Universiti Teknologi PETRONAS

Operation Workflow Enhancement

by

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A dissertation submitted in partial fulfilment of

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Business Information System

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Universiti Teknologi PETRONAS

Bandar Seri Iskandar

31750 Tronoh

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CERTIFICATION OF APPROVAL

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Approved by,

_____

(DR VIVIAN YONG SUET PENG)

Universiti Teknologi PETRONAS

Tronoh, Perak

May 2015

MAY 2015

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 expect as specified in the reference and acknowledgements, and that the original work contained herein has not been undertaken or done by unspecified sources or persons.

Yours sincerely,

_____

(SHAMIRAH BT FAREEDUDIN)

ABSTRACT

Operation Workflow Enhancement (OWE) is the continuation of Operation Reporting Enhancement (ORE) which is an automation script developed as part of the Business Processes Automation (BPA) which will be used by PETRONAS Malaysia Petroleum Management (MPM). This project is developed in hopes to improve and enhance the efficiency of the data consolidation that is currently being used for summary reporting without jeopardizing the current practice in PETRONAS MPM. The data consolidation is a process which merges the 4 operating reports into a master template that will be pivoted with proper formatting. Finally, all of the pivot table will then be displayed in the new form which is in graphical and visually represented called theDASHBOARD. All of the reports generated will also be integrate into theDASHBOARD by a click of a button for the users' reference. The production data will then be mapped into static maps of oil and gas fields across Malaysia.

ACKNOWLEDGMENT

First of all, I would like to express my sincere appreciation and gratitude to my supervisor, Dr Vivian Yong Suet Peng as well as my co-supervisor, Dr William Pao who made it possible for me to complete this project. The completion of this development phase would not be possible without their endless guidance, patience and support for this project.

Not to forget, the assistance given to me by the GAs really helped me to complete this project successfully.

Furthermore, I would also like to acknowledge with much appreciation to both my parents for their continuous support, emotionally, morally and financially throughout the whole journey.

Last not but least, many thanks and appreciation to my fellow friends, who has contributed in inspiring, stimulating suggestions and encouragement directly or indirectly throughout this project.

TABLE OF CONTENTS

LIST OF FIGURES **PAGE**

LIST OF TABLES **PAGE**

ABBREVIATIONS

ORE	Operation Reporting Enhancement
OWE	Operation Workflow Enhancement
MPM	Malaysia Petroleum Management
BPA	Business Process Automation
VBA	Visual Basic Application
GDP	Gross Domestic Product
CIS	Computer and Information Sciences
RF_PLAN	Recovery Factor Plan
RF_ACTUAL	Recovery Factor Actual
RAD	Rapid Application Development
GUI	Graphical User Interface
INPUTCRUDEPM	Input Crude Peninsular Malaysia
INPUTCRUDESS	Input Crude Sabah Sarawak

CHAPTER 1
INTRODUCTION

1.1 Project Background

Oil and Gas industry is a multi-billion dollar industry that drives many of the developing nations' economies and developed nations' economies alike. For example, Malaysian Oil and Gas industry- spearheaded by PETRONAS accounts for 45 percent of the Malaysia Gross Domestic Product (GDP) for 2010 (Chua & Oh, 2010).

PETRONAS Malaysia Petroleum Management (MPM) or also called as Petroleum Management Unit (PMU) is a resource owner and manager of Malaysia's domestic oil and gas assets. In order to boost the domestic properties for future investment of potential investor as well as protecting national interest, the utilization of the resources needed to be as optimal as possible.

Maintaining the positive impact to the country is very vital especially during the current economic condition of the country. Thus, resources are needed to be maintained and handled efficiently in order to ensure the positive impact mentioned above. This can be done by collecting the necessary data of natural gas, crude oil and flare on daily basis. This process is then are sent to the PETRONAS after consolidating the data on daily operation report.

Consequently, there is a large number of daily operations reports sent back each day for data consolidation purposes. During this business activity, all daily operation reports will be merged into centralized document – the master template. From this document, summary reports for all four products; crude oil (CRUDE), natural gas (GAS), condensate, flare (FLARE), will be developed.

The files are needed to be merged in order for the existing system to generate a summary report based on the respective input files. These four files are received by the PETRONAS's staffs in charged by many other people and usually via email. The PETRONAS staffs needed to collect all those inputs received via the email and manually input the value in those files which is quite inefficient to do so every single time they receive the emails. Plus there are also four different personnel handle these files by updating them hence the integrity, accuracy and security issues occur sometimes during the process of key in the data received.

All of the results of data which are generated are summarized in pivot table for the ease of the admin to see the values of their daily production. These data will also be seen in the graphical form display in theDASHBOARD. This will also improve the new technical employees' ability to understand the operation visually. The reports generated will also be incorporated in theDASHBOARD to make it easier for the user to refer to the values as well as increase efficiency by having one button to generate all of the reports instead of the lengthy process previously that includes total of 5 buttons to generate each of the reports.

1.2 Problem Statement

1.2.1 Problem Identification

The data consolidation is vital as it needs detailed supervision in order to avoid any human error. The data received from many sources and people and the people in charged needed to carefully insert the data and key in the inputs before generating the reports. The current process or method is done manually and can lead to human error by inserting different input values as well as results in wasting of time and effort as well as integrity issues.

It is vital for this department to ensure data accuracy and integrity as there reports will be taken into account in preparing financial statements at the end of the month. As mentioned, the administrator spent extensive effort and wasted about half a day in order to key in the input values as it is tedious to check the number one by one with a lot of classification involved. This problem leads to unproductive working day as it limits the administrator energy and time to complete their other jobs thus results in delayed of making other progress effectively.

As it involves about four parties to update and key in the values from the input files received, each of the users can only update one at a time. This problem also leads to time consuming as the other users need to wait for the current users to complete the updating process before they can start using the file as the file has no multi-users purpose. It also may result in accidental human error and integrity issues among the administrator/users.

Moreover, the 4 input files are not being specified of selecting the correct files into the correct field. Based on observation, there are still users who either select different files from the correct field or similar files twice in different field. Due to this situation, the incorrect reports generated will be unnoticed. Correct results especially for important data of daily operations is crucial for the company and this problem might give a big negative impact towards the company.

Plus, the new platform is developed by MPM which is theDASHBOARD that allows the admin to view all the data as well as the reports generated especially in pivot table visually as it is a graphical platform that represents the data which is more convenient. However, there are many files in order to refer to their daily operations which are the ORE, HYPIS and theDASHBOARD. Having many files for the same purpose might be confusing and nuisance as they need to open each of the files every time before they can proceed with the work.

Besides, the reports generated need the total of 5 buttons all together before the admin can view the pivot table of the results. This process consumes a lot of time and it will not be as efficient as the admin need to be as they need to focus on only this job instead of doing multiple jobs at a time.

Therefore, this Operation Workflow Enhancement (OWE) project is a continuous project to be done in order to overcome the problem faced by MPM as an intelligent automation script of consolidating data is developed to increase efficiency compared to the current system as well as succeed in automating the automation script.

1.2.2 Relevancy of Project

The importance of this project is to improve and enhance the current method of processing the data into the automation script that have been done by previous students and increase efficiency of data retrieval. According to a recent study, 37 percent of integrity issues are caused by multiple user engagement in a business activity (Buchanan, 2007). Thus, the main objectives hoping to be achieved through the delegation of task to the automation script is to minimize the risk of integrity issues and inconsistencies.

The correct files must be selected as well as the current system does not have that function. It is observed that the users may select different input files in the different field as well as redundancy of the files in two fields. Thus, the results of the reports generated might differs and can cause problem with the data that are not tally. This can affect the data accuracy for the final reports. By having this function, the results will be accurate and complete.

theDashboard will also be integrated together with the previous system which is ORE and thus copy all the worksheets in the ORE to theDashboard. A new function will also be added which is to generate all of the summary reports at per click as it can minimize time consuming by having the admin to click a total of 5 buttons to generate each reports for each operation available in MPM. Efficiency is increase by minimizing the number of clicks.

Besides, as mentioned by one of the PETRONAS's personnel, The Dashboard is being created in order to show the summary reports together with the related graphs for their reference. However, the current Dashboard is stated that the data retrieved from the reports needed to be displayed on it before it can be applied as well as the design. theDashboard is important for the people to see the overall states of the process as the pivot tables generated can also be viewed graphically.

Inefficiency happens when the master template takes time and extensive effort to be prepared. This situation prevents MPM personnel to do more productive activities to create greater value for PETRONAS. Therefore, delegating task to the automation script is important since it greatly reduces time and effort used for data consolidation activity. Thus, having the function of combining the reports generator into one single click or button might be one of the solutions.

1.3 Objectives

The objectives of Operation Workflow Enhancements (OWE) initiatives are:

- To create a user-friendly system that ease the tasks of operators and management of MPM
- To generate the full summary reports from the integrated system dynamically.
- To ensure data integration successfully done to be used by PETRONAS MPM and increase the efficiency of the process.

1.4 Scope of Project

theDASHBOARD received from MPM is not completed and the field are not properly inserted as it is not being implemented yet. Thus, having to analyse the data needed to be selected as well as the field from different files are some of the limitations occur throughout this project. Plus, in order to incorporate theDASHBOARD as well as the ORE, some coding needed to be done and the time consuming to load each of the reports are quite long.

Plus, any changes done in theDASHBOARD will effect on the integration process between ORE as the worksheets will be duplicated. Too many duplicate sheets will be confusing and not convenient for the user to use for their daily job.

CHAPTER 2

LITERATURE REVIEW

2.1 Enhancing Database Integrity and Process Automation

The word automation itself is defined as the use of information technologies to reduce the need for human work in production (KPMG, 2011). By implementing business rules from within the database structure, it is important as it has become increasingly apparent with the recent rise in popularity of object-oriented design and the massive re-engineering/restructuring that is taking place in the world today (Ross, 1999).

In information systems, business rules truly find their niche. While some data models and business situations do not call for a complex set of business rules built into the underlying databases, business rules are suited perfectly to applications that have many mathematical calculations, many constraints and logical choices and rules that must be shared across applications (Von Halle, 1997).

However, locating the expert to do it can be time-consuming either internally or outside in the marketplace. Thus, there is a need for integrating data across departments, bringing in transparency of information and data integrity from a fully automated system (Sanjay, 2013).

In order to establish and maintain sound process for generating the numbers and values reported to the board and in their regulatory filings, it is needed to be clear and understandable for the company. However, issues with the underlying data can lead to a variety of challenges and inefficiencies and it can lead to the organizations not meeting their objectives (KPMG, 2007).

2.2 Ability to retrieve data from the database

The database will serve the data of many users instead of single user. It is mentioned that there are number of important implications to access to the database (Martin, 1976). The data can be retrieved directly from the database into variable data structures that can be processed. It is more convenient and flexible but cost more in terms of time consuming (Collins, 1982).

The database index is a data structure that improves the speed of data retrieving process. Indexes are used to locate data without having to search every row in a database table all the time. It can improve the rapid random lookups of the records. It can be efficiently searched as it selects columns of data from a table that include low-level disk block address. This function is needed for the PETRONAS's staff as it will ease their jobs by retrieving the data from the database directly.

However, data redundancy may occur due to the join mechanism in the relational model between tables and values. It is needed to be evaded by depending on the primary key and specifying the values on each column (Codd, 1970). Data retrieving can be composed by displaying them in mapping feature at the users' screen and able to retrieve thousands of data in few seconds by having an effective graphical interaction (Frank, 1984). Retrieving batches of data rows can reduce the overhead performance while avoiding the use of tables (Sinha & Waugh, 1988).

The integration process done dynamically so that the users can refer to any files that they are convenient with and update the values while having the data automatically updated in other related files. This process can minimize the time used in order to update each files one by one manually as done previously.

2.3 Intelligent System Integration

The database will serve the data of many users instead of single user. It is mentioned that there are number of important implications to access to the database (Martin, 1976). The data can be retrieved directly from the database into variable data structures that can be processed. It is more convenient and flexible but cost more in terms of time consuming (Collins, 1982). Possible benefits of intelligent system integration as stated by Frost & Sullivan, 2008; Wong et al., 2008; Motegi et al., 2007; BOMI, 2009:

- Saving energy, leading to reduced costs and greenhouse emissions.
- Operational efficiencies, reduced time consumed.
- Increased flexibility and adaptability
- Increased occupant satisfaction
- Improved operational effectiveness and energy efficiency
- Increased user comfort and productivity
- Improved safety and reliability
- Enhanced system performance and reliability
- Improved competitiveness

2.4 User-friendly Interface

It is important to ensure that the system features are user-friendly. This is because the technicians in PETRONAS are changed frequently thus the process of explaining the system how-done will be consume a lot of time.

By having a user-friendly interface, the technicians can understand the system without much assistance and able to retrieve the results directly.

Best practices for designing an interface are:

- Keep the interface simple yet attractive

Visible to the users. Avoid unnecessary elements

- Strategically use color and texture

  Direct or redirect attention using colors, light, contrast and texture.

- Communicate what is happening

  Informing users the locations, actions, changes in state or errors and add communications elements that are understandable.

- Regular testing

  Developing prototypes to understand the problems and test frequently to avoid errors.

- Providing efficient workflow for users

  Removing functions that are not standard. Making the user interface is familiar and customized.

It can be concluded that user friendly interface is more preferred by the users instead of user empowerment depending on the users' level of usage. It is also stated that designing two separate interfaces might be suitable to fulfil both sides' needs compared to balanced interface (Ng Alan, 2004).

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

The current data consolidation activity is performed by PETRONAS MPM and it is currently being done manually by four (4) technicians and an administrator. The four technicians will complete the operation reports assigned to them, and the administrator will combined these documents into master templates. This is highly inefficient as it slows down business process and delays the result sent to PERONAS headquarters.

Since the importance of data consolidation activity is great and involves in the critical process, it is recommended that the business process is improved. The project is developed to increase the efficiency of data consolidation activity. An automation script will be developed by using Visual Basic for Application (VBA) on top of Microsoft Excel macro platform. The automation script will intelligently do the following subroutines.

- Configuration on the selection of correct input files.
- Copy and extract data from operation reports
- Merge data into master template/pivot table
- Create summary reports generated from master template per click.
- Integrate the summary reports generated with the new platform, theDASHBOARD.
- Display the data and values of daily operations in graphical form in theDAHSBOARDas well as the map.

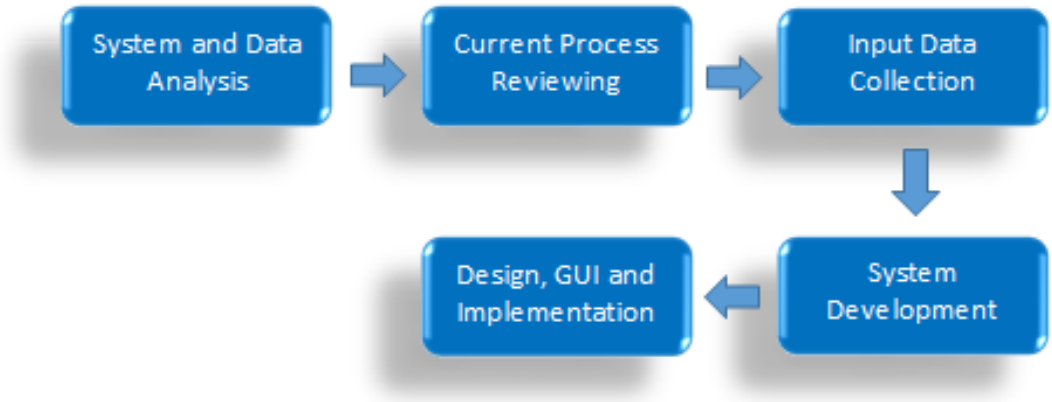


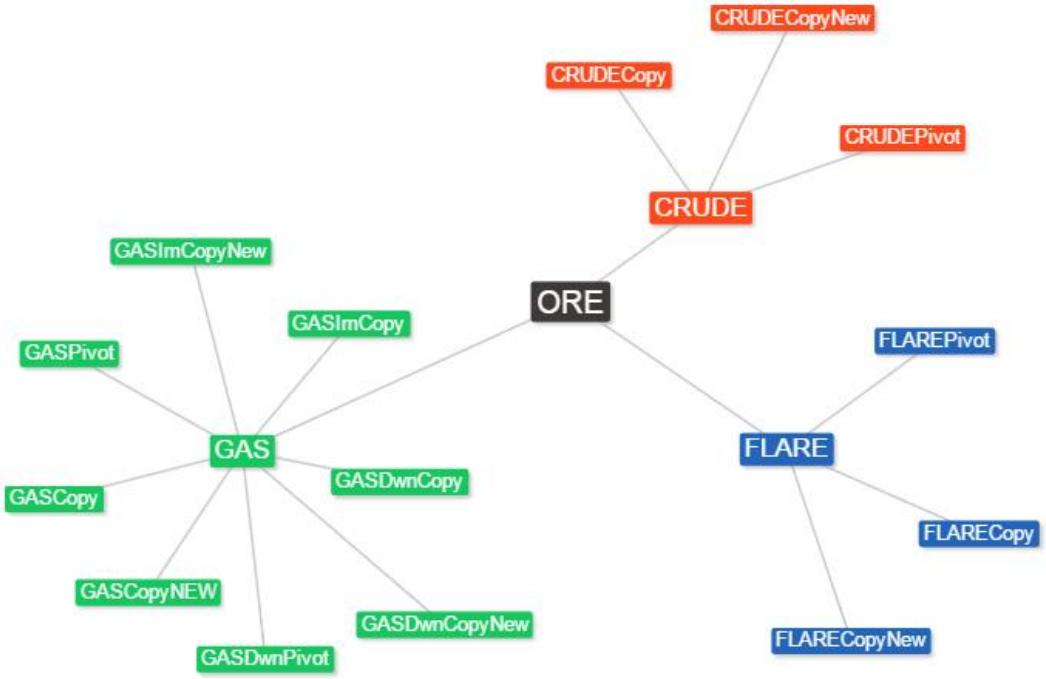
Figure 1: Process Summary

Figure 1 shows the process summary for OWE. The development methodology used in this project is Rapid Application Development (RAD). RAD takes advantage of automated tools and techniques to restructure the process of building information systems. This new process, extrapolated to the entire IS organization, results in a profound transformation of information systems development (Yadav & Makkar, 2014).

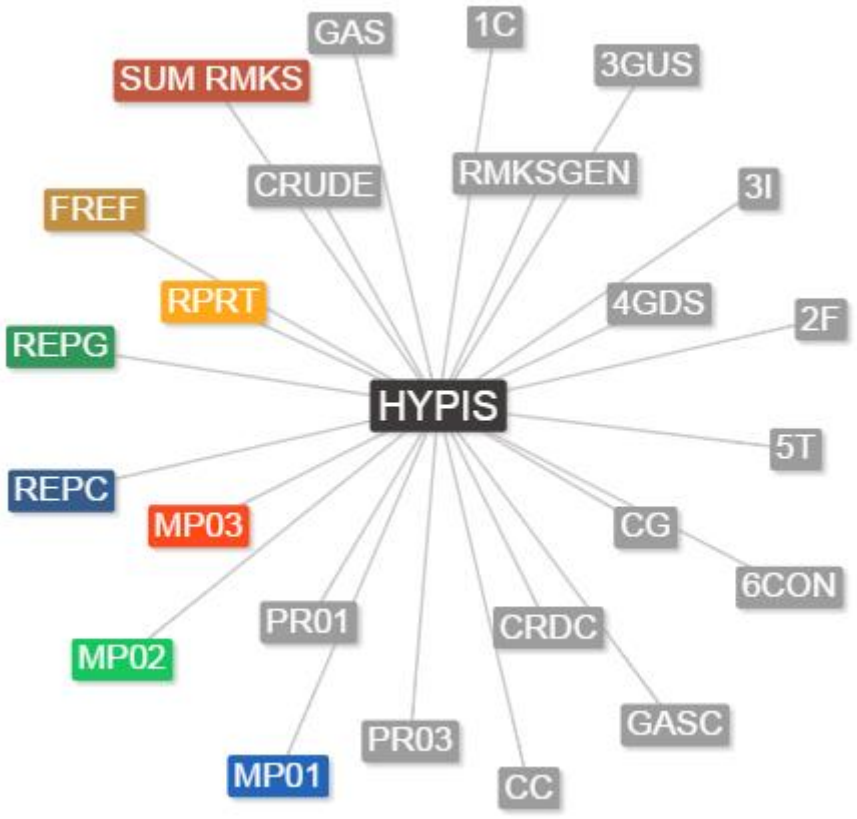
RAD is achieved by using a series of process for application development techniques that is defined in the methodology. This is most suitable methodology especially in the time constraints within 8 months only. The advantage of using RAD is the dynamic practices used by developers. It allows developers to move from user design phase to construction phase and vice versa without traditional limitations. Compared to waterfall methodology which is rigid in practice, RAD provides more flexibility since the project requirements will change throughout the research and development phase.

During the system analysis, all of the attributes in all 3 files are listed out so that it is clearer the content of the files and on which sheets need to be integrated.

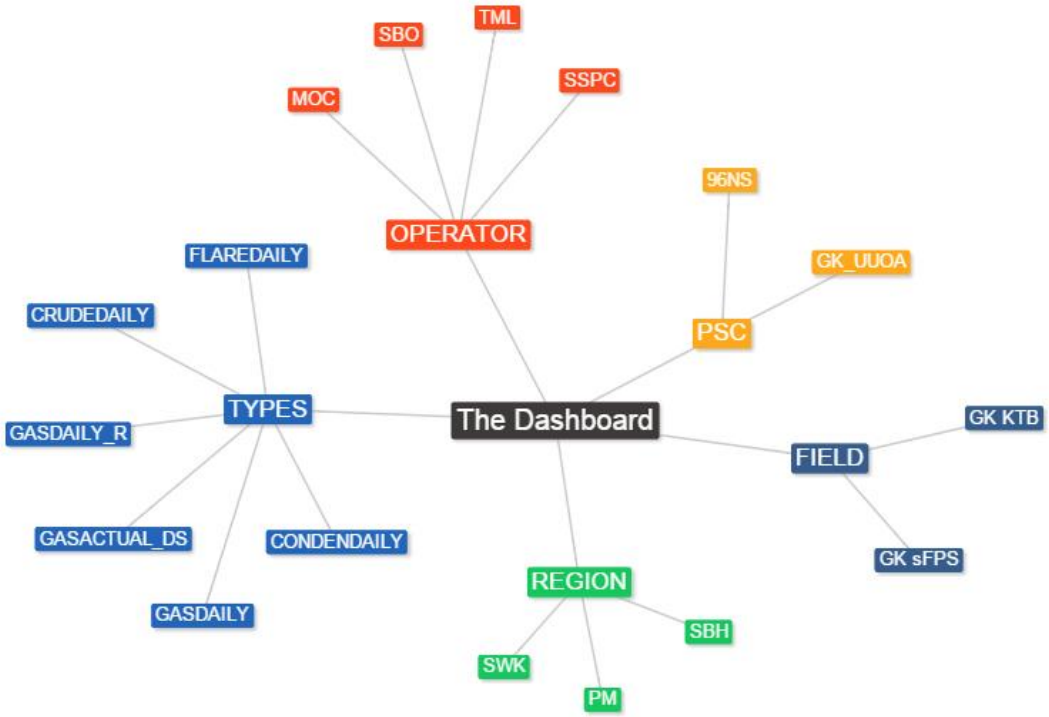
ORE



HYPIS


GAS
1C
SUM RMKS
3GUS
CRUDE
RMKSGEN
3I
FREF
RPRT
4GDS
2F
REPG
HYPIS
5T
REPC
MP03
CG
6CON
PR01
CRDC
MP02
GASC
PR03
MP01
CC

theDASHBOARD



3.2 Development Methodology

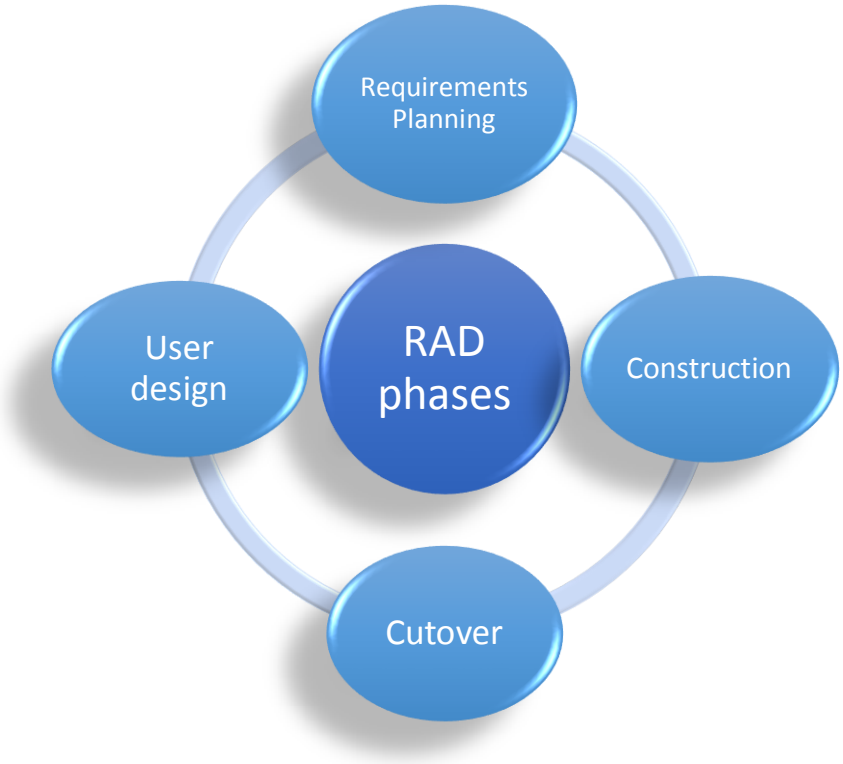


Figure 2: Phases of Rapid Application Development (from Louiziana, 2014)

- **Requirements Planning**

Requirements are collected from the user in this phase. Requirements may include datelines, core functions and user interface in order to be enhanced from previous work. This phase analyses its feasibility and users, IT, managers and staff agrees upon business needs and requirements.

- **User Design**

Building model prototypes and interact with users through Graphical User Interface (GUI) and the core functions in the automation script are designed in this phase to ease the users to understand the functions and interact with the system.

- **Construction**

Program and application development are developed in this phase. Security, integrity and efficiency are taken into consideration for the users.

- **Cutover**

Testing phase to ensure that the system works and deliver the finalized prototypes to be checked and accepted. Finalized prototyped is delivered to the user.

Figure 3: System Architecture for ORE

ORE system architecture defines the structure and behaviour of the system in a conceptual model.

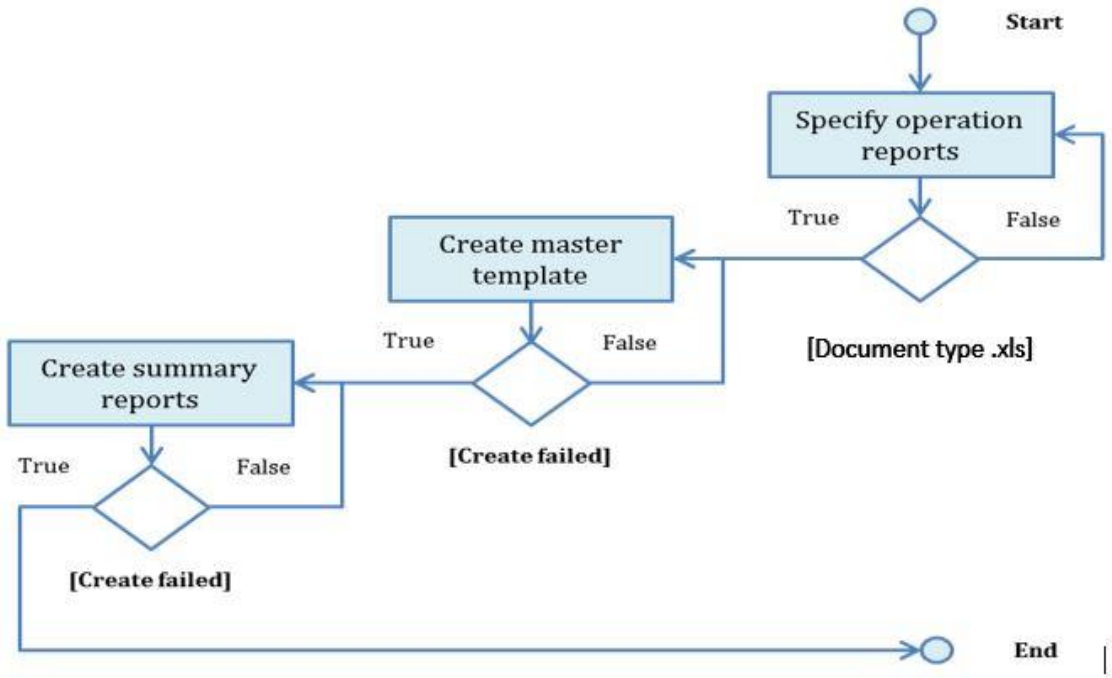


Figure 4: ORE System Flowchart

After all the operation reports have been specified by the user, the macro (automation script) will extract all data from the operation reports according to respective fields, starting from INPUTGASPM, INPUTGASSS, INPUTCRUDEPM and INPUTCRUDESS. If any of the data extraction incurred any errors, the process will come to a halt. The automation script will then prompt the user to restart data extraction processes or to abort the system. Otherwise, if the data extraction is successful, the operation reports will be merged inside the master template.

The figure below shows the flow of integration between the HYPIS and ORE file and format into theDASHBOARD.

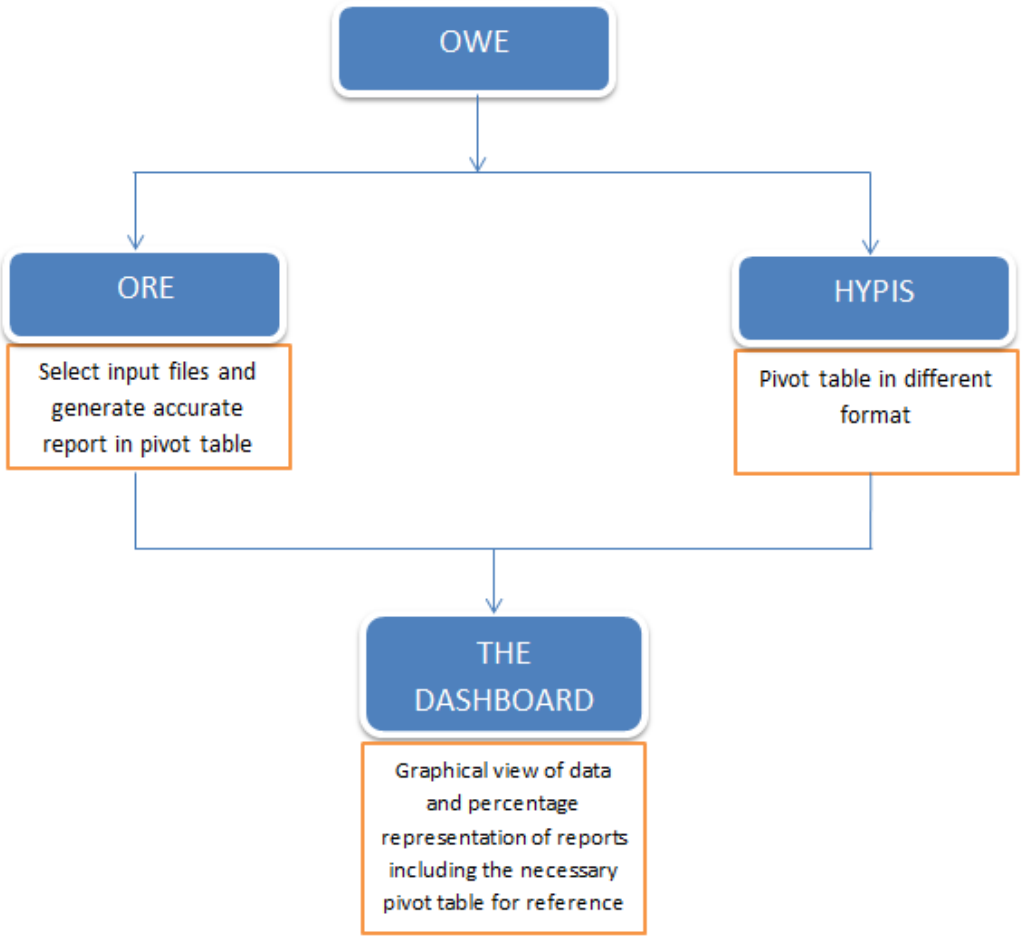


Figure 5: OWE Flow - Integration of HYPIS and ORE format into theDASHBOARD

The flow can also be simplified as below:

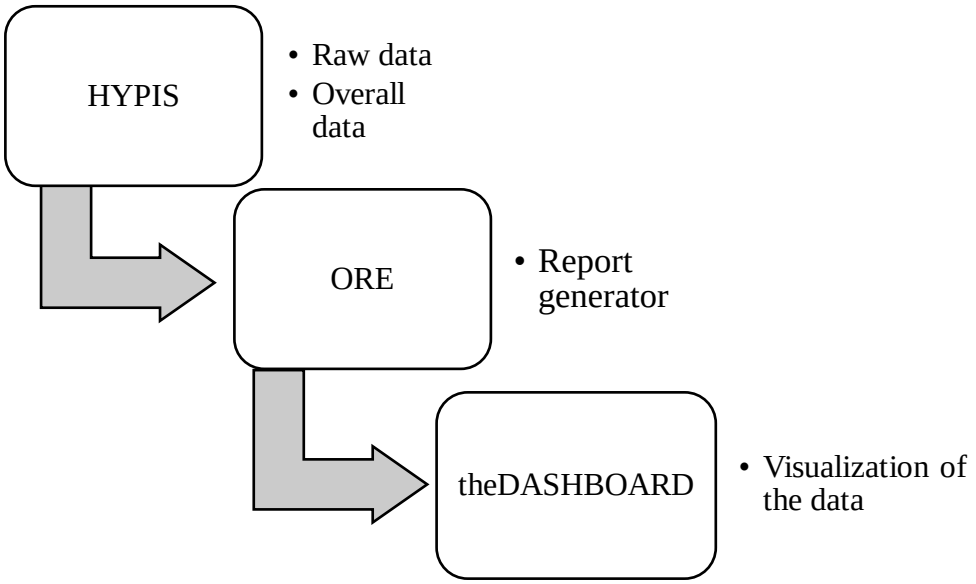


Figure 6: Simplified OWE flow

3.3 Development Tools

In order to complete this project, the previous students used Microsoft Excel Macro as the programming language used in Macro is Visual Basic for Application (VBA) which is a built-in function in Microsoft Office. VBA is a high-level programming language as it is easy to be used to develop the programs.

Tools used are:-

Hardware

- Personal Computer (PC) running on WINDOWS 7 and above operating system (OS)

Software

- Microsoft Office Standard 2010 – Microsoft Excel (Macro)

3.4 Gantt Chart and Milestones

		FYP1							FYP2						
No	Details	1-2	3-4	5-6	7-8	9-10	11-12	13-14	1-2	3-4	5-6	7-8	9-10	11-12	13-14
1	Project Planning														
2	Literature Review/Theory														
3	Data Gathering/ Analysis														
4	Develop System Architecture														
5	Design UI														
6	Submission of Interim Report														
7	Proposal Defence														
8	Development & Prototype														
9	System Implementation														
10	System Testing														
11	Pre-SEDEX														
12	Technical Report Submission														
13	Dissertation Soft bound Submission														
14	VIVA														
15	Hardbound Dissertation														

Table 1: Gantt chart for FYP 1 and FYP2 with milestones

CHAPTER 4

RESULTS AND FINDINGS

4.1 Graphical User Interface

The graphical user interface (GUI) is developed via Visual Basic Application for the project to upload the document modules. The GUI is easy to navigate and all adjustment processes must be done via the GUI to avoid probability of human errors. Below is the GUI for uploading documents module.

Figure 7: Uploading Documents Module Interface

By specifying the related operation reports, the necessary master template can be created for INPUTGASPM, INPUTGASSS, INPUTCRUDEPM, and INPUTCRUDESS. There will be an error checking mechanism to ensure that the specified items are the correct file type of Microsoft Excel format as well as correct input files. The system will notify users in case of any errors encountered during the document upload. If there are no errors, the consolidation process will then proceed.

After data extraction is complete, the automation script will create summary reports with aggregated data such as variances, means, standard deviations, etc. If any of the summary reports failed to be created, the step is terminated. The automation script will notify the user to restart the step, or to abort. Else, all summary reports will be created. The automation script will auto-terminate after this step.

The first step in the business process is to upload all the input documents. User needs to copy all four operation reports into the directory which contains the master template. All operation reports INPUTGASPM, INPUTGASSS, INPUTCRUDEPM, and INPUTCRUDESS will be stored in a directory located in the user's computer. Once all operation reports are copied, the user needs to specify these documents inside ORE Upload Documents module. Below shows the suggested location to store all the reports directory.

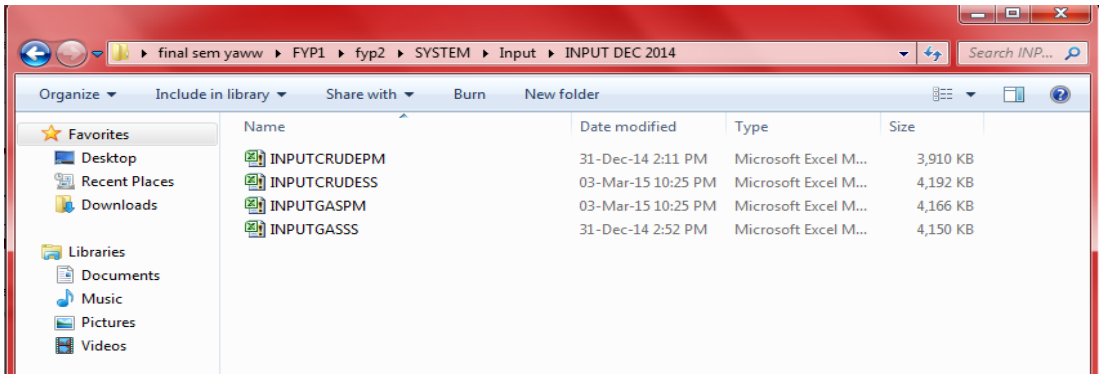


Figure 8: Suggested Directory

Document Name	Uses
INPUTGASPM	The document contains production data for gas fields in Peninsular Malaysia. Production data is used to generate GAS (Malaysia) Upstream, GAS (Malaysia Import) Upstream, and GAS (Malaysia) Downstream summary reports.
INPUTGASSS	The document contains production data for gas fields in Sabah and Sarawak. Production data is used to generate GAS (Malaysia) Upstream, GAS (Malaysia Import) Upstream, and GAS (Malaysia) Downstream summary reports.
INPUTCRUDEPM	The document contains production data for gas fields in Peninsular Malaysia. Production data is used to generate CRUDE (Malaysia), and FLARE (Malaysia) summary reports.
INPUTCRUDESS	The document contains production data for gas fields in Sabah and Sarawak. Production data is used to generate CRUDE (Malaysia), and FLARE (Malaysia) summary reports.

Table 2: Operation Reports

All specific input files contain production data for Peninsular Malaysia and Sabah/Sarawak. After specifying these operation reports, the user will click the 'consolidate' button and these operation reports will be data mined, line by line, and all data in searched rows will be copied into the master template. The macros will intelligently read back the data via cell referencing and extract data via cell values.

The automation system will then check if the users select the correct input files according to their respective fields to avoid inaccurate reports of data to be generated. The system will notify the users of the errors and will not proceed unless the selections of input files are inserted correctly. Below is the flow of the process and the error message box that will notify the users once they select incorrect input files:

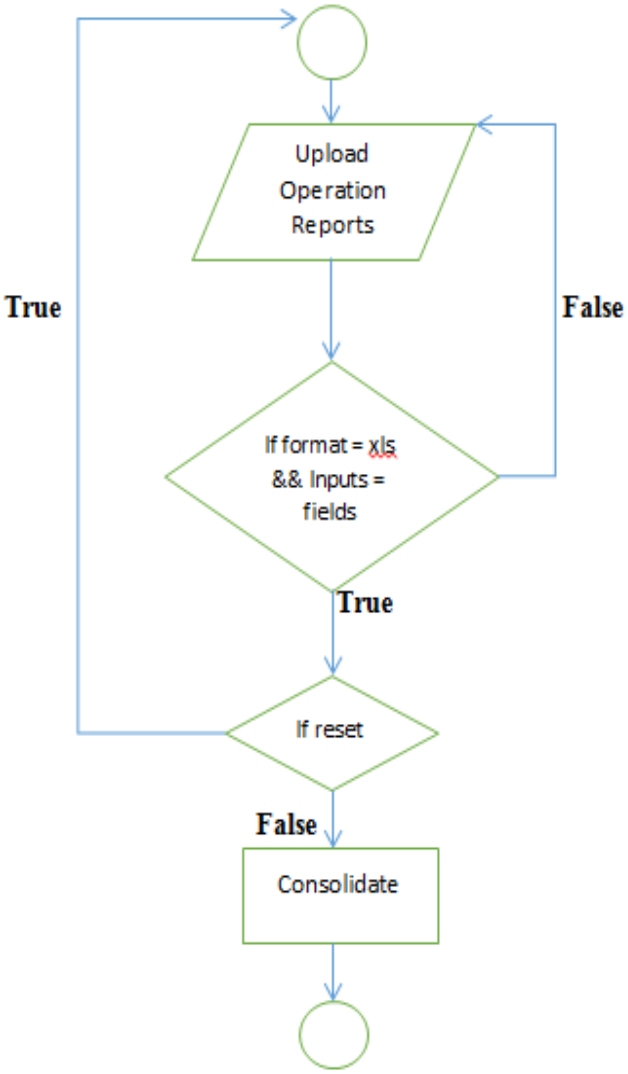


Figure 9: File Browse and Reset Flowchar

The figure below shows the error checking function to ensure the users to select correct input files in the correct fields:

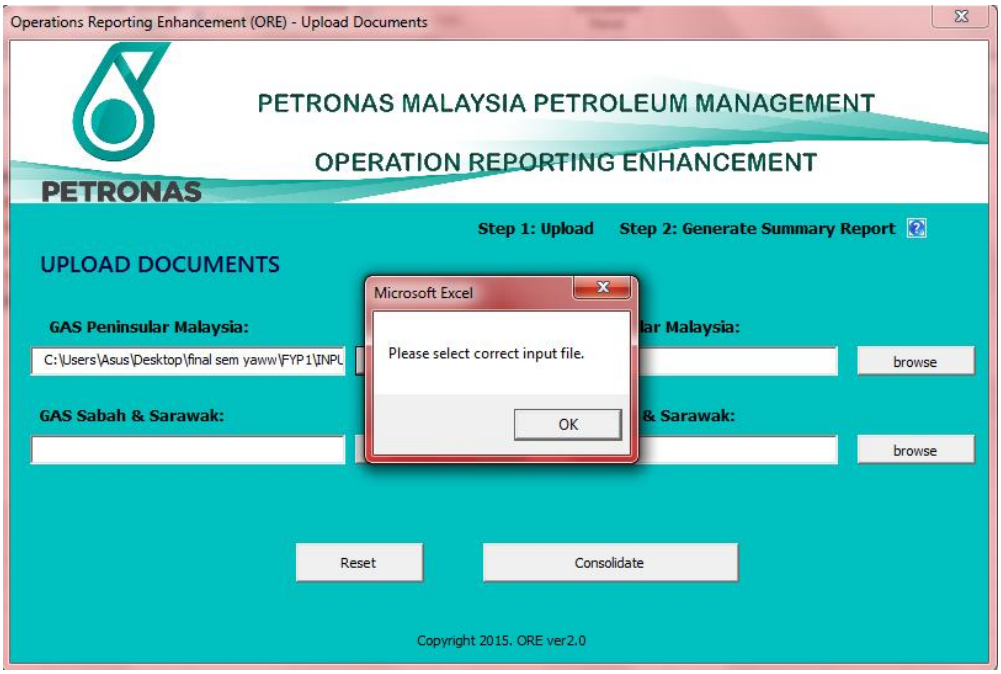


Figure 10: Field checking

4.2 System Prototype

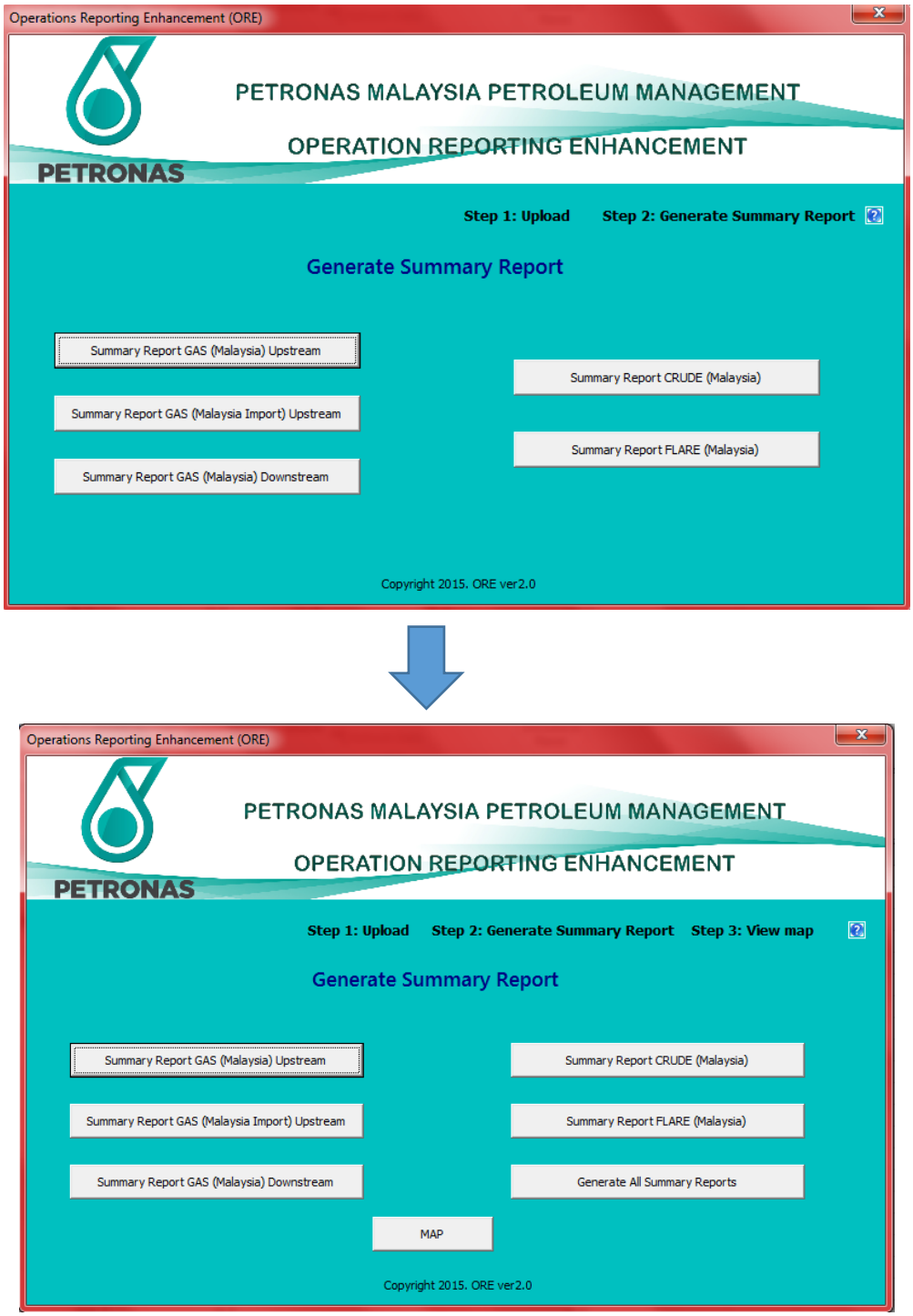


Figure 11: Second interface comparison

Figure 12: Finalized interface

The figure above shows the comparison of the function added with the previous interface which is the second step in ORE is to create the summary reports as well as the function to view the map. Figure 11 shows the interface after consolidation has been successful. Previously, this GUI will have five (5) buttons, each to generate a specific summary report. Upon clicking the button, summarization process will commence one by one which is quite tedious. A new function is added to the current process which a button that can generate all the summary reports at the same time just by a click and prompt a message to notify the users as below. This process can minimize time consumed to generate the reports by the users efficiently. The finalized interface as shown above omitted the map button by having it already being integrated in theDASHBOARD so that the users do not have to integrate it separately.

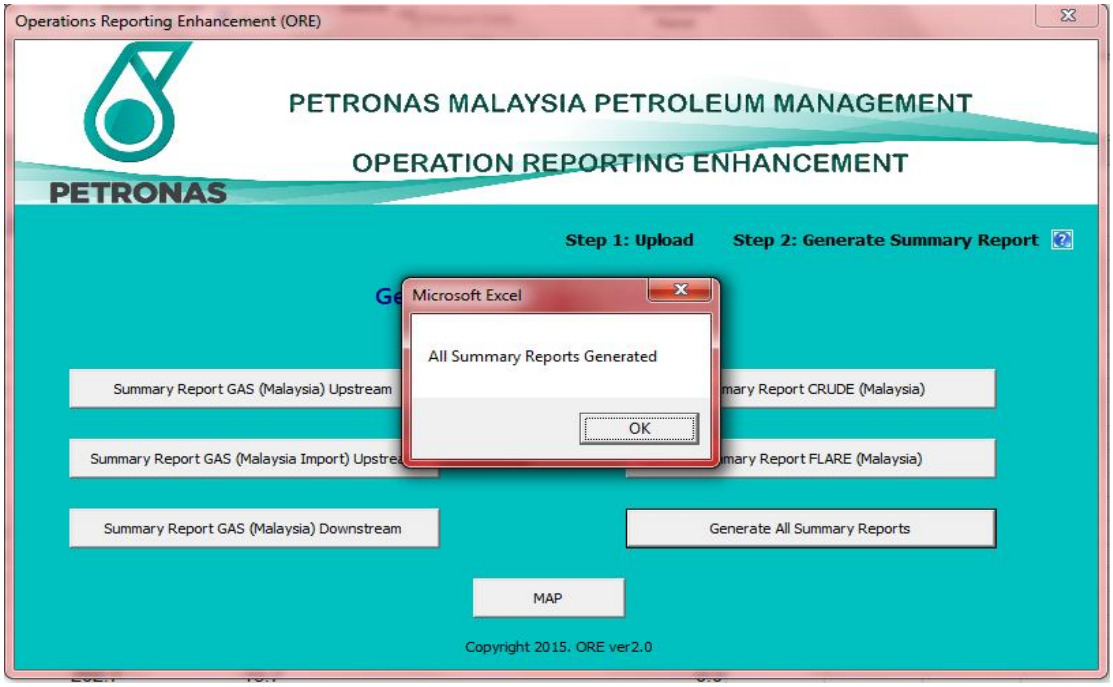


Figure 13: Notify message

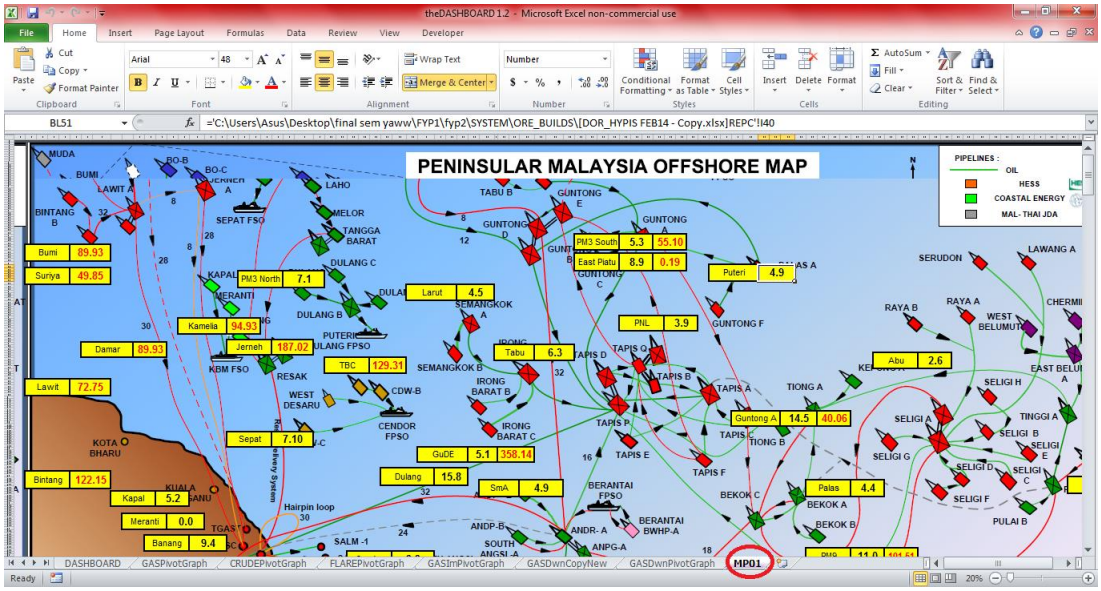
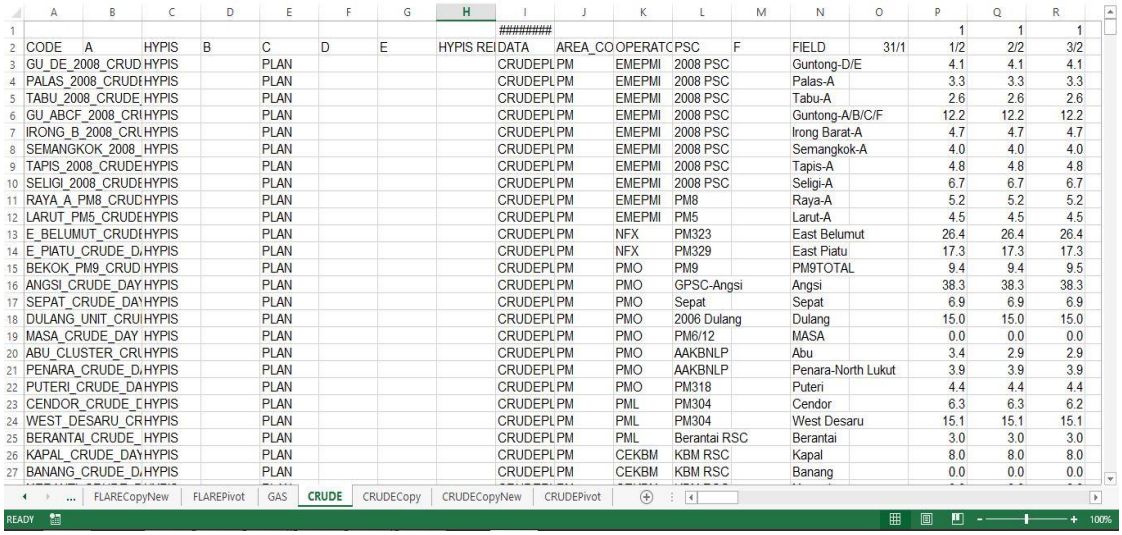


Figure 14: Map already being integrated in theDASHBOARD

The summarization of the process includes three stages, namely Raw-Copy sheet, Copy-CopyNew sheet, and CopyNew-Pivot sheet.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1									########							1	1	1
2	CODE	A	HYPIS	B	C	D	E	HYPIS REI	DATA	AREA_CO	OPERATC	PSC	F	FIELD	31/1	1/2	2/2	3/2
3	GU_DE_2008_CRUD		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Guntong-D/E		4.1	4.1	4.1
4	PALAS_2008_CRUDI		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Palas-A		3.3	3.3	3.3
5	TABU_2008_CRUDE		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Tabu-A		2.6	2.6	2.6
6	GU_ABCF_2008_CRI		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Guntong-A/B/C/F		12.2	12.2	12.2
7	IRONG_B_2008_CRU		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Irong Barat-A		4.7	4.7	4.7
8	SEMANGKOK_2008_		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Semangkok-A		4.0	4.0	4.0
9	TAPIS_2008_CRUDE		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Tapis-A		4.8	4.8	4.8
10	SELIGI_2008_CRUDI		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	2008 PSC		Seligi-A		6.7	6.7	6.7
11	RAYA_A_PM8_CRUD		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	PM8		Raya-A		5.2	5.2	5.2
12	LARUT_PM5_CRUDE		HYPIS		PLAN				CRUDEPL	PM	EMEPMI	PM5		Larut-A		4.5	4.5	4.5
13	E_BELUMUT_CRUDI		HYPIS		PLAN				CRUDEPL	PM	NFX	PM323		East Belumut		26.4	26.4	26.4
14	E_PIATU_CRUDE_D/		HYPIS		PLAN				CRUDEPL	PM	NFX	PM329		East Piatu		17.3	17.3	17.3
15	BEKOK_PM9_CRUD		HYPIS		PLAN				CRUDEPL	PM	PMO	PM9		PM9TOTAL		9.4	9.4	9.5
16	ANGSI_CRUDE_DAY		HYPIS		PLAN				CRUDEPL	PM	PMO	GPSC-Angsi		Angsi		38.3	38.3	38.3
17	SEPAT_CRUDE_DA		HYPIS		PLAN				CRUDEPL	PM	PMO	Sepat		Sepat		6.9	6.9	6.9
18	DULANG_UNIT_CRU		HYPIS		PLAN				CRUDEPL	PM	PMO	2006 Dulang		Dulang		15.0	15.0	15.0
19	MASA_CRUDE_DAY		HYPIS		PLAN				CRUDEPL	PM	PMO	PM6/12		MASA		0.0	0.0	0.0
20	ABU_CLUSTER_CRU		HYPIS		PLAN				CRUDEPL	PM	PMO	AAKBNLP		Abu		3.4	2.9	2.9
21	PENARA_CRUDE_D/		HYPIS		PLAN				CRUDEPL	PM	PMO	AAKBNLP		Penara-North Lukut		3.9	3.9	3.9
22	PUTERI_CRUDE_DA		HYPIS		PLAN				CRUDEPL	PM	PMO	PM318		Puteri		4.4	4.4	4.4
23	CENDOR_CRUDE_[		HYPIS		PLAN				CRUDEPL	PM	PML	PM304		Cendor		6.3	6.3	6.2
24	WEST_DESARU_CR		HYPIS		PLAN				CRUDEPL	PM	PML	PM304		West Desaru		15.1	15.1	15.1
25	BERANTAI_CRUDE_		HYPIS		PLAN				CRUDEPL	PM	PML	Berantai RSC		Berantai		3.0	3.0	3.0
26	KAPAL_CRUDE_DA		HYPIS		PLAN				CRUDEPL	PM	CEKBM	KBM RSC		Kapal		8.0	8.0	8.0
27	BANANG_CRUDE_D/		HYPIS		PLAN				CRUDEPL	PM	CEKBM	KBM RSC		Banang		0.0	0.0	0.0

Figure 15: Raw (CRUDE)

Figure 13 shows an example of the raw sheet. This is the raw data extracted from the input files and copied into the raw sheet. No alteration is done in this stage, it will only copy back the cell values. This raw sheet is before any of the column deletion takes place. For example, CRUDECopy document contains CRUDEPLAN and CRUDEDAILY data while FLARECopy document contains FLAREPLAN and FLAREDAILY data.

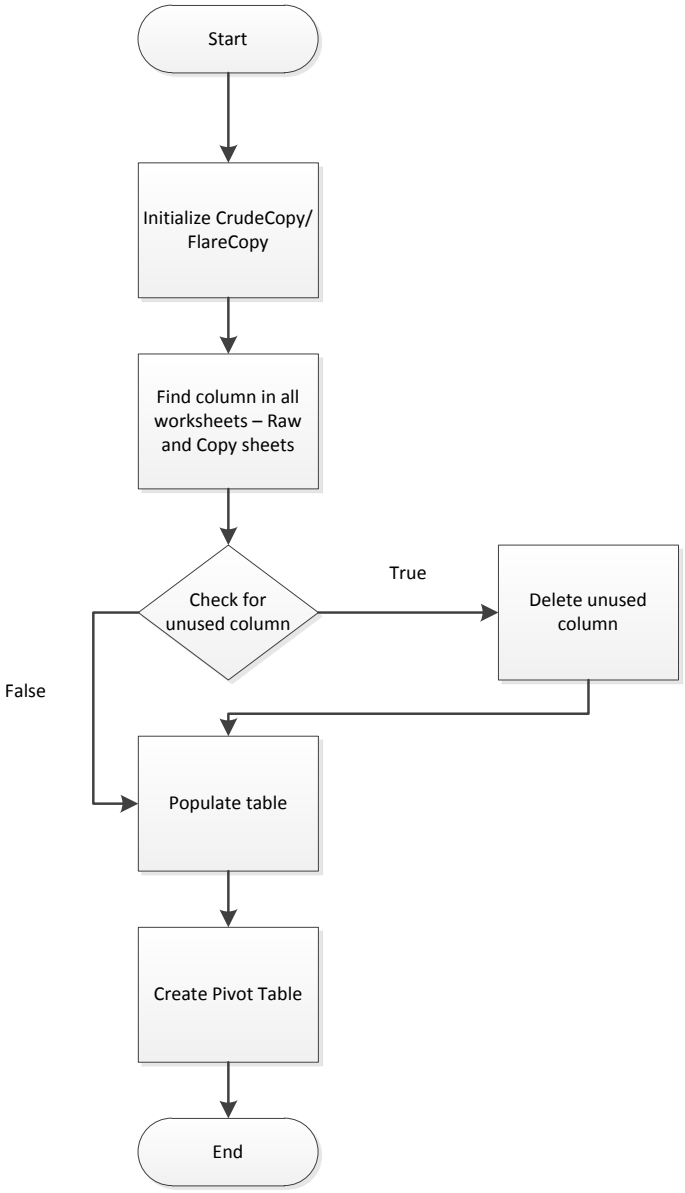
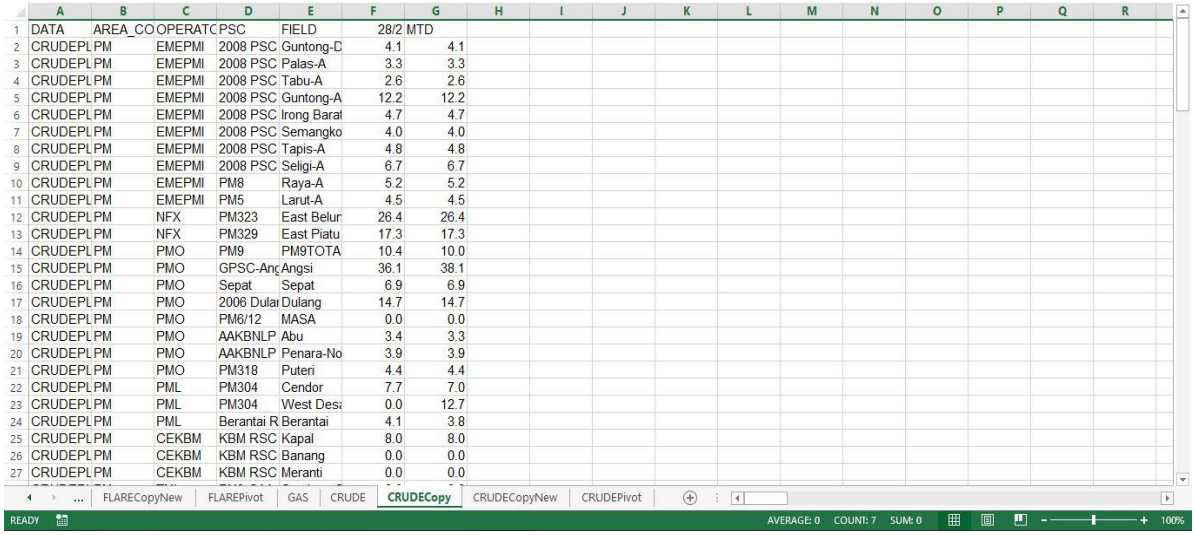


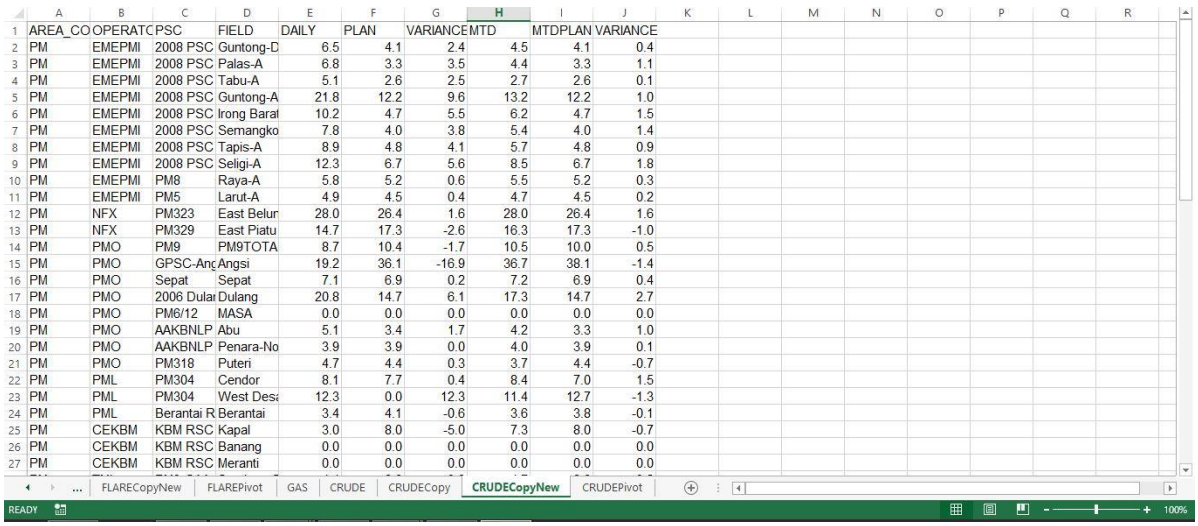
Figure 16: Flowchart for Copy Column



	A	B	C	D	E	F	G
1	DATA	AREA_CO	OPERATC	PSC	FIELD	28/2	MTD
2	CRUDEPL	PM	EMEPMI	2008 PSC	Guntong-D	4.1	4.1
3	CRUDEPL	PM	EMEPMI	2008 PSC	Palas-A	3.3	3.3
4	CRUDEPL	PM	EMEPMI	2008 PSC	Tabu-A	2.6	2.6
5	CRUDEPL	PM	EMEPMI	2008 PSC	Guntong-A	12.2	12.2
6	CRUDEPL	PM	EMEPMI	2008 PSC	Irong Barat	4.7	4.7
7	CRUDEPL	PM	EMEPMI	2008 PSC	Semangko	4.0	4.0
8	CRUDEPL	PM	EMEPMI	2008 PSC	Tapis-A	4.8	4.8
9	CRUDEPL	PM	EMEPMI	2008 PSC	Seligi-A	6.7	6.7
10	CRUDEPL	PM	EMEPMI	PM8	Raya-A	5.2	5.2
11	CRUDEPL	PM	EMEPMI	PM5	Larut-A	4.5	4.5
12	CRUDEPL	PM	NFX	PM323	East Belur	26.4	26.4
13	CRUDEPL	PM	NFX	PM329	East Piatu	17.3	17.3
14	CRUDEPL	PM	PMO	PM9	PM9TOTA	10.4	10.0
15	CRUDEPL	PM	PMO	GPSC-Anc	Angsi	36.1	38.1
16	CRUDEPL	PM	PMO	Sepat	Sepat	6.9	6.9
17	CRUDEPL	PM	PMO	2006 Dular	Dulang	14.7	14.7
18	CRUDEPL	PM	PMO	PM6/12	MASA	0.0	0.0
19	CRUDEPL	PM	PMO	AAKBNLP	Abu	3.4	3.3
20	CRUDEPL	PM	PMO	AAKBNLP	Penara-No	3.9	3.9
21	CRUDEPL	PM	PMO	PM318	Puteri	4.4	4.4
22	CRUDEPL	PM	PML	PM304	Cendor	7.7	7.0
23	CRUDEPL	PM	PML	PM304	West Desa	0.0	12.7
24	CRUDEPL	PM	PML	Berantai R	Berantai	4.1	3.8
25	CRUDEPL	PM	CEKBM	KBM RSC	Kapal	8.0	8.0
26	CRUDEPL	PM	CEKBM	KBM RSC	Banang	0.0	0.0
27	CRUDEPL	PM	CEKBM	KBM RSC	Meranti	0.0	0.0

Figure 17: Copy (CRUDE)

Figure 15 shows the document after column deletion. Only 7 columns remain up to this point to be copied to the new sheet of CopyNew documents. All other columns will be deleted except current date of the operation reports. These values will be used to populate the CopyNew sheet for both CRUDE and FLARE.



	A	B	C	D	E	F	G	H	I	J
1	AREA_CO	OPERATC	PSC	FIELD	DAILY	PLAN	VARIANCE	MTD	MTDPLAN	VARIANCE
2	PM	EMEPMI	2008 PSC	Guntong-D	6.5	4.1	2.4	4.5	4.1	0.4
3	PM	EMEPMI	2008 PSC	Palas-A	6.8	3.3	3.5	4.4	3.3	1.1
4	PM	EMEPMI	2008 PSC	Tabu-A	5.1	2.6	2.5	2.7	2.6	0.1
5	PM	EMEPMI	2008 PSC	Guntong-A	21.8	12.2	9.6	13.2	12.2	1.0
6	PM	EMEPMI	2008 PSC	Irong Barat	10.2	4.7	5.5	6.2	4.7	1.5
7	PM	EMEPMI	2008 PSC	Semangko	7.8	4.0	3.8	5.4	4.0	1.4
8	PM	EMEPMI	2008 PSC	Tapis-A	8.9	4.8	4.1	5.7	4.8	0.9
9	PM	EMEPMI	2008 PSC	Seligi-A	12.3	6.7	5.6	8.5	6.7	1.8
10	PM	EMEPMI	PM8	Raya-A	5.8	5.2	0.6	5.5	5.2	0.3
11	PM	EMEPMI	PM5	Larut-A	4.9	4.5	0.4	4.7	4.5	0.2
12	PM	NFX	PM323	East Belur	28.0	26.4	1.6	28.0	26.4	1.6
13	PM	NFX	PM329	East Piatu	14.7	17.3	-2.6	16.3	17.3	-1.0
14	PM	PMO	PM9	PM9TOTA	8.7	10.4	-1.7	10.5	10.0	0.5
15	PM	PMO	GPSC-Anc	Angsi	19.2	36.1	-16.9	36.7	38.1	-1.4
16	PM	PMO	Sepat	Sepat	7.1	6.9	0.2	7.2	6.9	0.4
17	PM	PMO	2006 Dular	Dulang	20.8	14.7	6.1	17.3	14.7	2.7
18	PM	PMO	PM6/12	MASA	0.0	0.0	0.0	0.0	0.0	0.0
19	PM	PMO	AAKBNLP	Abu	5.1	3.4	1.7	4.2	3.3	1.0
20	PM	PMO	AAKBNLP	Penara-No	3.9	3.9	0.0	4.0	3.9	0.1
21	PM	PMO	PM318	Puteri	4.7	4.4	0.3	3.7	4.4	-0.7
22	PM	PML	PM304	Cendor	8.1	7.7	0.4	8.4	7.0	1.5
23	PM	PML	PM304	West Desa	12.3	0.0	12.3	11.4	12.7	-1.3
24	PM	PML	Berantai R	Berantai	3.4	4.1	-0.6	3.6	3.8	-0.1
25	PM	CEKBM	KBM RSC	Kapal	3.0	8.0	-5.0	7.3	8.0	-0.7
26	PM	CEKBM	KBM RSC	Banang	0.0	0.0	0.0	0.0	0.0	0.0
27	PM	CEKBM	KBM RSC	Meranti	0.0	0.0	0.0	0.0	0.0	0.0

Figure 18: CopyNew (CRUDE)

Figure 16 shows CopyNew documents. Data will be sorted out by the area code. All data extracted are from the Copy sheet and sorted according to planned production and actual production data. For both CRUDE and FLARE, the field will have a planned production data, an actual production data, a planned MTD production data, and an actual MTD production data (MTD). The variances will be calculated in terms of differences between planned production and actual production data. Table 5 shows the remarks for each extracted data. All these formulas has been analysed by the previously.

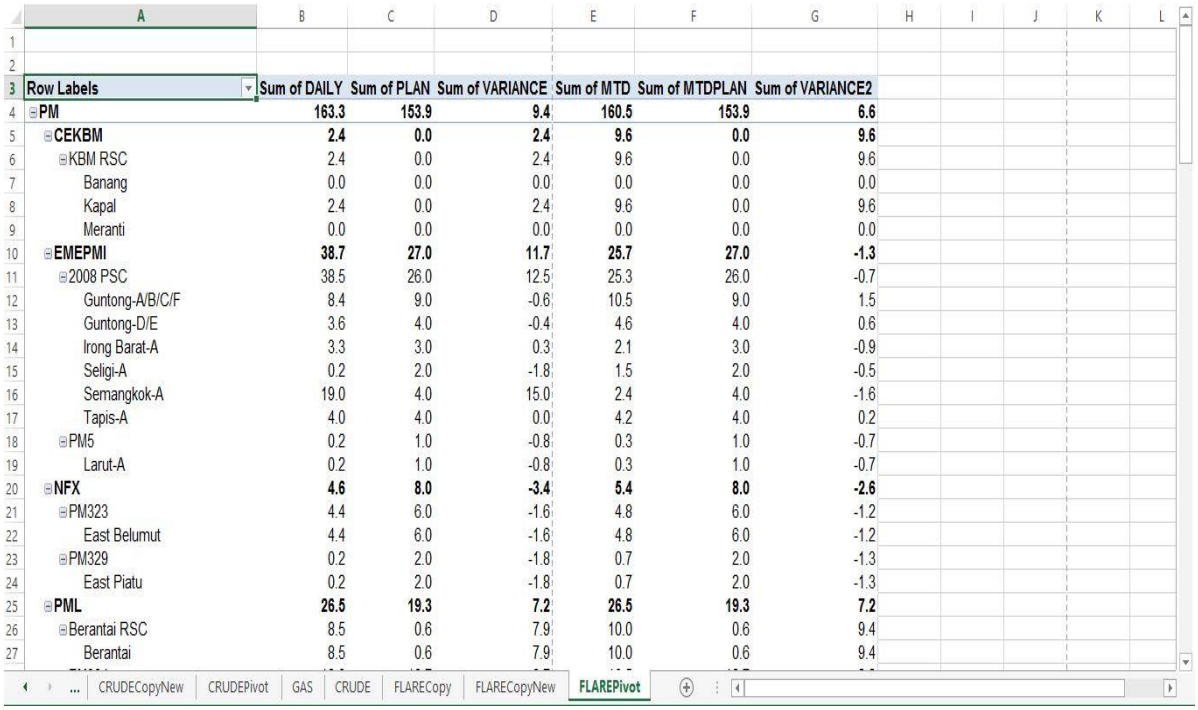
Column	Remarks
SUM OF DAILY	The daily production for the current date
SUM OF PLAN	The planned production for the current date
Month to Date (MTD DAILY)	The sum of daily production divided by the number of days per month.
Month to Date (MTD PLAN)	The sum of planned production divided by the number of days per month.

Table 3: Extracted Data

Row Labels	Sum of DAILY	Sum of PLAN	Sum of VARIANCE	Sum of MTD	Sum of MTDPLAN	Sum of VARIANCE2
PM	**245.3**	**212.2**	**33.1**	**236.2**	**225.2**	**11.0**
CEKBM	**3.0**	**8.0**	**-5.0**	**7.3**	**8.0**	**-0.7**
KBM RSC	3.0	8.0	-5.0	7.3	8.0	-0.7
Banang	0.0	0.0	0.0	0.0	0.0	0.0
Kapal	3.0	8.0	-5.0	7.3	8.0	-0.7
Meranti	0.0	0.0	0.0	0.0	0.0	0.0
EMEPMI	**90.0**	**52.1**	**37.9**	**60.7**	**52.1**	**8.6**
2008 PSC	79.3	42.4	36.9	50.5	42.4	8.1
Guntong-A/B/C/F	21.8	12.2	9.6	13.2	12.2	1.0
Guntong-D/E	6.5	4.1	2.4	4.5	4.1	0.4
Irong Barat-A	10.2	4.7	5.5	6.2	4.7	1.5
Palas-A	6.8	3.3	3.5	4.4	3.3	1.1
Seligi-A	12.3	6.7	5.6	8.5	6.7	1.8
Semangkok-A	7.8	4.0	3.8	5.4	4.0	1.4
Tabu-A	5.1	2.6	2.5	2.7	2.6	0.1
Tapis-A	8.9	4.8	4.1	5.7	4.8	0.9
PM5	4.9	4.5	0.4	4.7	4.5	0.2
Larut-A	4.9	4.5	0.4	4.7	4.5	0.2
PM8	5.8	5.2	0.6	5.5	5.2	0.3
Raya-A	5.8	5.2	0.6	5.5	5.2	0.3
NFX	**42.8**	**43.7**	**-0.9**	**44.3**	**43.7**	**0.6**
PM323	28.0	26.4	1.6	28.0	26.4	1.6
East Belumut	28.0	26.4	1.6	28.0	26.4	1.6
PM329	14.7	17.3	-2.6	16.3	17.3	-1.0

... | CRUDECopy | CRUDECopyNew | CRUDEPivot | FLARECopy | FLARECopyNew | FLAREPivot

Figure 19: Pivot Sheet (CRUDE)



Row Labels	Sum of DAILY	Sum of PLAN	Sum of VARIANCE	Sum of MTD	Sum of MTDPLAN	Sum of VARIANCE2
PM	**163.3**	**153.9**	**9.4**	**160.5**	**153.9**	**6.6**
CEKBM	**2.4**	**0.0**	**2.4**	**9.6**	**0.0**	**9.6**
KBM RSC	2.4	0.0	2.4	9.6	0.0	9.6
Banang	0.0	0.0	0.0	0.0	0.0	0.0
Kapal	2.4	0.0	2.4	9.6	0.0	9.6
Meranti	0.0	0.0	0.0	0.0	0.0	0.0
EMEPMI	**38.7**	**27.0**	**11.7**	**25.7**	**27.0**	**-1.3**
2008 PSC	38.5	26.0	12.5	25.3	26.0	-0.7
Guntong-A/B/C/F	8.4	9.0	-0.6	10.5	9.0	1.5
Guntong-D/E	3.6	4.0	-0.4	4.6	4.0	0.6
Irong Barat-A	3.3	3.0	0.3	2.1	3.0	-0.9
Seligi-A	0.2	2.0	-1.8	1.5	2.0	-0.5
Semangkok-A	19.0	4.0	15.0	2.4	4.0	-1.6
Tapis-A	4.0	4.0	0.0	4.2	4.0	0.2
PM5	0.2	1.0	-0.8	0.3	1.0	-0.7
Larut-A	0.2	1.0	-0.8	0.3	1.0	-0.7
NFX	**4.6**	**8.0**	**-3.4**	**5.4**	**8.0**	**-2.6**
PM323	4.4	6.0	-1.6	4.8	6.0	-1.2
East Belumut	4.4	6.0	-1.6	4.8	6.0	-1.2
PM329	0.2	2.0	-1.8	0.7	2.0	-1.3
East Piatu	0.2	2.0	-1.8	0.7	2.0	-1.3
PML	**26.5**	**19.3**	**7.2**	**26.5**	**19.3**	**7.2**
Berantai RSC	8.5	0.6	7.9	10.0	0.6	9.4
Berantai	8.5	0.6	7.9	10.0	0.6	9.4

Figure 20: Pivot Sheet (FLARE)

Figure 17 and Figure 18 shows the final results and the extracted data are arranged into proper formatting called pivot table. This is the last step in creating the summary operation reports. PivotTable is a built-in table builder in Microsoft Excel and it allows user to create summary of data with ease. The automation script (macro) will create tables which are used to sort CopyNew data into proper summary reports formatting.

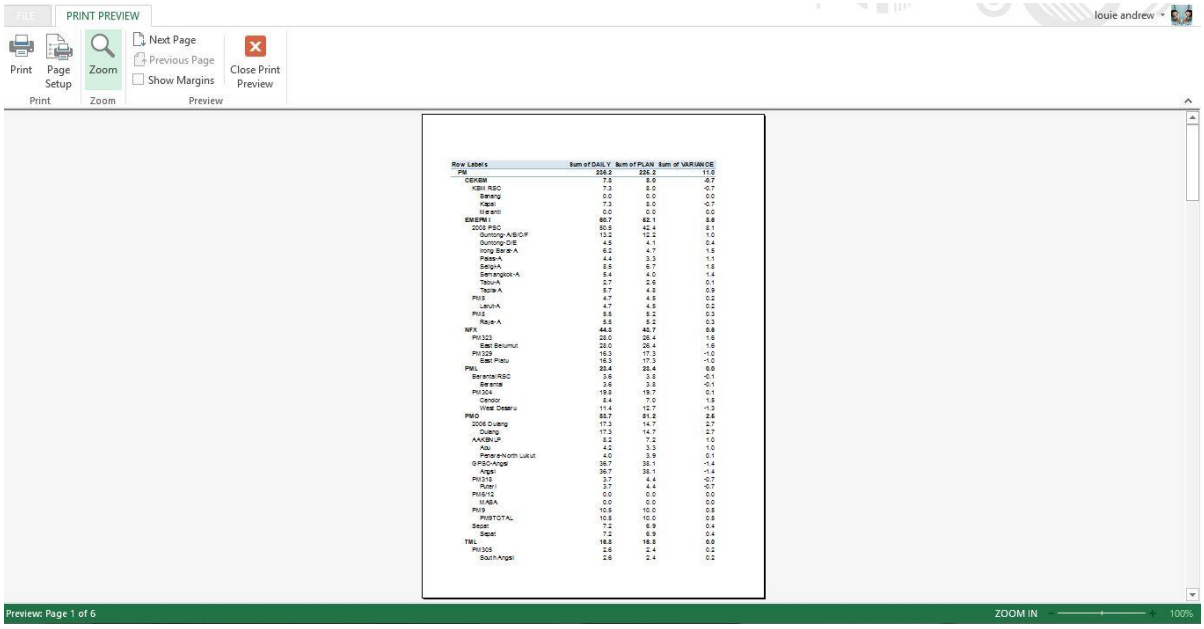


Figure 21: Print Preview

Print preview message will be prompt to the users and they are also able to preview the active work sheets for printing purposes and email the report summary from a simple click button through the macro functions. The print and email feature will make ORE more user friendly as it allows users to use less time to do a simple task. Figure 18 illustrates the print feature.

The next step of the process is to integrate the ORE file together with theDASHBOARD file. All of the worksheets in ORE file will be copied in theDASHBOARD file in order to reduce the number of files the admin or users need to refer to. It is also beneficial to integrate those files as it will work dynamically instead of working in static form. The data from the pivot table generated by ORE system will dynamically been updated into graphical form of theDASHBOARD. The users can then view and refer to the values in both pivot and visual form.

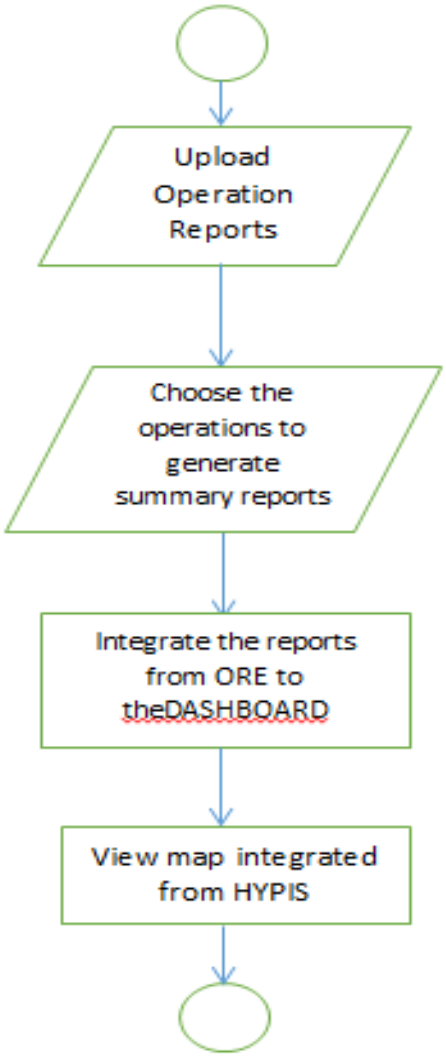
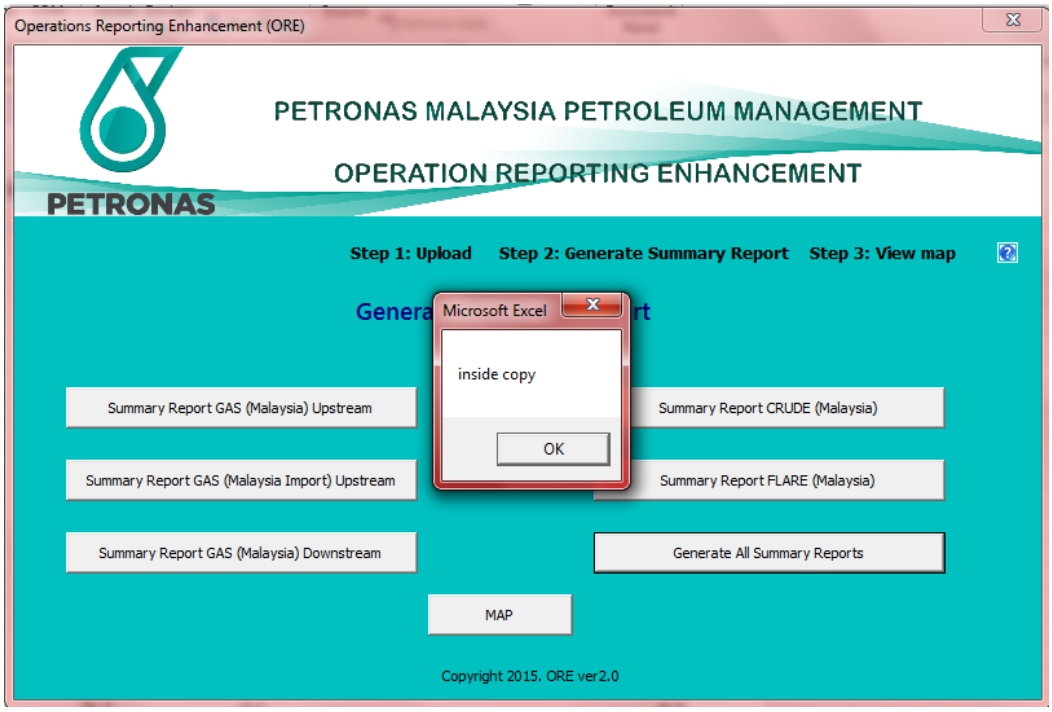


Figure 22: The flowchart of the System Integration Process

A message box will pop up to notify that the integration of ORE and theDASHBOARD will be made which is called as “inside copy” as shown below:



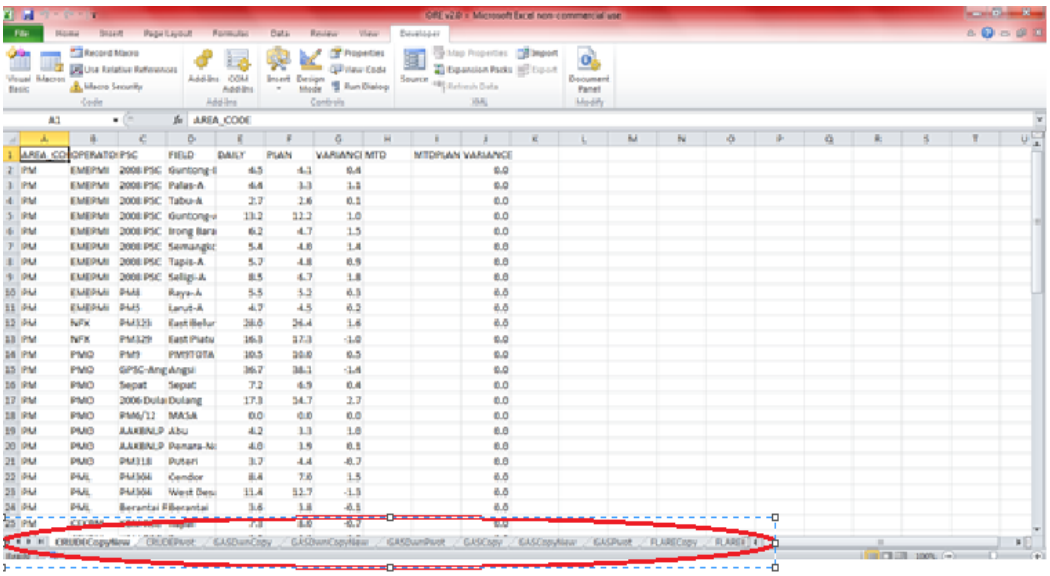


Figure 23: ORE file that will be integrated into theDASHBOARD

The figures below show the comparison of the original interface of theDASHBOARD without the worksheets integrated with the ORE file and with the integration done:

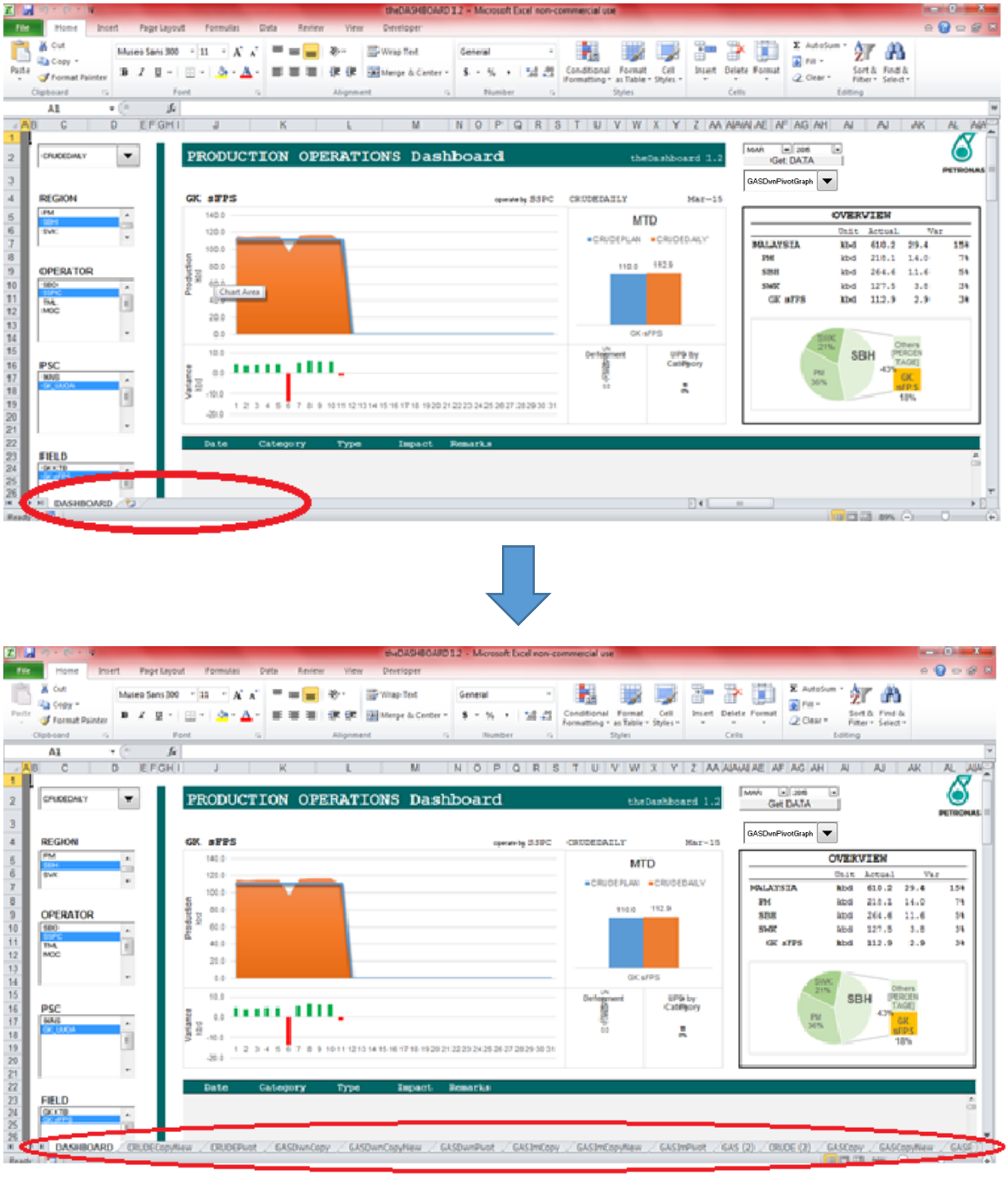
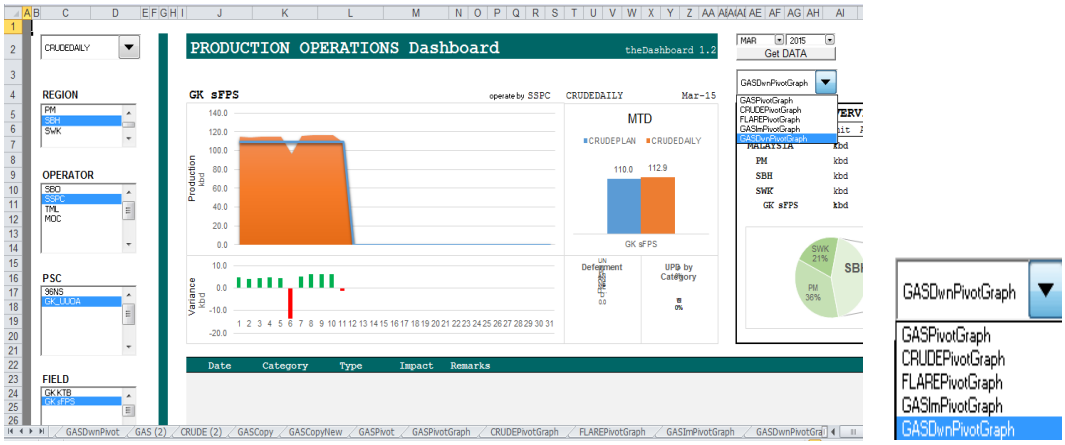


Figure 24: TheDASHBOARD - Comparison of the integrated and non-integrated

Another function added is that the users are able to view the pivot table generated in graphical form in theDASHBOARD file. There will be 5 pivot graphs generated in line with the 5 pivot tables which are GASPivotGraph, CRUDEPivotGraph, FLAREPivotGraph, GASImPivotGraph and GASDwnPivotGraph.



Each of the drop down will link to their respective pivot graphs generated in another sheet for the users to view as below. There is also “back” button to link the users back to the dashboard.

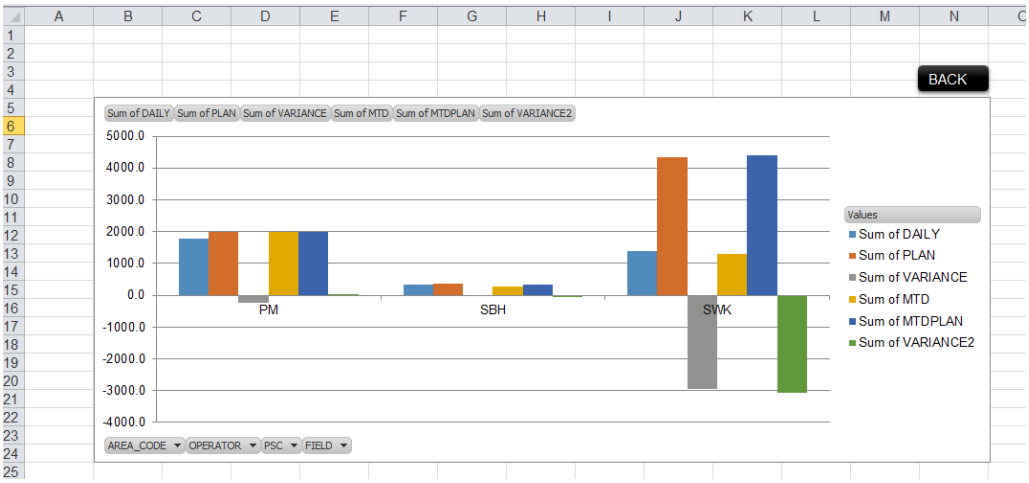
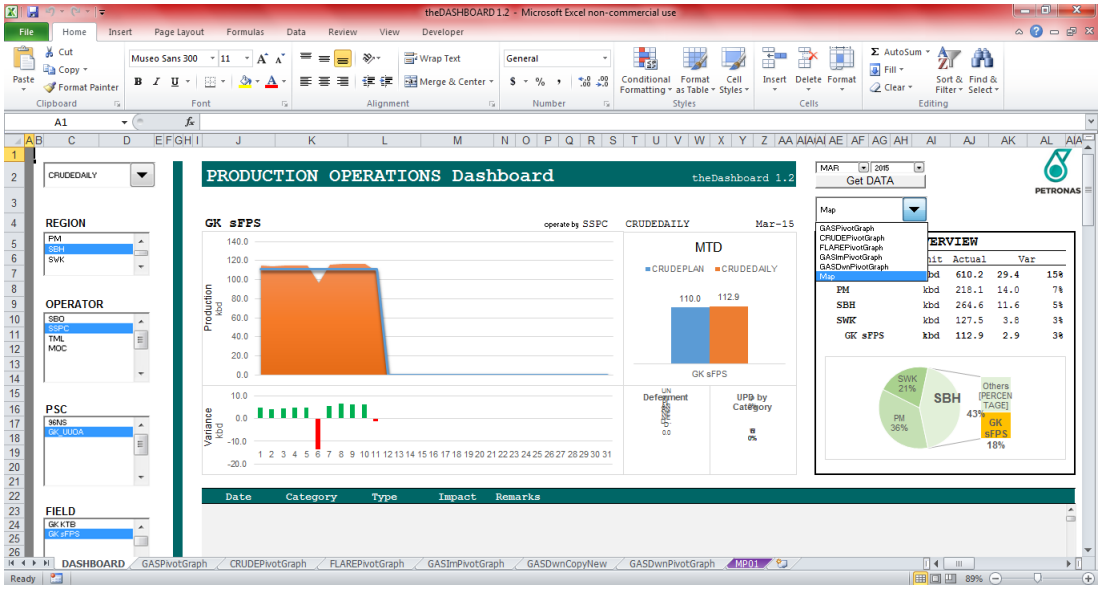
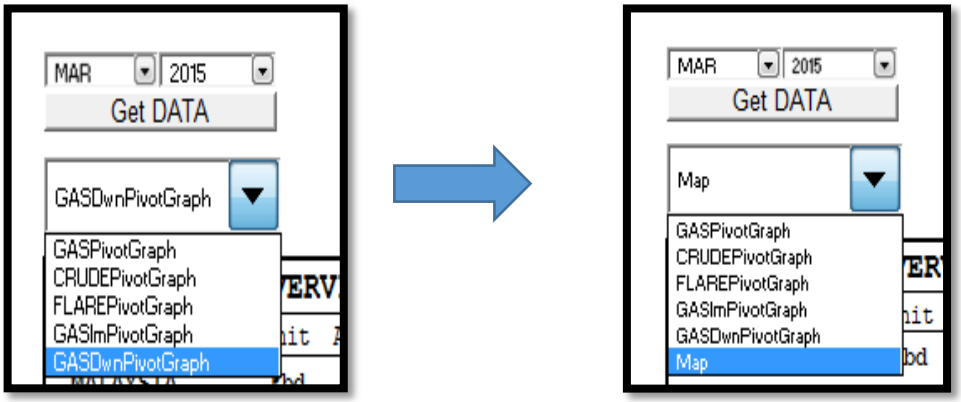
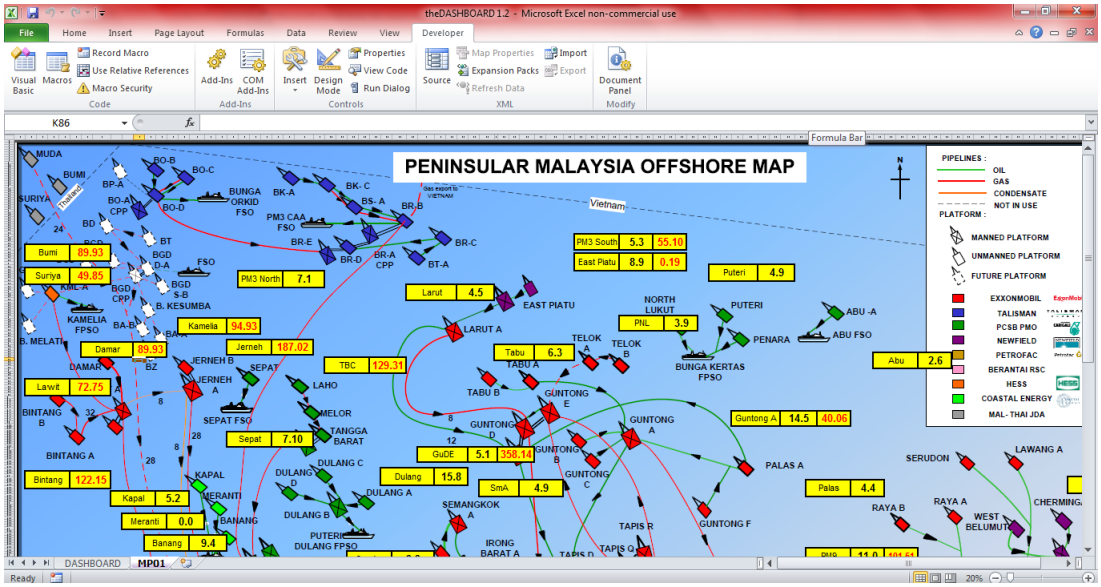


Figure 25: Pivot Graph

Lastly, the integration system also allows the users to view the map of the daily production operations as it shows the values on each available field. The values are taken directly from the HYPIS file and integrated in ORE file as well. The map is shown in the below figure:







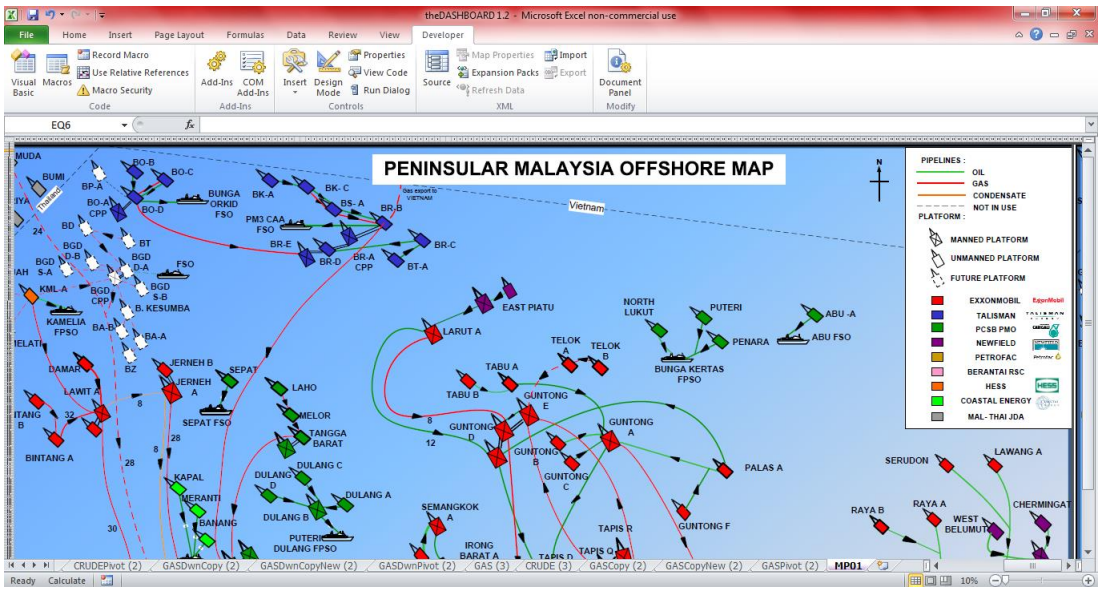


Figure 26: Map integrated from HYPIS dynamically

The map is integrated into theDASHBOARD which originally integrate from the HYPIS December file. It is also being integrated into the HYPIS February file to make it easier for the user to use only February file instead of referring the December file to view the map. The values are dynamically integrated which allows the user to update the values and updating it in theDASHBOARD at the same time.

There is also another function being omitted which the integrate button of 2 HYPIS file of December and February. This function will pop up too many notifications to save the previous files which are quite inconvenient. Another way of integrating these two files are suggested and implemented which is to just copy the sheets dynamically. The integrate button was being implemented as below but recently omitted as the user-friendly system is being concerned.

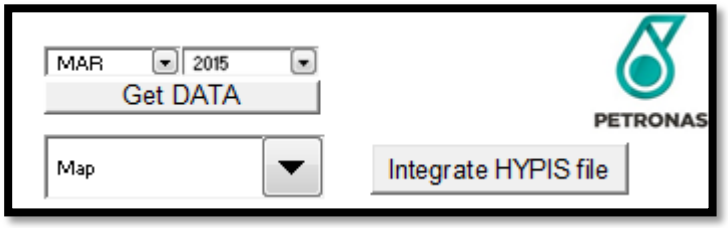


Figure 27: Omitted HYPIS Integration button

The figures below show the difference between the original HYPIS December file with the integrated file from February:

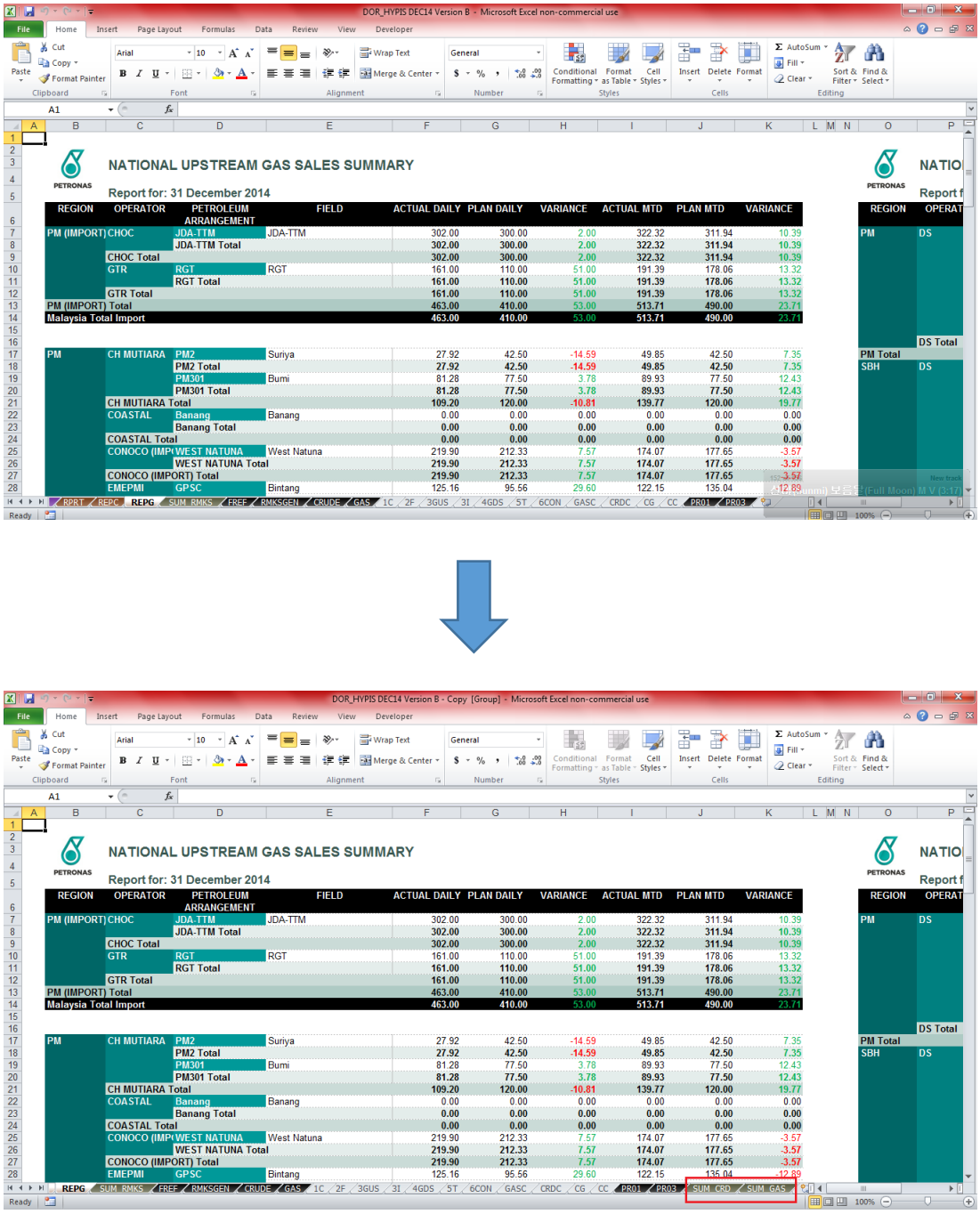


Figure 28: Integrated HYPIS December file

While, the figures below show the difference between the original HYPIS February file with the integrated file from December:

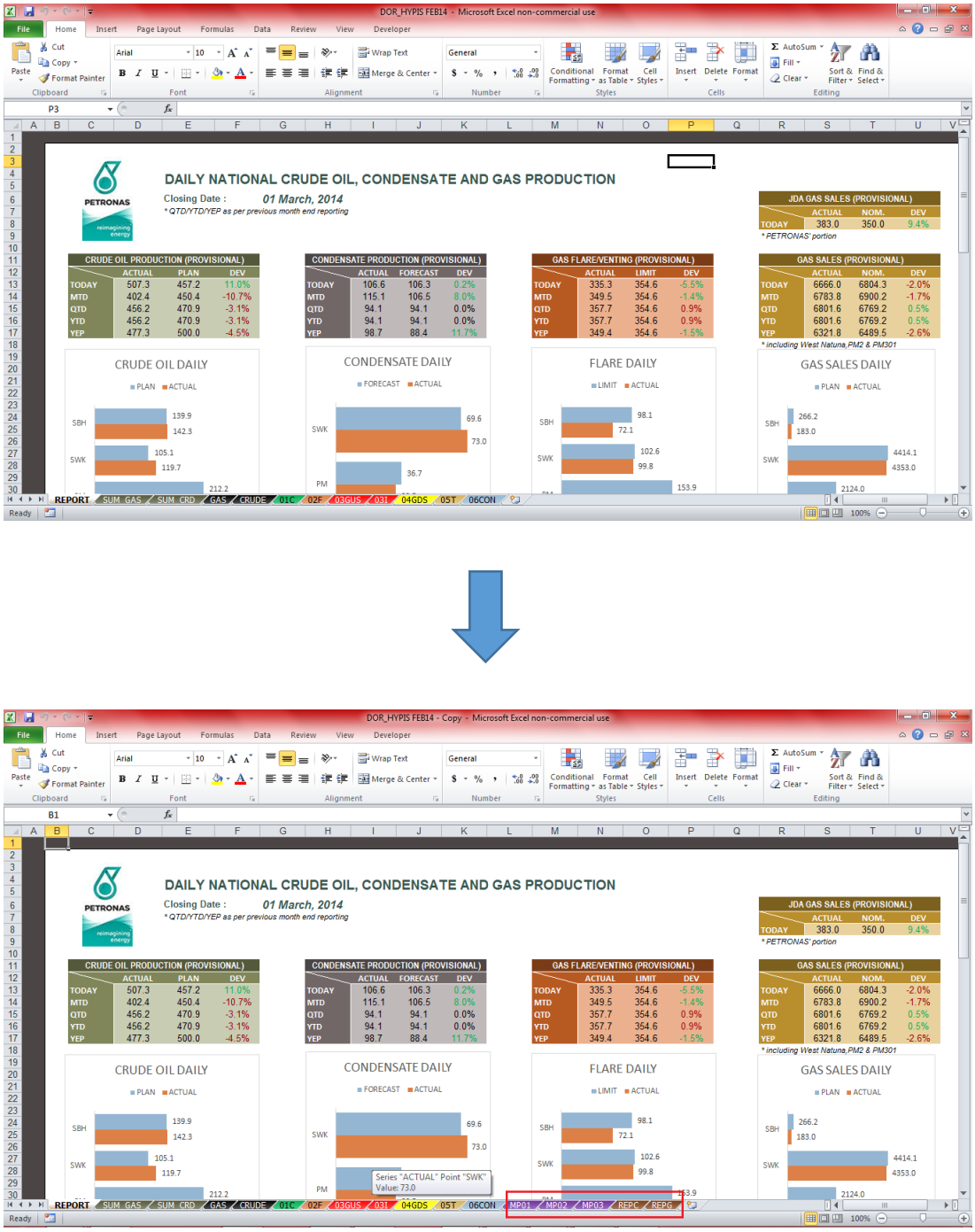


Figure 29: Integrated HYPIS February file

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This project has successfully managed to automate the report summary for GAS, CRUDE OIL and FLARE Malaysia on the database provided by PETRONAS MPM. Additional features and functions are added for example, configuration on the correct input files to be selected, pivot tables generated in HYPIS format, integration between ORE and theDASHBOARD files, displaying the data and results graphically as well as the static map of the operations.

The enhancement on the automation script has managed to ensure accumulated data extracted successfully, accurately and tally with PETRONAS MPM report summary. Hopefully, this initiative has achieved its main objectives and has improved the report consolidation undertaken by PETRONAS MPM, which is to enhance the security and integrity of the data as well as maximizing efficiency and effectiveness of completing the job while taking into consideration minimizing the time consumed for the process to be completed in order to ease their job.

5.2 Recommendations

Some future works that can be recommended for improvement is to enable the theDASHBOARD to enhance the visualized map as all the files are merged and incorporated in it. The map can also display current or previous reports based on specific locations. These recommendations are to provide insights and ideas for improvements to be done on certain aspects of the automation script and the user interface. These recommendations could be used as the basis of future works on this project.

CHAPTER 6

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APPENDICES

Appendix 1- Comparison between previous and current file content

theDASHBOARD		
Previous	**Current**	**After Integration with ORE**
theDASHBOARD	GASPivotGraph	GASPivotGraph
	CRUDEPivotGraph	CRUDEPivotGraph
	FLAREPivotGraph	FLAREPivotGraph
	GASImPivotGraph	GASImPivotGraph
	GASDwnCopyNew	GASDwnCopyNew
	GASDwnPivotGraph	GASDwnPivotGraph
	MP01	MP01
		GASImCopy
		GASImCopyNew
		GASImPivot
		FLARECopy
		FLARECopyNew
		FLAREPivot
		CRUDECopy
		CRUDECopyNew
		CRUDEPivot
		GASDwnCopy
		GASDwnCopyNew

		GASDwnPivot
		GAS(2)
		CRUDE(2)
		GASCopy
		GASCopyNew
		GASPivot

HYPIS DECEMBER	
Previous	**Current**
MP01	MP01
MP02	MP02
MP03	MP03
RPRT	RPRT
REPC	REPC
REPG	REPG
SUM_RMKS	SUM_RMKS
FREF	FREF
RMKSGEN	RMKSGEN
CRUDE	CRUDE
GAS	GAS
1C	1C

2F	2F
3GUS	3GUS
3I	3I
4GDS	4GDS
5T	5T
6CON	6CON
GASC	GASC
CRDC	CRDC
CG	CG
CC	CC
PR01	PR01
PR03	PR03
	SUM_CRD
	SUM_GAS

HYPIS FEBRUARY	
Previous	**Current**
REPORT	REPORT
SUM_GAS	SUM_GAS
SUM_CRD	SUM_CRD
GAS	GAS
CRUDE	CRUDE
01C	01C
02F	02F
03GUS	03GUS
03I	03I
04GDS	04GDS
05T	05T
06CON	06CON
	MP01
	MP02
	MP03
	REPC
	REPG

Table 4: Comparison before and after integration