

Business Intelligence Development Project

Closing Report

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1 Introduction

This report will introduce the Business Intelligence Development Project which developed the BI solutions for Cronus International Ltd according to the user stories (referring to the append). It will discuss the project solution through the following aspects:

- Data Structure and visualization
- Refresh Setting
- Project Delivery
- Conclusion

This report will only discuss the solutions for the 1st and 3rd user stories, which is Customer Analysis and Purchaser Workload analysis. The rest solutions will be discussed by Suvash in his report.

1.1 Update History

1.1.1 Iteration One

In solution of Customer Analysis, the user originally requested a solution for analysing the customer discount by sales amount. However, the user changed their requirement after some time that they would like to understand the Customers by RFM Model and the current discount.

1.1.2 Iteration Two

Base on the teacher's comment, the following update has been made, which is highlighted:

- Master data --- Customer table and Vendor table were imported into the solution
- Table naming practice has been improved. Please refer to Chapter 2.
- Added analysis for total purchase number per Vendor in visualization
- Validated the solution data with NAV. Please refer to Chapter 4.

2 Data Structure

In this session, the data structure will be introduced, including:

- Server, Database and Tables
- Data Cleansing
- Primary Key Determination
- Measure creation

2.1 Server, Database and Tables

Server Name	<i>NAV2015</i>
Database Name	<i>BIG4TF023_Rehn_2022</i>
Company Name	<i>Cronus 01</i>

2.1.1 Tables used in Customer RFM and Discount Analysis

Table Name	<i>01 Cronus Int_W1\$ Sales Header Merged (Refer to 2.1.3)</i>
	<i>01 Cronus Int_W1\$ Sales Line Merged (Refer to 2.1.3)</i>
	<i>01 Cronus Int_W1\$ Sales Line Discount</i>
	<i>01 Cronus Int_W1\$ Exchange Currency Rate</i>
	<i>01 Cronus Int_W1\$ Customer</i>
	<i>RFM Analysis</i>

2.1.2 Tables used in Purchaser Workload Analysis

Table Name	<i>01 Cronus Int_W1\$ Purchase Header Merged (Refer to 2.1.3)</i>
	<i>01 Cronus Int_W1\$ Purchase Line Merged (Refer to 2.1.3)</i>
	<i>01 Cronus Int_W1\$ Salesperson_Purchaser</i>
	<i>01 Cronus Int_W1\$ Vendor</i>

2.1.3 Merged Tables

Tables to be merged	Merged Table
<i>01 Cronus Int_W1\$ Sales Header</i>	<i>01 Cronus Int_W1\$ Sales Header Merged</i>
<i>01 Cronus Int_W1\$ Sales Header Archive</i>	
<i>01 Cronus Int_W1\$ Sales Line</i>	<i>01 Cronus Int_W1\$ Sales Line Merged</i>
<i>01 Cronus Int_W1\$ Sales Line Archive</i>	
<i>01 Cronus Int_W1\$ Purchase Header</i>	<i>01 Cronus Int_W1\$ Purchase Header Merged</i>
<i>01 Cronus Int_W1\$ Purchase Header Archive</i>	
<i>01 Cronus Int_W1\$ Purchase Line</i>	<i>01 Cronus Int_W1\$ Purchase Line Merged</i>
<i>01 Cronus Int_W1\$ Purchase Line Archive</i>	

2.2 Data Cleansing

Since the data was extracted from Microsoft NAV, the data were already well structured. However, there were some blank columns which, per my research, were mis-opened orders and lines. Therefore, the blank columns were excluded during the Data Transformation phase.

2.3 Primary Key Determination

Since the data in this solution will include the archived data, the primary key will combine the fields of Document Type and Document Number with Version No. The detailed steps are as follow:

- Filter the rows in which version No equals to null or 1
- Replace null as 0 in fields of version No
- Combine Document Type, Document No and Version No as primary key

Filter Rows

Apply one or more filter conditions to the rows in this table.

☒ Basic ☐ Advanced

Keep rows where 'Version No_'

equals null

☐ And ☒ Or

equals 1

Figure: Filter rows in which the Version No_ equals to null or 1

Replace Values

Replace one value with another in the selected columns.

Value To Find

null

Replace With

0

Figure: Replace null as 0

New column name

Primary Key

Custom column formula ⓘ

= [Document Type]&[No_]&[Version No_]

Figure: Create the primary key

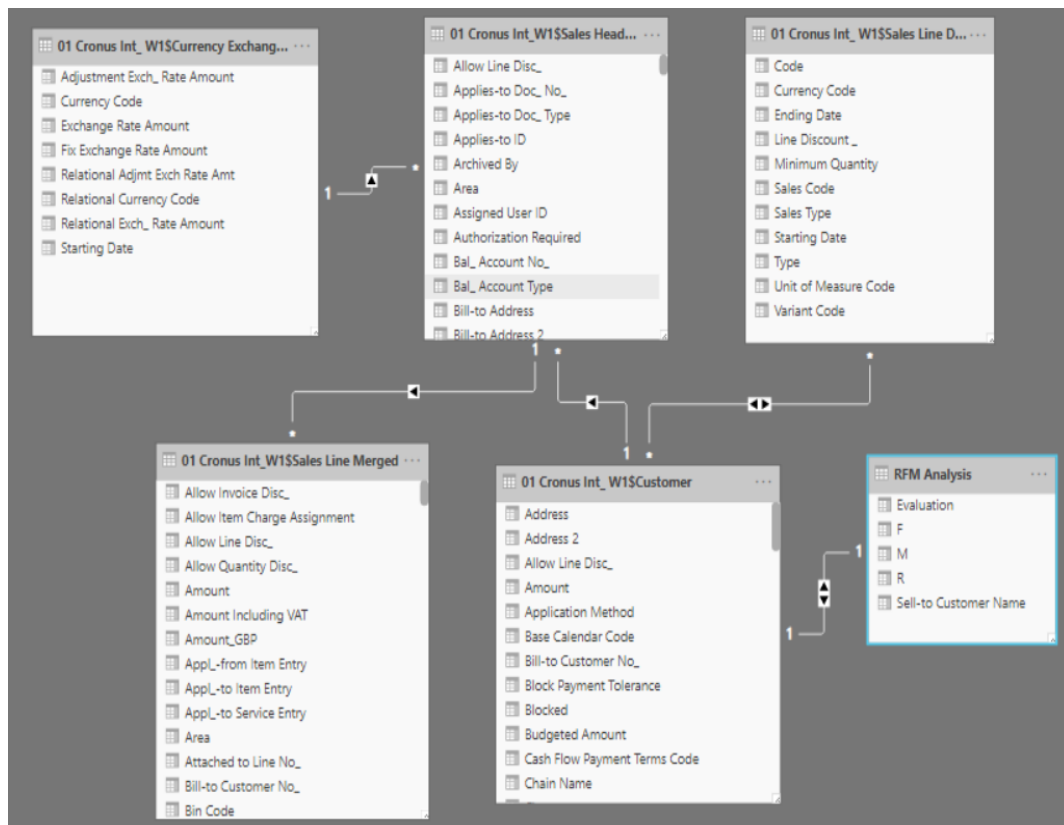


Figure: Data model for Customer RFM analysis

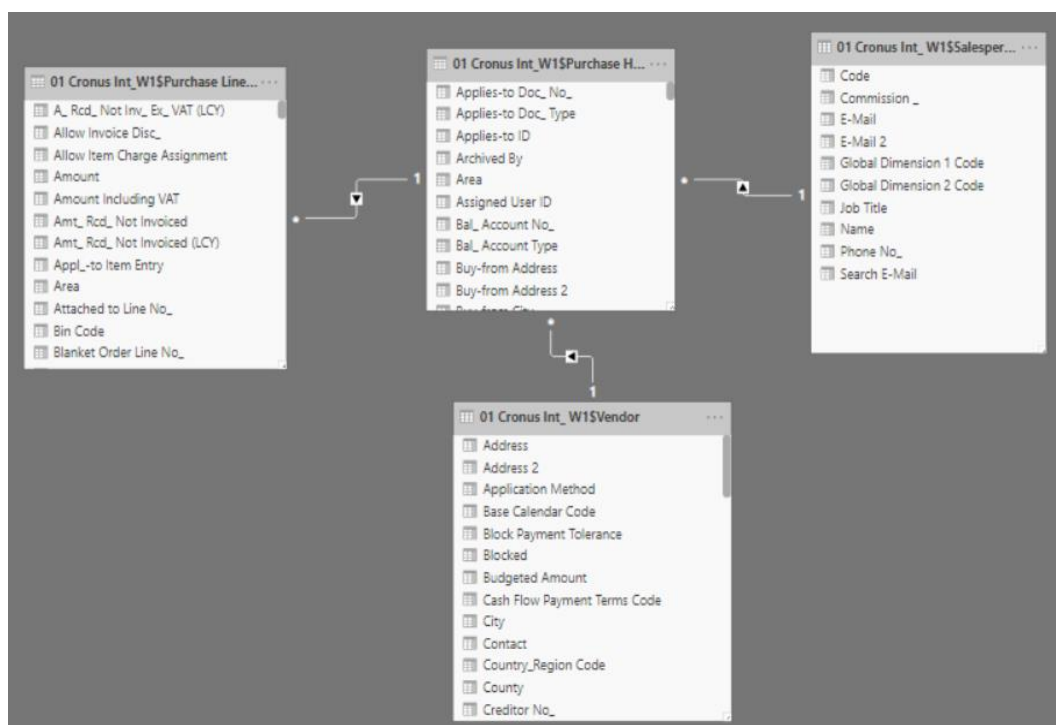


Figure: Data model for Purchaser workload analysis

Remark: To clarify the data model for each solution, additional pages were created base on the solutions.

2.4 Measures

In this session, the measures and detailed steps will be presented. No measure needs to be created for Purchaser Workload Analysis. There are two new columns, three measures and one new table will be needed for Customer RFM Analysis, which are:

- The new column **"Time Period"** to calculate how many months since the sales order was created till current date:

= DATEDIFF('RFM_Sales Header'[Document Date];TODAY();MONTH)

- The measure **"R"** to calculate the minimum time period between current date and sales order created date.

= MIN('RFM_Sales Header'[Time Period])

- The measure **"F"** to calculate how many sales orders were placed

= COUNTA('RFM_Sales Header'[Primary Key])

- The measure **"M"** to calculate the total sales amount.

= COUNTA('RFM_Sales Header'[Primary Key])

- After the measures are created, a new table **"RFM Analysis"** will be created by using the following fuction:

= SUMMARIZE('RFM_Sales Header','RFM_Sales Header'[Sell-to Customer Name];"R";'RFM_Sales Header'[R];"F";[F];"M";[M])

- A new column is created to group the customers by the result of "R", "F", "M":

= IF('RFM Analysis'[R]<AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]>AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M]> AVERAGE('RFM Analysis'[M]), "Best Customer",

IF('RFM Analysis'[R]<AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]>AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] < AVERAGE('RFM Analysis'[M]), "Potential Best Customer",

IF('RFM Analysis'[R]<AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]<AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] > AVERAGE('RFM Analysis'[M]), "Potential Best Customer",

IF('RFM Analysis'[R]<AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]<AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] < AVERAGE('RFM Analysis'[M]), "Others",

IF('RFM Analysis'[R]>AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]>AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] > AVERAGE('RFM Analysis'[M]), "Potential Customer",

IF('RFM Analysis'[R]>AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]>AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] < AVERAGE('RFM Analysis'[M]), "At risk",

IF('RFM Analysis'[R]>AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]<AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] > AVERAGE('RFM Analysis'[M]), "Potential Best Customer",

IF('RFM Analysis'[R]>AVERAGE('RFM Analysis'[R]))&& 'RFM Analysis'[F]<AVERAGE('RFM Analysis'[F]) && 'RFM Analysis'[M] < AVERAGE('RFM Analysis'[M]), "At risk", "Others"))))))))

- To convert all sales amount into GBP. A new column is created by using below function:

= if('RFM_Sales Line'[Currency Code]="",'RFM_Sales Line'[Amount],'RFM_Sales Line'[Amount]*RELATED('Currency Exchange Rate'[Relational Exch_Rate Amount])/RELATED('Currency Exchange Rate'[Exchange Rate Amount]))

2.5 Visualization

Please refer to the Power BI Desktop file or Power BI Service Report.

3 Refresh Settings

In Power BI Service, the Gateway is connected to NAV2015 of Haaga-Helia University of Applied Sciences. The Scheduled Refresh can be set according to user's requirement.

Settings for BI_Development_Project

This dataset has been configured by bge875@myy.haaga-helia.fi.

Last refresh succeeded: Fri Dec 13 2019 13:55:32 GMT+0200 (Eastern European Standard Time)

[Refresh history](#)

Gateway connection

To use a data gateway, make sure the computer is online and the data source is added in [Manage Gateways](#). If you're using an On-premises data gateway (standard mode), please select the corresponding data sources and then click apply.

Use a data gateway



Gateway	Department	Contact information	Status	Actions
Personal Gateway			Running on EXTVDISTUDL133	
<div>Apply Discard</div>				

Data source credentials

BIG4TF023_Rehn_2022-nav2015 [Edit credentials](#)

Figure: Gateway connection

Refresh history						×
Scheduled <u>OneDrive</u>						
Details	Type	Start	End	Status	Message	
	On demand	12/15/2019, 1:26:27 PM	12/15/2019, 1:27:00 PM	Completed		

Figure: Refresh tested

4 Data Validation

In this part, the data in the solution will be validated with NAV.

4.1 RFM Analysis Validation

To validate the customer discount, the following steps were followed:

- Step One Select Top 3 Maximum Line Discount with their Customer Name in the visual
- Step Two Select Line Discount equals to 100 and 50 with Document No and Customer No in Table '01 Cronus_Int_W1\$ Sales Line Merged'
- Step Three Compare the data with NAV by Document No and Customer No
- Step Four Select one of the best customer 'London Light Company' as to validate the RMF calculation accuracy.
- Step Five Compare the RFM result with NAV

Customer Discount Analysis

Customer	Disc_Group	Line_Disc (Min)	Line_Disc (Max)	Lin_Disc(Avg)
Blanemark Hifi Shop		0,00	100,00	16,93
Beef House		0,00	50,00	8,75
Karoo Supermarkets	RETAIL	10,00	50,00	16,00

Figure: Top 3 Maximum Line Discount from Customer Discount Analysis

Document Type	Document No_	Line No_	Sell-to Customer No_	Type	No_	Location Code	Posting Group
1	1077	20000	49525252	2	70200	GREEN	RAW MAT
0	1076	30000	60000	2	LS-MAN-10	WHITE	RESALE
0	1075	40000	60000	2	LS-MAN-10	WHITE	RESALE
1	1142	40000	60000	2	LS-MAN-10	WHITE	RESALE
1	1141	30000	60000	2	LS-MAN-10	WHITE	RESALE
1	1100	10000	27321782	2	1000	YELLOW	FINISHED
1	1098	20000	44756404	2	1700	BLUE	FINISHED

Figure: Document No and Customer No with Line Discount equals to 100 and 50 in Table '01 Cronus_Int_W1\$ Sales Line Merged'

1077 · Beef House · 1

General							
No.:	1077	Order Date:	1.2.2019				
Sell-to Customer No.:	49525252	Document Date:	1.2.2019				
Sell-to Contact No.:	CT000060	Requested Delivery Date:	1.2.2019				
Sell-to Customer Name:	Beef House	Promised Delivery Date:					
Sell-to Address:	Südermarkt 6	External Document No.:					
Sell-to Address 2:		Salesperson Code:	KI				
Sell-to Post Code:	DE-40593	Campaign No.:					
Sell-to City:	Düsseldorf	Responsibility Center:					
Sell-to Contact:	Frau Karin Fleischer	Status:	Released				
Posting Date:	1.2.2019						

Lines							
Type	No.	Description	Location Code	Quantity	Unit of Measur...	Line Amount Excl. VAT	Line Discount %
Item	80207	Basic Mouse	GREEN	400	PCS	1 345,28	20
Item	70200	Hinge	GREEN	10	PCS	9,42	50

1142 · Blanemark Hifi Shop

General							
Sell-to Customer No.:	60000	Document Date:	3.5.2019				
Sell-to Customer Name:	Blanemark Hifi Shop	Requested Delivery Date:	22.3.2019				
Sell-to City:	London	External Document No.:					
Posting Date:	3.5.2019	Salesperson Code:	JM				
Order Date:	3.5.2019	Status:	Open				

Lines										
Type	No.	Description	Location Code	Quantity	Qty. to Assemble to Order	Reserved Quantity	Unit of Measur...	Unit Price Excl. VAT	Line Amount Excl. VAT	Line Discount %
Item	LS-MAN-10	Loudspeakers	WHITE	10			PCS	1,00		100

Figure: Archived and non-archived data were examined in NAV

Sell-to Customer Name	R	F	M	Evaluation
London Light Company	2	11	6939686,1	Best Customer

Figure: RMF calculation result of 'London Light Company', which indicate the latest purchase date was two month ago.

1193 · London Light Company · 1

General							
No.:	1193	Order Date:	13.11.2019				
Sell-to Customer No.:	44756404	Document Date:	13.11.2019				
Sell-to Contact No.:	CT000049	Requested Delivery Date:					
Sell-to Customer Name:	London Light Company	Promised Delivery Date:					
Sell-to Address:	235 Peachtree Street	External Document No.:					
Sell-to Address 2:		Salesperson Code:	SM				
Sell-to Post Code:	PE17 4RN	Campaign No.:					
Sell-to City:	Cambridge	Responsibility Center:					
Sell-to Contact:	Mr. Mathew Charles	Status:	Released				
Posting Date:	13.11.2019						

Figure: NAV showed the latest document data of London Light Company was 13.11.2019, which is match with its RFM result.

4.2 Nr of Purchase Validation

The steps to validate the Nr of purchase are as follow:

Step One Select one of the purchasers to examine the data

Step Two Compare the result with the data in NAV



Figure: The solution showed 4 purchase orders with 8 lines belong to Bryan Spahr. Orders and lines were created in 2018 and 2019. One of the Vendor was JB-Spedition.

Purchase Orders ▾

BS Purchaser Code ▾

Limit totals: "...06.01.20

No.	Buy-from Vendor No.	Status	Currency Code	Document Date	Posting Date	Due Date	Requested Receipt ...	Purchaser Code
106052	49989898	Open	EUR	14.11.2018	14.11.2018	30.11.2018		BS
106053	49989898	Open	EUR	14.1.2019	14.1.2019	31.1.2019		BS

Figure: 2 open purchase orders created by Bryan Spahr. The orders were created in 2018 and 2019.

		Code	Quantity	measur...
Item	80002	Computer III 600 MHz	100	PCS
Item	80103	19" M009 Monitor	100	PCS
Item	80211	Quietkey Keyboard	200	PCS

106053 · JB-Spedition

General				49989898		14.10.2018	
Lines							
<div>Line Functions Order Find Filter Clear Filter</div>							
Type	No.	Description	Location Code	Quantity	Reserved Quantity	Unit of Measur...	Direct
Item	80206	Webcam		200		PCS	
Item	80216	Ethernet Cable		500		PCS	
Item	80207	Basic Mouse		200		PCS	

Figures: Detailed purchase lines in each purchase order. There were 6 lines in total.

106052 · JB-Spedition

General	
Buy-from Vendor No.:	49989898
Buy-from Contact No.:	CT000127
Buy-from Vendor Name:	JB-Spedition
Buy-from City:	München
Posting Date:	14.11.2018
Order Date:	14.10.2018
Document Date:	14.11.2018
Vendor Order No.:	
Vendor Shipment No.:	
Vendor Invoice No.:	123458
Status:	Open

Figure: The vendor of purchase order 106052 is JB-Spedition

106051 · Subacqua · 1

General	
No.:	106051
Buy-from Vendor No.:	34151086
Buy-from Contact No.:	CT000094
Buy-from Vendor Name:	Subacqua
Buy-from Address:	c/ Neptuno 18
Buy-from Address 2:	
Buy-from Post Code:	ES-37001
Buy-from City:	Salamanca
Buy-from Contact:	Srta. Pilar Pinilla Gallego
Posting Date:	14.10.2018
Order Date:	14.10.2018
Document Date:	14.10.2018
Vendor Order No.:	
Vendor Shipment No.:	
Vendor Invoice No.:	123457
Order Address Code:	
Purchaser Code:	BS
Responsibility Center:	
Status:	Released

Lines									
Type	No.	Description	Location Code	Quantity	Unit of Measur...	Direct Unit Cost Excl. VAT	Line Amount Excl. VAT	Line Discount %	
Item	1980-S	MOSCOW Swivel Chair, red		200	PCS	139,316	25 076,88	10	
Item	1964-S	TOKYO Guest Chair, blue		200	PCS	141,345	25 442,10	10	

106050 · NewCaSup · 1

General	
No.:	106050
Buy-from Vendor No.:	01905382
Buy-from Contact No.:	CT000070
Buy-from Vendor Name:	NewCaSup
Buy-from Address:	12002 Simcoe St.
Buy-from Address 2:	
Buy-from Post Code:	CA-ON M5E 1G5
Buy-from City:	Toronto
Buy-from Contact:	Mr. Toby Nixon
Posting Date:	14.10.2018
Order Date:	14.10.2018
Document Date:	14.10.2018
Vendor Order No.:	
Vendor Shipment No.:	
Vendor Invoice No.:	123456
Order Address Code:	
Purchaser Code:	BS
Responsibility Center:	
Status:	Released

Lines									
Type	No.	Description	Location Code	Quantity	Unit of Measur...	Direct Unit Cost Excl. VAT	Line Amount Excl. VAT	Line Discount %	
Item	1000	Bicycle		1 000	PCS	350,594	333 064,30		
Item	1001	Touring Bicycle		1 000	PCS	350,594	333 064,30		

Figures: 2 archived purchase order with detailed purchase lines created by Bryan Spahr. There were 4 purchases in total.

5 Project Delivery

The two parts solutions of this project are combined and delivered to users through Power BI Cloud platform --Power BI Service Pro as a whole solution. Users can view the reports, add comments and edit the reports according to their granted right.

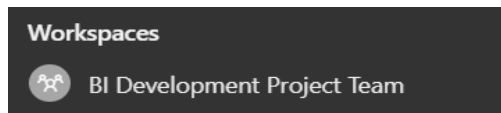


Figure: A specific workspace was created for the project

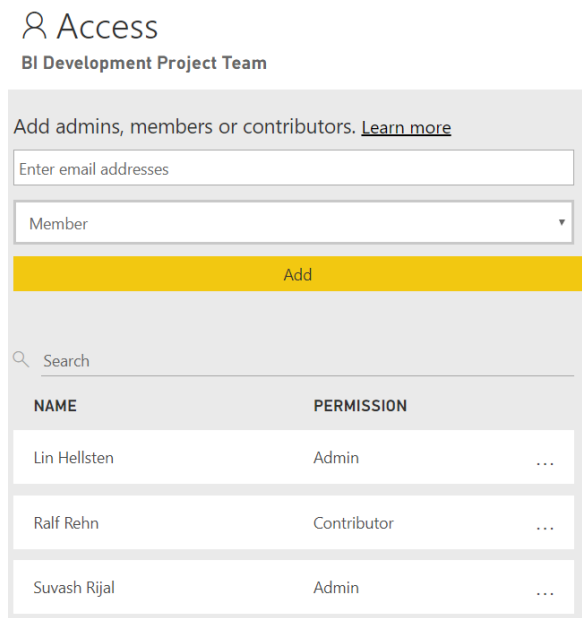


Figure: Different right can be granted to team members and users



Figure: Access solutions through the specific workspace in Power BI Service

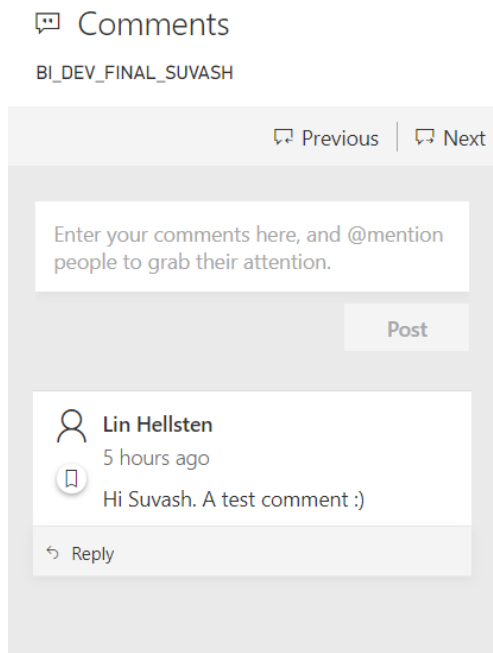


Figure: Comments can be added through Power BI Service

6 Conclusion

In this session, the achievement and challenge of team collaboration and individual work will be discussed.

6.1 Achievement

Through this project, we experienced the real-life environment on agile analytics development. At the project initiation phase, we had a team meeting to brainstorm, prioritize user stories, define the features, ect. After we defined the requirements and features, we started to develop own solutions respectively. However, according to Agile, we communicated and shared our issues, findings ect positively during the entire project development. For example, we shared the cleansed and transformed datasets for sales through Power BI Service and Suvash tested it in his own Power BI Desktop environment since he decided to use the same tables for his solutions, which improves team's productivity and reduce the repetitive work. Meanwhile we also discussed and tested a lot about the measures that used in the solutions (Will discuss more in next chapter).

Though the whole project took longer time than what we expected, the methodology was well followed and went smooth and the BI solutions were developed as designed.

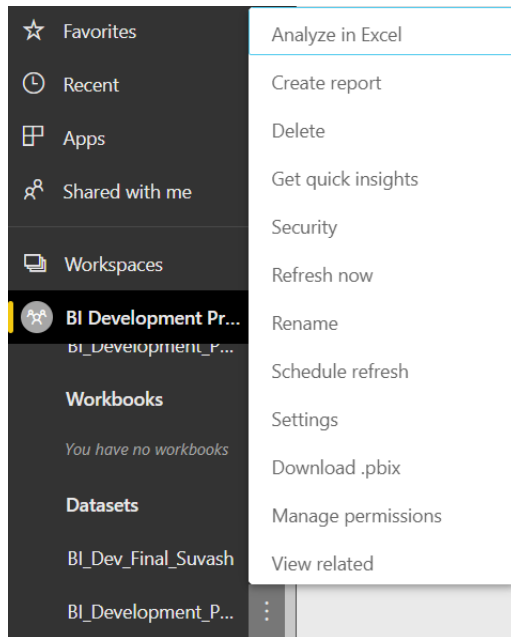


Figure: Datasets can be downloaded as pbix file and used in Power BI Desktop

6.2 Challenge

As mentioned above, we encountered some issues on the measures. After Suvash shared the teacher's comment about currency, I realized that it was not taken into account in my solution either. Therefore, we started to work on it. At the beginning, I thought about take the dynamic currency data through the Web. Meanwhile, Suvash considered to use "Unit Price" and "Unit Cost (LCY)" to calculate the currency rate. Later I noted that NAV has its own Currency Tables. However, the metadata of the Exchange Currency Rate confused me. After some research, I understood that the field "Exchange Rate Amount" represents the Local Currency Amount while "Relational Exch_Rate Amount" represents the Foreign Currency Amount.

It happened when I worked on the primary key. Take Sales Data as the example. I appended the active and archived data as new tables named Sales Header and Sales Line. After that, I tried to create the data model between Sales Header and Sales Line using the combination key of Document Type and Document No. It created a many to many relationships, which was not useful for the solution. It took me quite long time to understand that NAV archives data more than once. Therefore, I created the relationships for Sales Header and Sales Line by filtering the active data (which is not archived) and the first-time archived data (whose version No is 1).

In my perspective, the unfamiliar with NAV system is the most challenge and hinder my progress on the BI solution development.

6.3 Conclusion

Though the project is a bit more complex than what I thought, I found myself very interested to it and acquired much more than what I expected on both NAV system and Power BI as well as the process of analytics project development.

Append



Project Backlog.xlsx