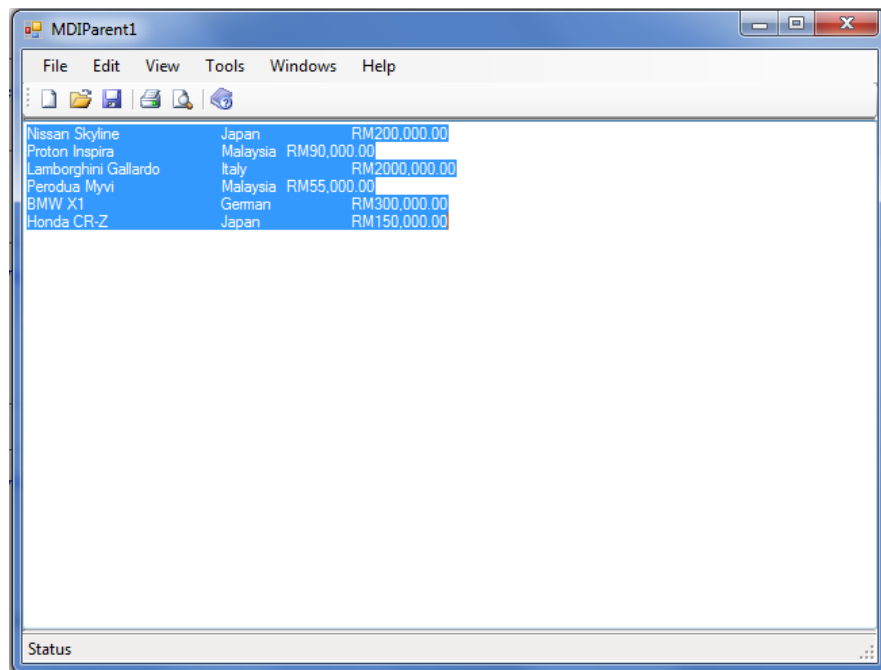


Figure 22: Read File

Then after user finished cross-checking and analyze the BOM report, the file can be exported out to local drive and as well as saved back into the system itself for future references and storage.

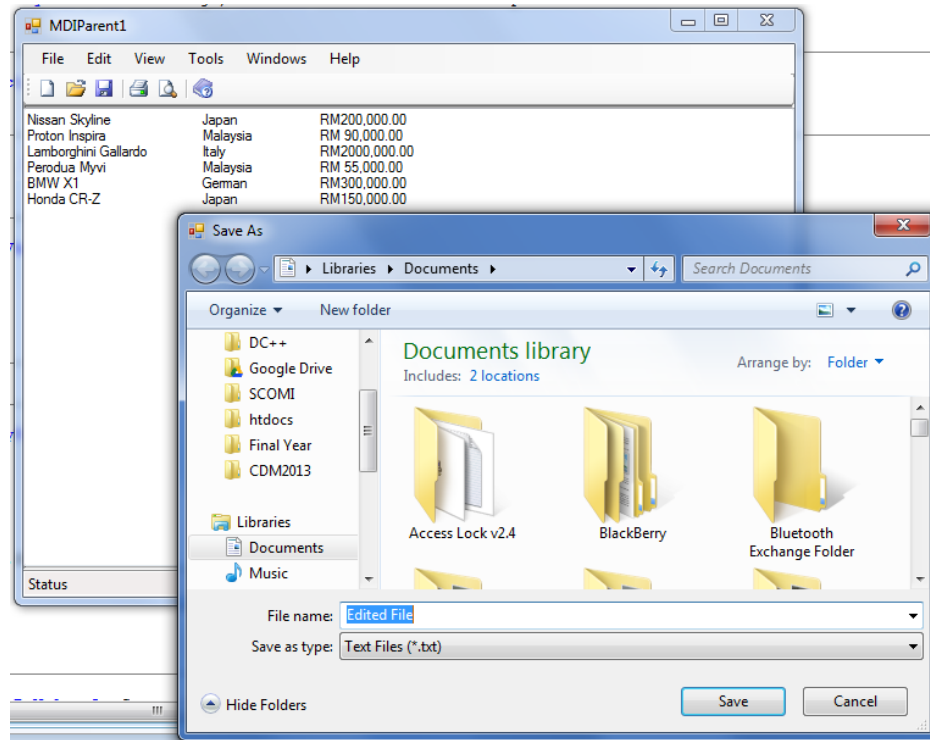


Figure 23: Save File

CHAPTER 5: CONCLUSION

Relevancy to the Objective

This project will be developed to address the objectives stated. Generally, there are three (3) objectives to be achieved in this project:

To conduct a study on how Engineering Services department could improve their productivity and efficiency in handling and analyzing BOM reports.

To propose a system that can manage the BOM reports systematically.

To develop a computer based system for the Engineering Services department that can manage the BOM reports efficiently and boost the productivity of the staff.

Hopefully by the end of the second phase all these three objectives will be achieved.

Suggested Future Work for Expansion and Continuation

The future work for this project aside from the main features, some suggestion for expansion and continuation in future work are:

Integration with Teamcenter application. Current method is, the staff have to export the BOM report into spreadsheet file first and then upload it back to this system to be analyzed. If this system can be integrated with Teamcenter application then there is no need to go through all the trouble.

Integration with SAP system. Currently this system only manage to produce spreadsheet output because SAP team right now comfortable with their task converting data from spreadsheet file to the SAP system but if this system can automatically transfer the data into the SAP system then the job task could be much more easier.

Conclusion

As a conclusion, this system, Bill of Materials Report Management System hopefully will meet all the three objectives stated earlier. This system now going through the development phase based on the proposed interfaces in Chapter 4. This system will go through a lot more correction and modification until it meet the requirement set earlier.

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