DESIGN AND IMPLEMENTATION OF A DATA WAREHOUSE

Joint Consulting Project

Section 602 - Group 6

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1. Introduction

Dominick's Finer Food chain, founded in 1918, was a Chicago-area grocery store chain which operated over 30+ locations during 1990 to 2000. DFF operated in sales of wide range of products including dairy, meat, cosmetics, alcohol, pharmacy and fresh produce. DFF was known for its experimentation over market to generate revenue. It experimented with 'food and drug' combo, walkie-talkie for communication, the ways through which the announcements were made to the customer and so on. After running for more than 20 years, on Dec 2013, its parent company announced to close all its stores in Chicago. [1]
To create a data warehouse for DFF, major concern is the complex data set. It contains files from 5 critical tables of DFF recording customer in-traffic, product details and inventory count over 10 years. Complexity is magnified by erroneous and incomplete information in the tables resulting in multiple interpretation of data, for example there are negative values in quantity of a commodity. It can be interpreted as junk or loss incurred to store due to breakage or spoilage leading to uncertainty.
Beside complex dataset, lack of subject knowledge of Retail and Marketing might hinder the development of a data warehouse which actually brings value to the business.

1.1 Details about DFF Data

DFF majorly consist of 4 data files: CCOUNT, DEMOGRAPHICS, UPC and MOVMENT.

Understanding the data:
CCOUNT**:** It is in-store traffic information file which contains number of customers visited and sales of each product in dollars segregated by date and stores. Information is also grouped by weeks. It also stores the coupons redeemed for various products on daily basis for each store. Data is dirty comprising of missing primary columns such as store id and date and includes unknown characters and negative values. Each store's demographic information is further described in Store-Specific Demographics excel file.

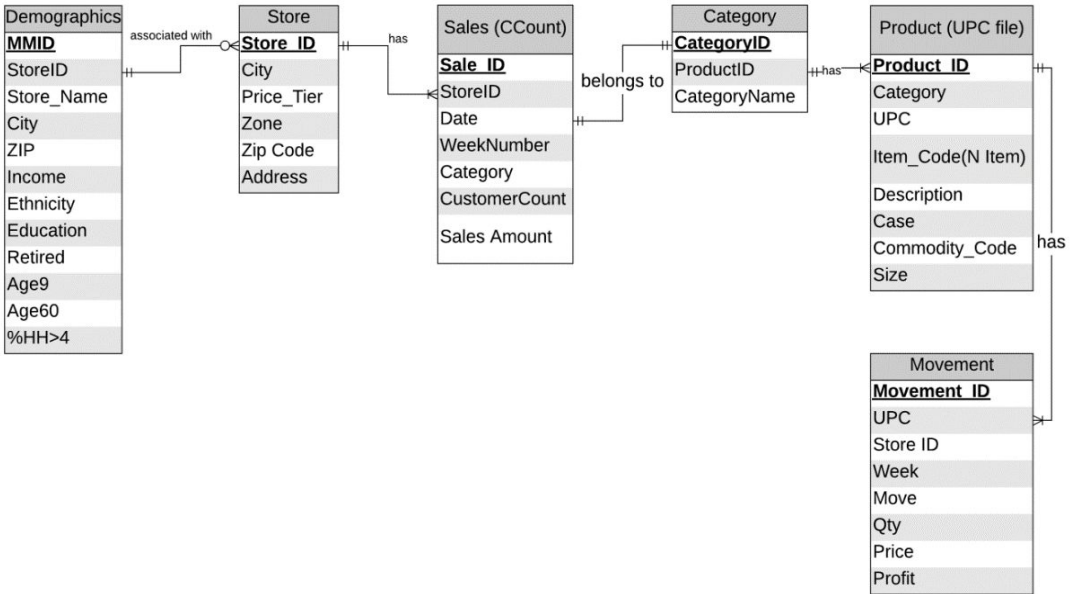
Store-Specific Demographics: It contains demographic details containing location of each store. For example, % of household with 1 person or % of College Graduates. Many tables hold repetitive data (i.e. contains same information) and can be removed/ignored.

UPC: UPC files contain the unique key to identify products which are followed throughout market i.e. among different vendors, distributors and manufacturers. UPC key contains the product key associated with manufacturer key. Each file in UPC corresponds to single category which in turn has multiple commodities (identified by commodity code). DFF uses Item Code which uniquely defines a product within DFF database. Same key also helps to identify if the product was delivered to the Dominick's warehouse or directly to the store.
Movement: Movement file stores number of units, profit and Quantity segregated by week, UPC number and stores.

OLTP Metadata

File	Metadata	Description
CCount	Store, Date, Week, CustCount, Grocery, Dairy, Frozen, Bottle, Meat, MeatFroz, MeatCoup, Fish, FishCoup, Beer, Wine, Spirits, Pharmacy, DairyCoup, PharCoup, etc.	CCount has customer count data for a store for a particular date. It also consists of coupons redeemed and sales data for categories such as fish, dairy, etc.
Demographics	Age9, age60, ethnic, educ, nocar, income, incsigma, hsizeavg, hsize1, hsize2, hsize34, hsize567, Hh3plus, hh4plus, hhsingle, hhlarge, workwo, retired, unemp, wrkch17, nwrkch5, nwrkch17, wrkch, nwrkch, wrkwch, wrkwnch, telephn, mortgage, nwhite, poverty, etc.	This file consists of demographics data which is distributed store wise. It provides with data based on age, income, gender, family size etc.
Movement	Store, UPC, Move, Profit, Qty, Price, Sale, Week	Movement file stores the data of number of items that were sold for a store in a week
UPC	Com_Code, UPC, Description, Case, Size, Nitem	Product data from with description and commodity codes

Entity-Relation Diagram



Database Representation of Tables

CCount

Sales ID	StoreID	Date	Category	Sales	Customer Count
1	47	880101	GROCERY	14900	1546
2	47	880101	DAIRY	3321	1546
3	47	880101	FROZEN	2625	1546
4	47	880101	BOTTLE	0	1546
.	.	.	.	.	.
100	47	880102	GROCERY	15881	1749
101	47	880102	DAIRY	3321	1749
102	47	880102	FROZEN	2621	1749
103	47	880102	BOTTLE	0	1749
.	.	.	.	.	.

Store

StoreID	City	Price_Tier	Zone	ZipCode	Address
2	Chicago	High	B	60439	5400 N. Lakewood Avenue

Demographic

MMID	StoreID	Store_Name	City	Zip	Income	Ethnicity	Education	Retired	Age9	Age60	%HH>4
12345	2	Dominick Chicago	Chicago	60439	10.2	0.6	0.8	0.67	0.54	0.46	0.33

Category

CategoryID	CategoryName	ProductID

WTPA	toothpaste	100002
WTPA	toothpaste	100001

Product

ProductID	UPC	Category	Item_code	Description	Case	CommodityCode	Size
1	1192603016	ANA	7342431	CAFFEDRINE CAPLETS 1	6	953	16 CT
2	1192662108	ANA	7333311	SLEEPINAL SOFTGEL	6	953	8 CT
3	1192603016	ANA	7342431	CAFFEDRINE CAPLETS 1	12	953	16 CT

Movement

MovementID	UPC	StoreID	Week	MOve	QTY	DiscountType	Price	Profit
1	1060831115	5	298	7	1		0.59	15.25
2	1060831115	5	335	2	1	B	0.51	50.98

1.2 Domain Understanding

"Retail is the process of selling consumer goods or services to customers through multiple channels of distribution to earn a profit. Retailers satisfy demand identified through a supply chain" [2]. There are four core principles to be followed in retail [3]:

1. Customer is most important
2. Understanding your customer
3. 4 Ps - Product, Price, Promotion, Place
4. Location

Current trends, Strategies & problems in Retails Market

Digital Disruption

The rise of e-commerce has disruptive effect on retail market. Currently, more than 10% of US retail market is dominated by e-commerce. According to Credit Suisse, more than 8640 stores with 147m sq. feet of space closed in 2018 [4]. Below graph supports the underlying trend:

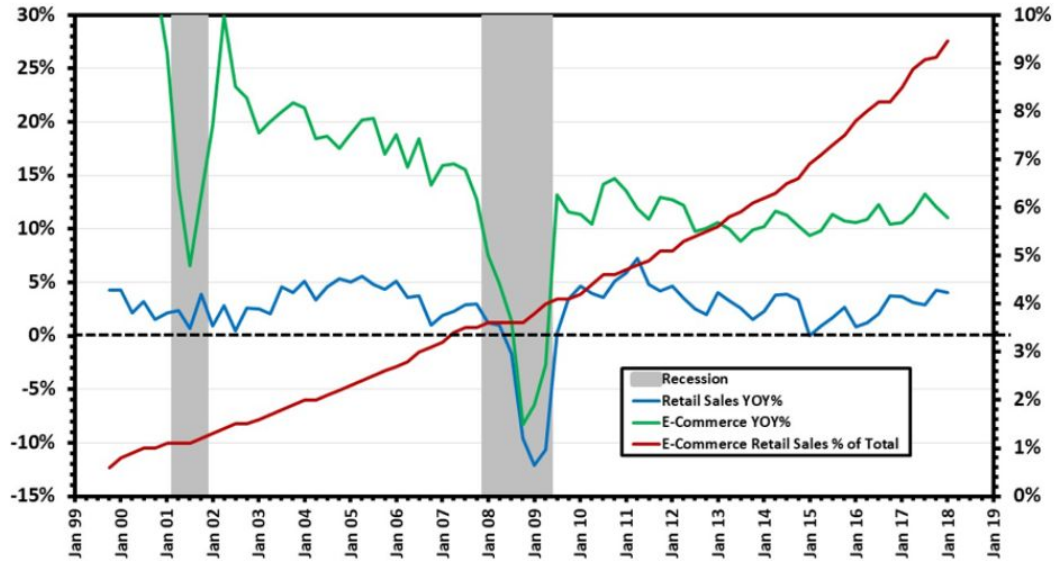


Figure 1) Retail and E-Commerce Year-Over-Year Sales Growth Rate (Left) and E-Commerce Retail Sales as Percent of Total Retail Sales (Right); Recessions are Shown in Grey (https://fred.stlouisfed.org/)

Retails chains should come up with ideas to annul the loss in revenue due to e-commerce by providing in-home service and delivery.

Customer Customization according to Demographics and Psychographics

Customers change their shopping pattern frequently and look for personalized experience. Currently retailers analyze demographic data to understand their customer and provide variety in products in which those customers are interested in. Steps involve analyzing customer base, checking competition, understanding product/service, choosing specific demographic to target

and finally expanding product base [4]. However, targeting a specific population doesn't mean you are excluding people who doesn't fit criteria. [5]

Marketing Trends by One of the Smartest Supermarket in the United States

Texas based super mart H-E-B is notorious for promoting local produce by associating them with symbol of pride towards their state. Products are branded like Houston Blend Coffee and Hill Country, which trigger the sentiments in the customers and lead to similar amount of sales as compared to branded products.

Another strategy they use is Neuro marketing by utilization of yellow coupons spread across the aisles. "Put a big yellow price sign next to something, and it will light up people's brains - even if it's not actually a great deal" [6]. In H-E-B's case, they offer flagged coupons to tear off and to be carried to the checkout counter for scanning which takes Cialdini's principles of persuasion in account by influencing the customers to engage rather than just pick up a product with discount pasted on the product label.

Utilizing this strategy can lead to promotion of certain products which may have been failing to grasp customer's attention. Furthermore, by putting these strategies in action, Dominick's can promote in-house products and utilize coupons in the stores.

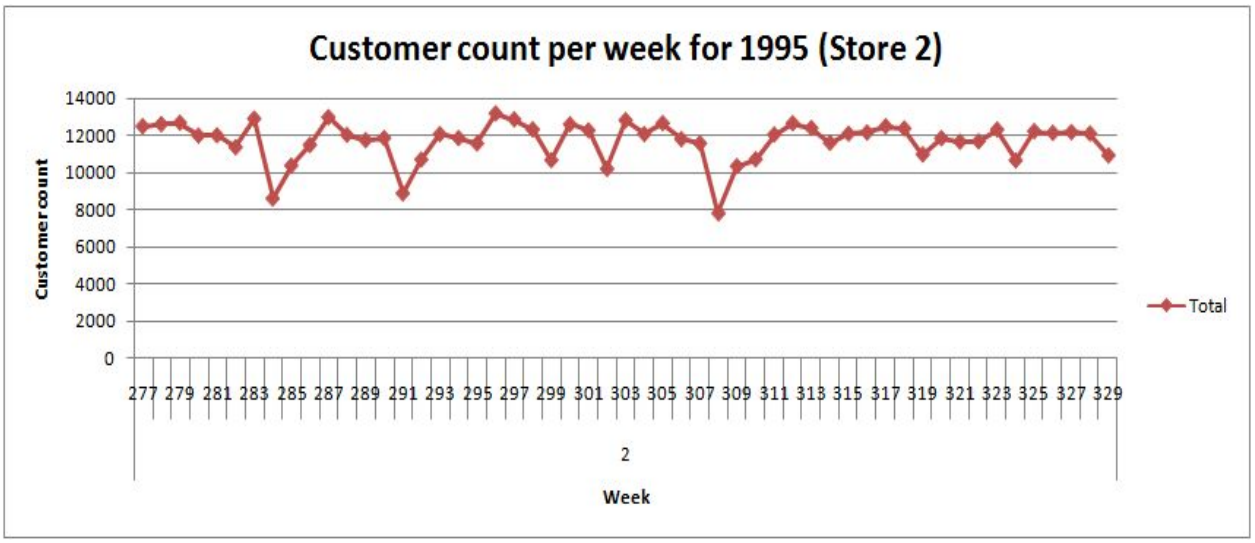
Revenue Vs Profitability

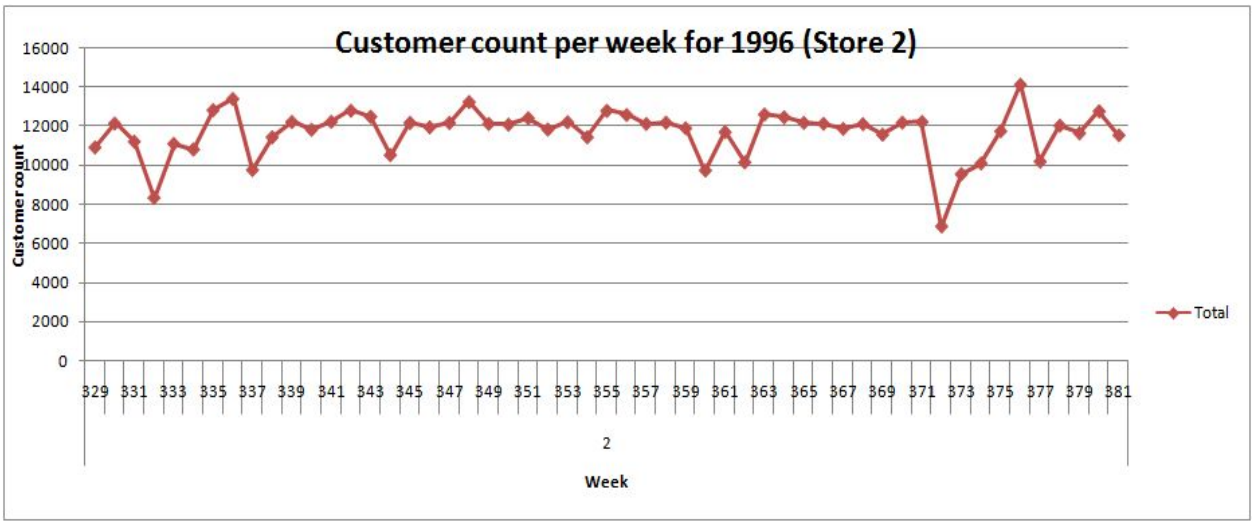
Retailers face several challenges, the biggest one is to increase profitability. Customers have ever changing demands which are difficult to track. This causes problems in managing the supply chain. There may be products which are always in demand but there is low availability due to supply chain inefficiencies or lack of labor. Retailers also fail to evaluate the potential customers and markets which leads to lower sales. The inventory management system especially during the holiday season is not efficient to manage the inventory across the all the stores. Customers are ever demanding of good quality products which are cheap. To do this, they resort to multiple channels such as online shopping. Retailers are expected to be consistent across all the channels and provide convenience to the customers. Often, retailers fail to estimate their competitors' capabilities. Small retailers cannot compete with big retailers on price. Conclusively, they need to focus on something other than price to create a good shopping experience. [7]

2. Business questions

2.1 What is weekly trend of customer in traffic for store 2 between 1995 and 1996? *(Selected)*

Pivot:

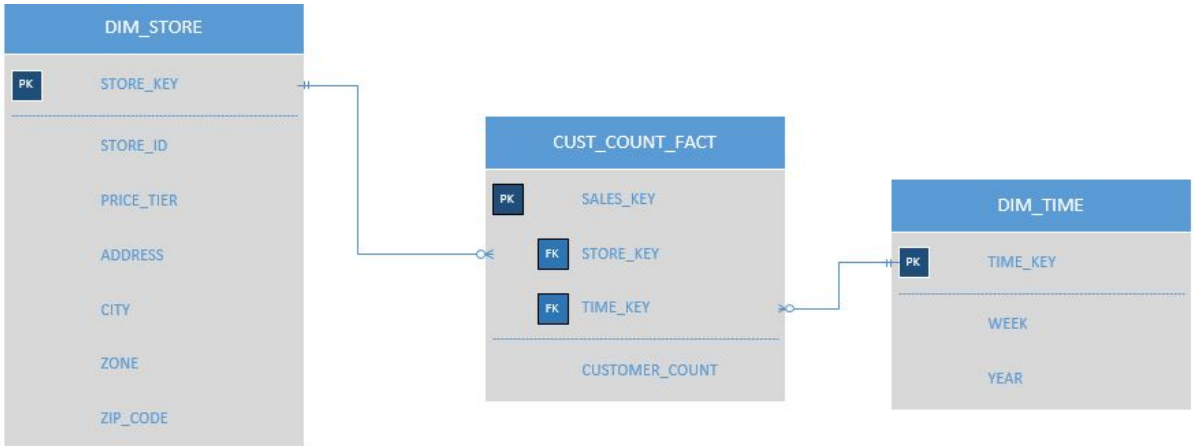




Business Justification: For a sample of stores, we have taken data for year 1995 and 1996 to find out the number of customers visiting the store weekly. Using this data, we have identified a general trend of reduction in customer count during the 1st week of months. During these trough points in graph i.e. the weeks with reduced customer count, we can reduce the staff or let the staff members plan their vacations. This will further lead to reduction of over-stocking and employees count can be reduced to save salary expenses.

ERD:

Dimensional Model:

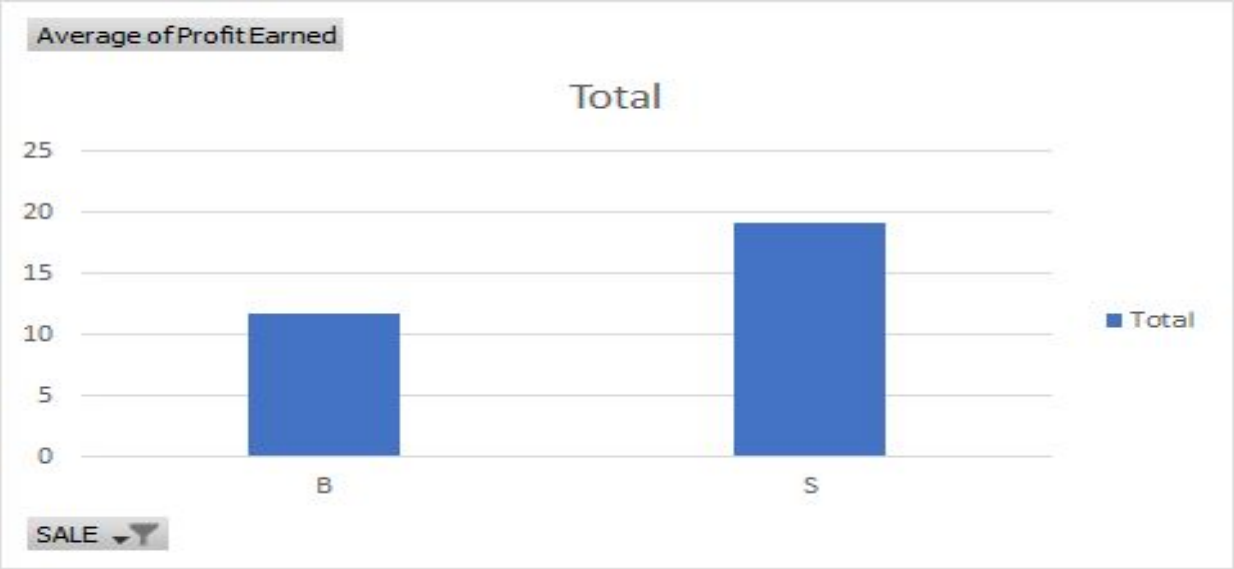


Schema Justification: To calculate customer count on a specific store on weekly basis, we need two dimensions namely *DIM_TIME* and *DIM_STORE*. Time dimension will aggregate the data on weeks and year. Similarly store dimension will help to find customer count on different stores.

CUST_COUNT_FACT will have auto incrementing primary key and foreign key to other dimensions. *CUST_COUNT_FACT* will have only one attribute *CUSTOMER_COUNT* which corresponds to customer in traffic on a particular week on a particular store (summing daily customer count to aggregate it week wise: *sum (customer_count_daily) from sales_table/CCount group_by week, group_by store)*

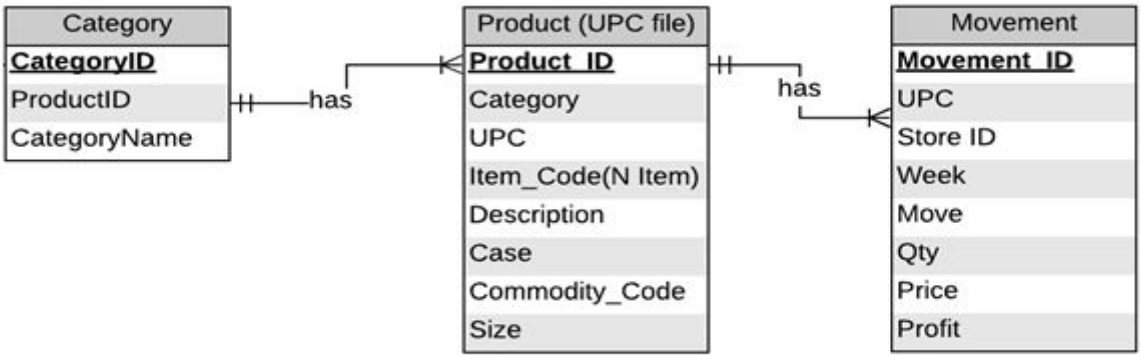
2.2 In category of frozen products, which method of discount (Coupon or price reduction) gives more profit? *(Selected)*

Pivot:

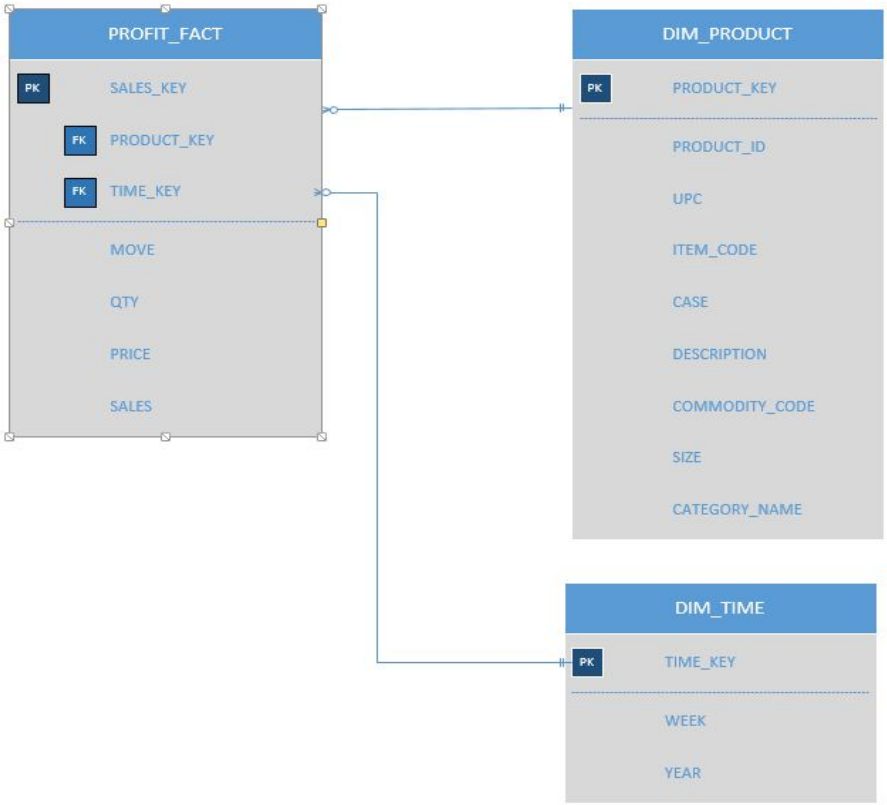


Schema Justification: Due to lower shelf life of frozen foods they are often sold on discounted rates to avoid loss. Analysis of profit earned in category frozen entree shows that when simple price reduction is offered, sale and profit is more. Dominick can consider offering simple price reduction rather than offering coupons.

ERD:



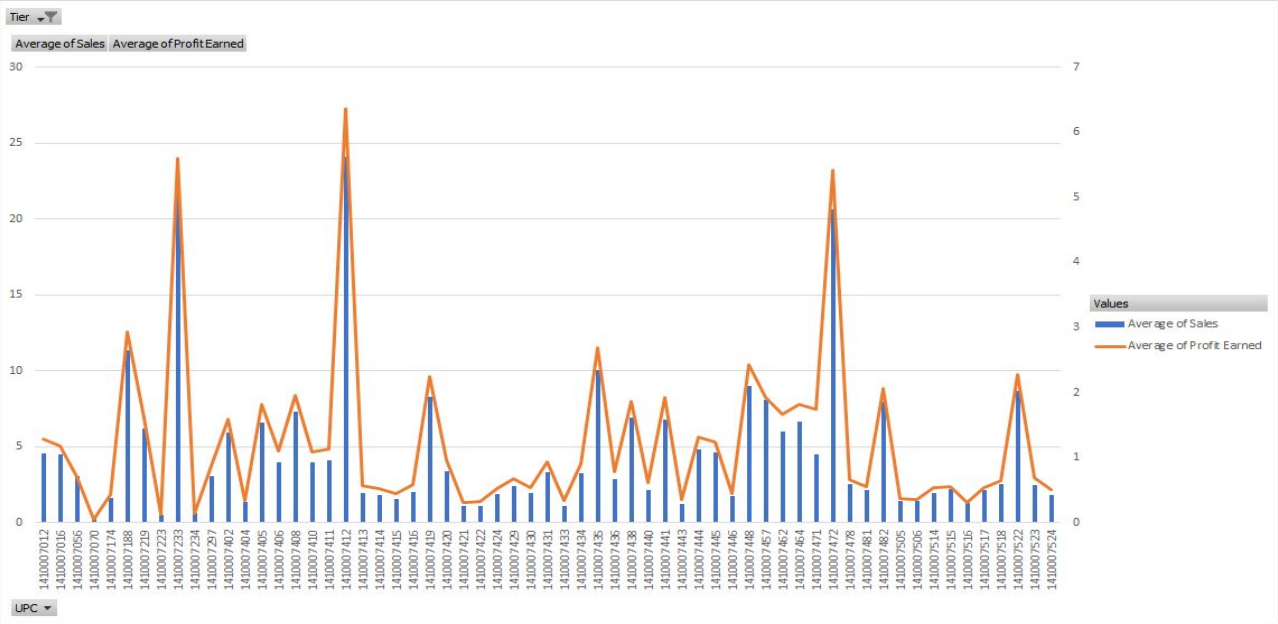
Dimensional Model:



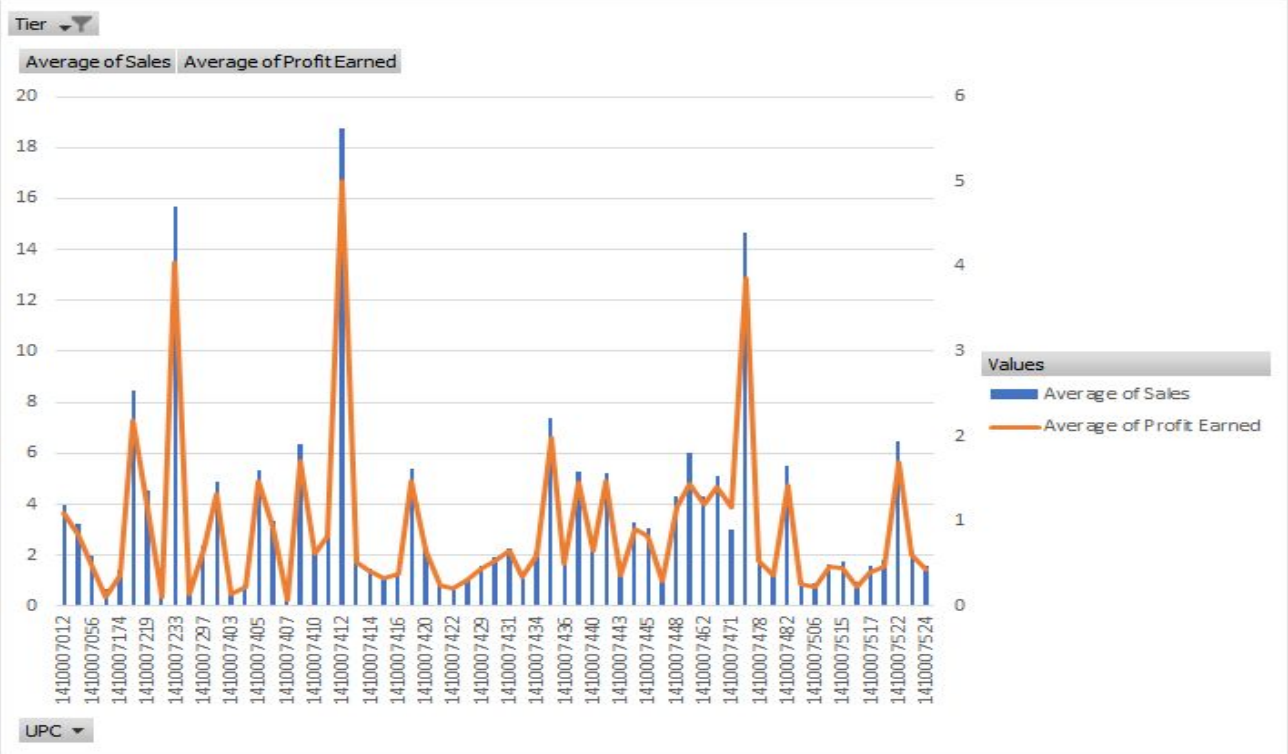
Schema Justification: For this question, we propose a schema which consists of a fact table PROFIT_FACT and two-dimension tables as DIM_PRODUCT and DIM_TIME. The basic requirement of this question is to calculate the sales of frozen products when products had simple discount vs same product when they had bonus buy offer. This schema holds these sales details in PROFIT_FACT as 'sales' attribute. Since BQ asks for frozen products, PROFIT_FACT is linked to DIM_PRODUCT in which PRODUCT_KEY is the surrogate key & PRODUCT_ID is the OLTP database's ID. Further, to figure out discount type product dimension for any week or year (coming from the DIM_TIME) table will be used.
Data in PROFIT_FACT table comes from movement table/movement file. Since ERD movement table (or movement file from Dominick) records data on a daily basis, sales will be aggregated week wise.

2.3 Which UPCs had most sale in high, medium and low tier for cookies? *(Selected)*

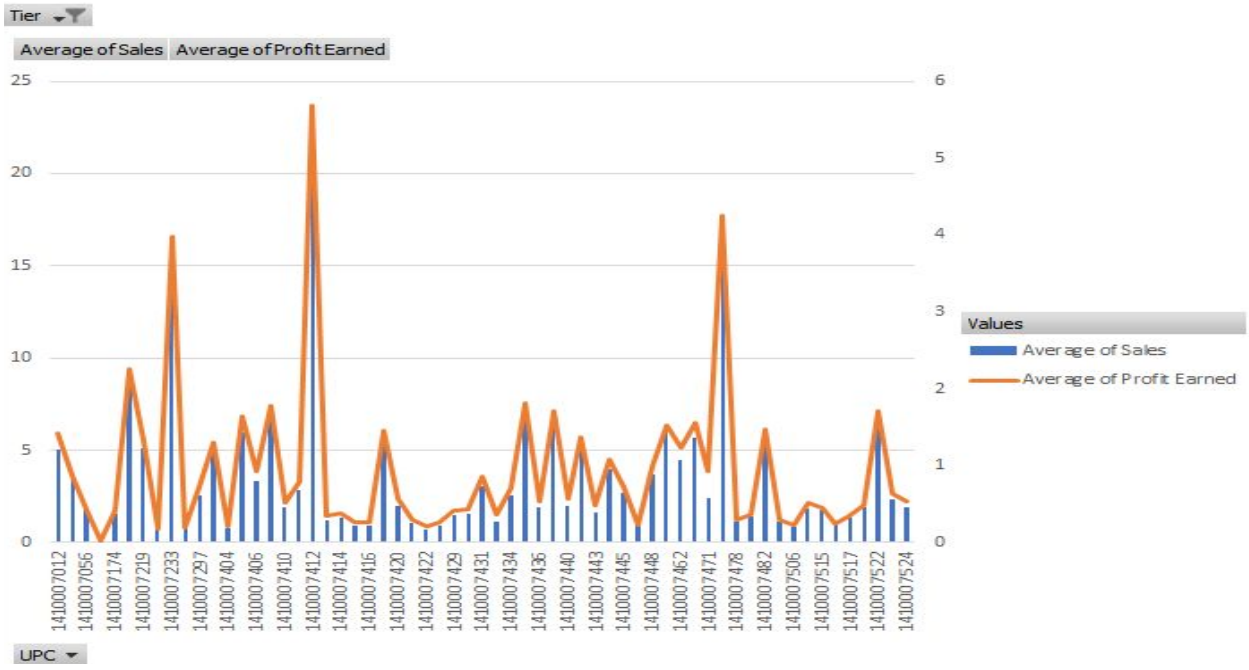
Pivot (High tier stores):



Pivot (Low tier stores):

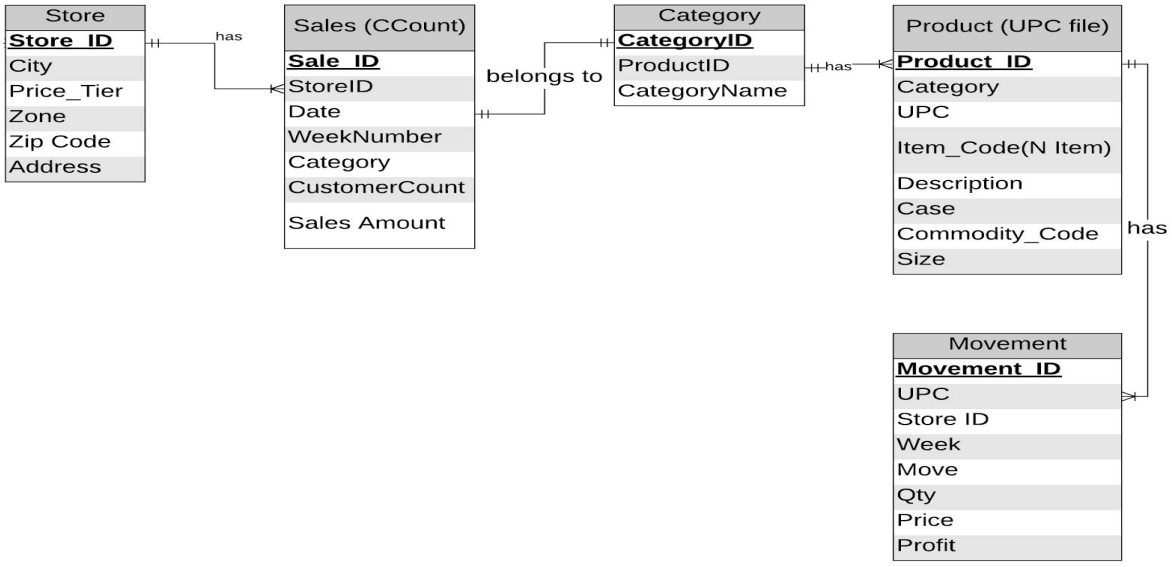


Pivot (Medium tier stores):

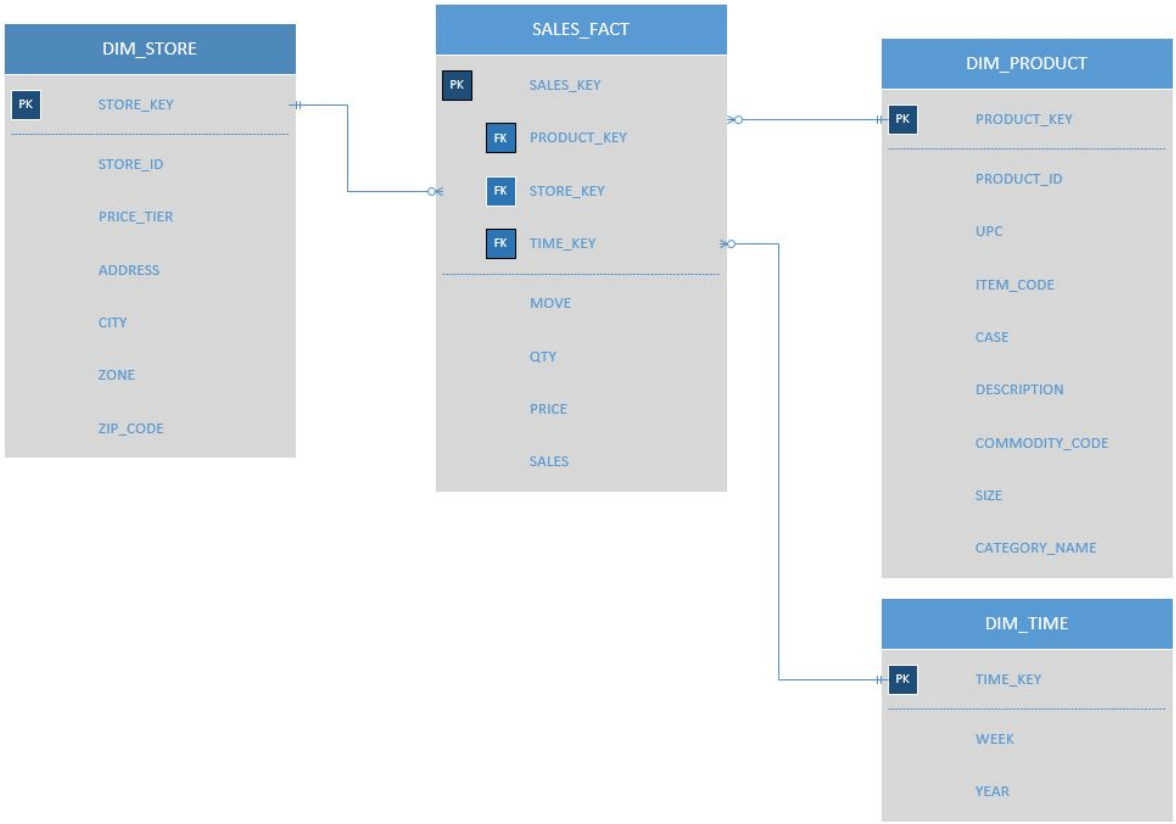


Schema Justification: For cookies, the pivot charts show data for different tiers i.e. high, medium and low. We observed that sale of certain UPCs was very high as compared to the others. For example, the sale and profit of UPC is high across all the tiers. This analysis can help the business to promote certain UPCs more than the others. Our analysis on different tiers for the cookies shows that known products, especially high and medium tiers one, are often bought. The business can then focus on the sale of these products by introducing coupons or discounts. They should particularly aim at the high/medium tier to increase profit margins substantially.

ERD:



Dimensional Model:



Schema Justification: For this question, we propose a schema which consists of a fact table SALES_FACT and three-dimension tables as DIM_PRODUCT, DIM STORE and DIM_TIME. We need to find the UPCs (Cookie type) that had highest sales in different tiers. For this, we have designed the SALES_FACT table to store the movement, quantity, price and sales data

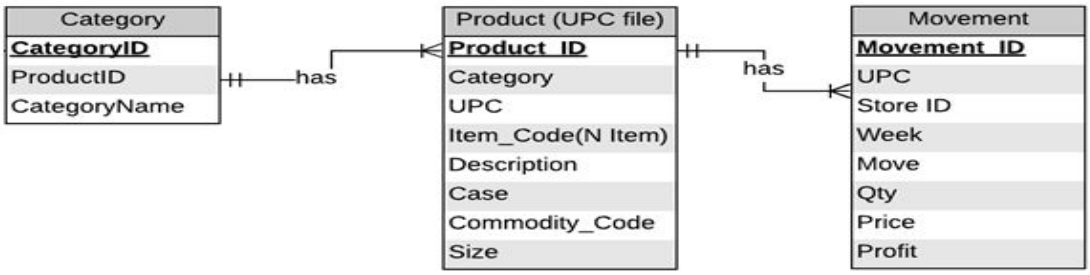
(from movement table). The UPC data comes from the Product dimension. DIM_STORE will store the store details which will provide the tier data. In this way, we can capture the sale of a UPC in a particular store/tier.

2.4 What is the trend of candies' sale during Halloween year by year? *(Selected)*

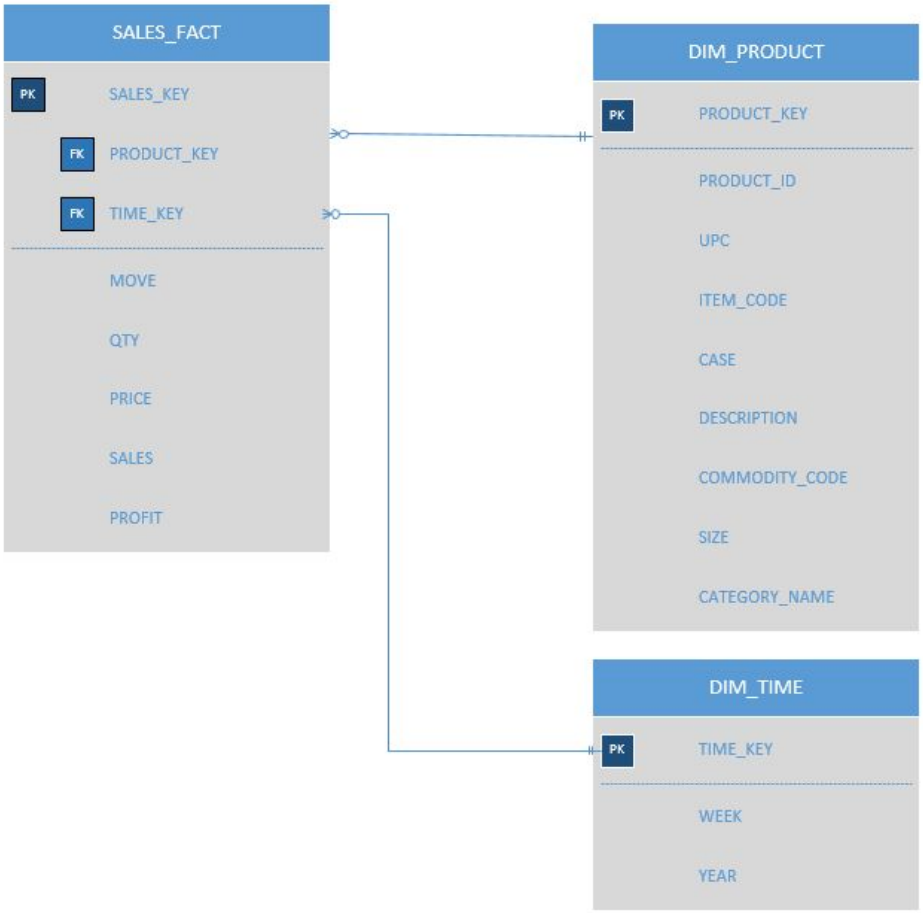
Pivot:

Schema Justification: Graph shows the trend of candies during Halloween season from 89 to 96. It can help to predict sales of next year which could range between 4000-5000. This trend can be validated with data from years to come.

ERD:



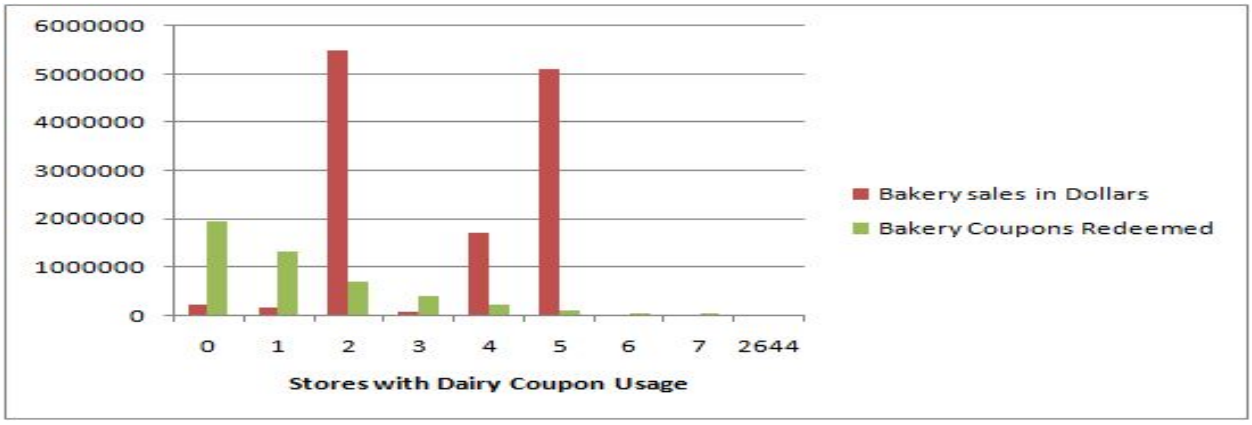
Dimensional Model:



Schema Justification: To find the sales of candies again uses SALES_FACT which is linked to DIM_TIME to find Halloween weeks and DIM_PRODUCT to find select only candies products.

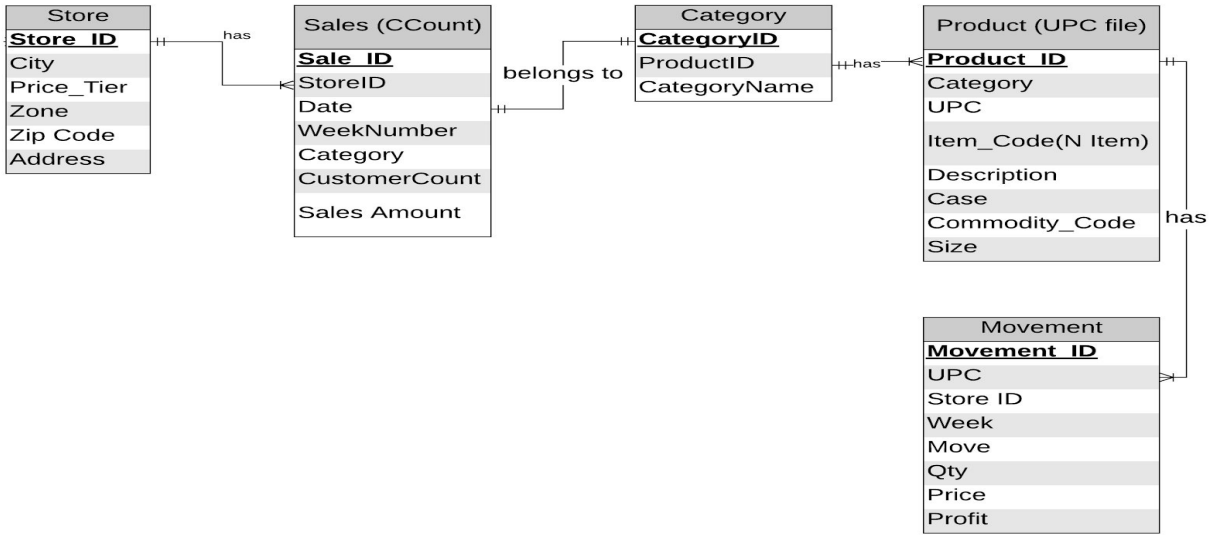
2.5 Find out the relation between Bakery sales and bakery coupons redeemed for all stores? *(Selected)*

Pivot

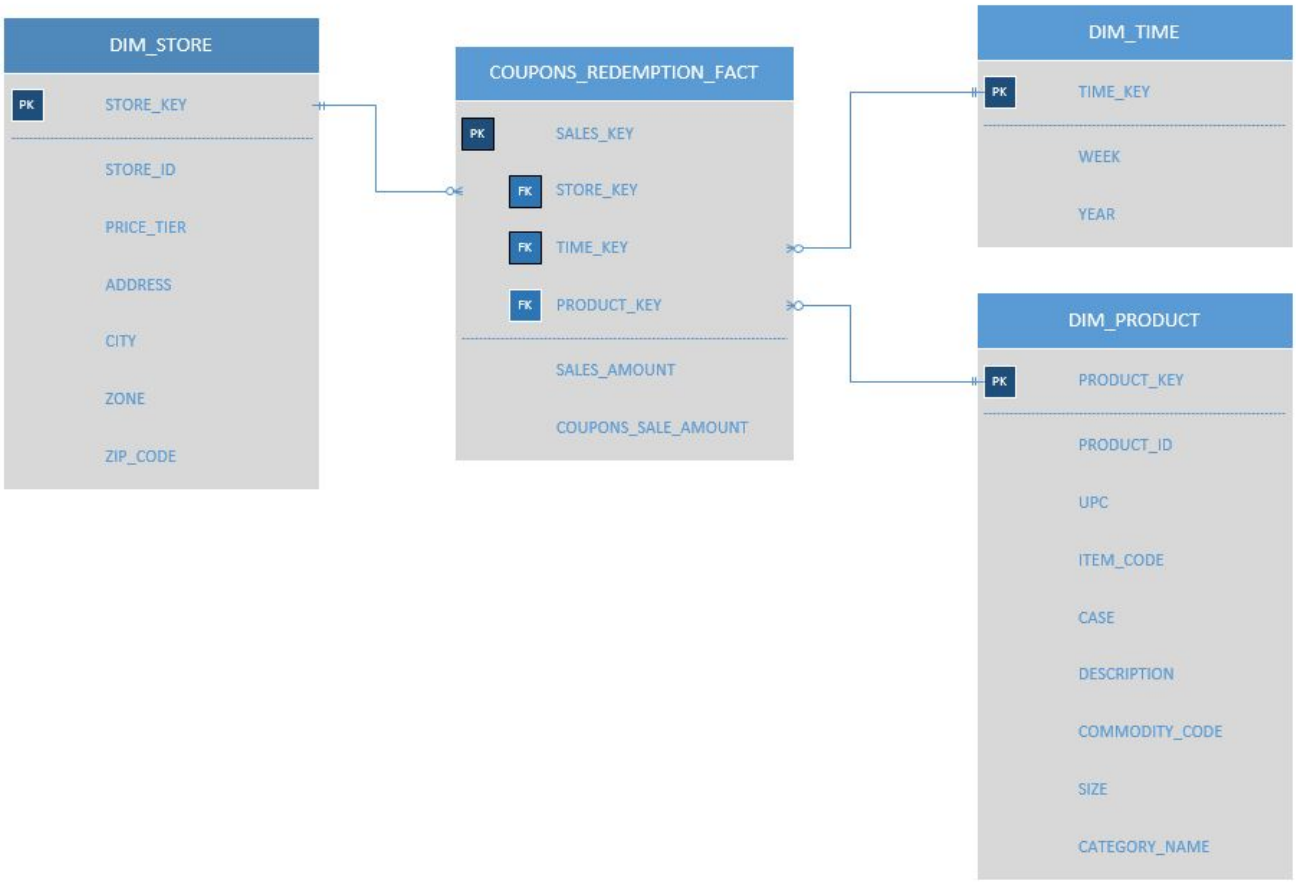


Schema Justification: In this business question, we looked at the data given in the CCount table for bakery sales. We wanted to evaluate this amount store wise to see if there is any relevance of the coupons redeemed for bakery items. We noticed that for certain stores such as 0, 1, 2 as shown above, the coupons redemption was high. In contrast, the sale of bakery items was very low. If we see the sale for store 2, 4 and 5, we notice that the bakery sales were extremely high. In this case, the coupons redeemed was not so substantial. This analysis can be further explored to evaluate the difference. One of the strategies by DFF can be to give out more options in coupons or discounts to attract customers in store 2, 4, 5 to eventually increase the sales exponentially. DFF can also try to understand the trend of sales for coupons in stores 0, 1, 2 and strategize to increase the bakery sales in those stores.

ERD:



Dimensional Model:



Schema Justification: To find the relation between bakery sales and coupons redeemed for all stores, we propose a schema which consists of the COUPONS_REDEMPTION_FACT fact table. This table stores the SALES_AMOUNT for regular sales and COUPONS_SALE_AMOUNT for the coupons redeemed sales amount from the CCount table

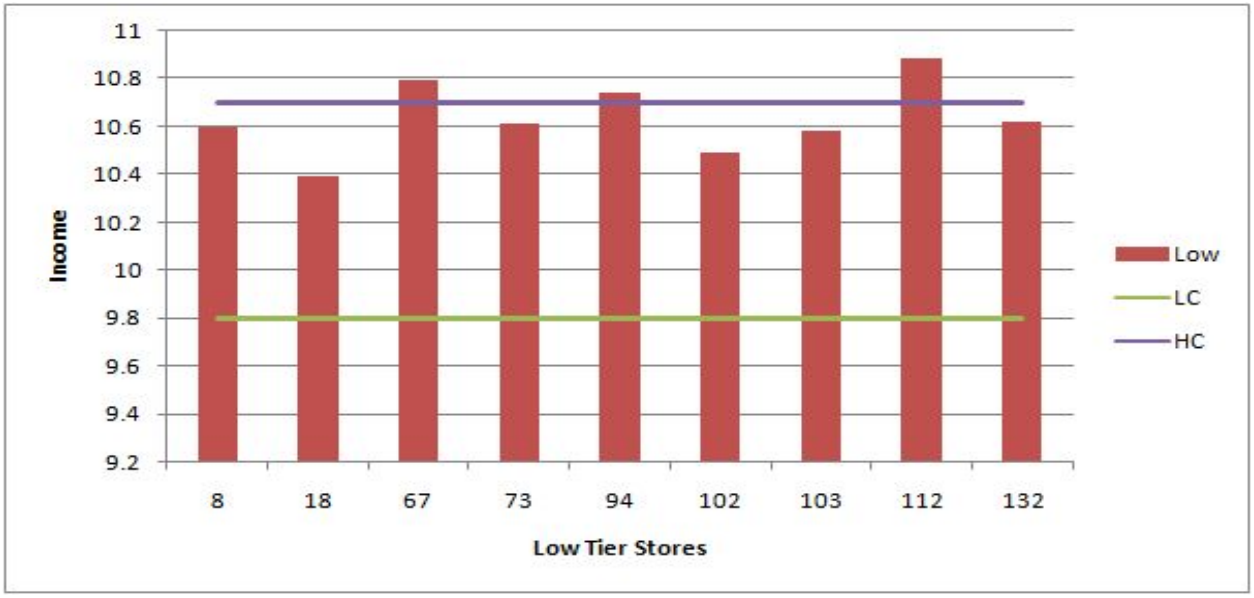
data. The DIM_STORE table stores the store details and the DIM_PRODUCT stores the product details along with the CATEGORY_NAME. The DIM_TIME dimension table stores the week at the lowest granularity, moving up to year.

2.6 Find out stores which are wrongly categorized as Low, Medium or high based on the demographic income?

It is assumed that tier of a store depends on the income of people of that area. A high tier store's product and their prices are relatively high as average income in that area is above median income. Overall income of Chicago demographic ranges from 9.8 to 11.5. A low tier store refers to a zone where income lies between 9 and 9.8. A store is considered as medium tier if income lies between 9.8 and 10.7. A high tier store has population whose income lies between 10.8 & above. Apart from income other factors contribute too to decide the tier. However, there are facts represented by our analysis that strongly question the tier of stores.

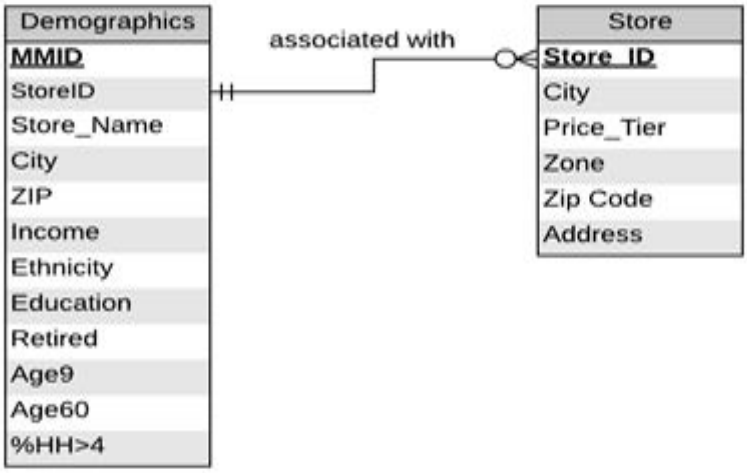
Low Tier:

Pivot



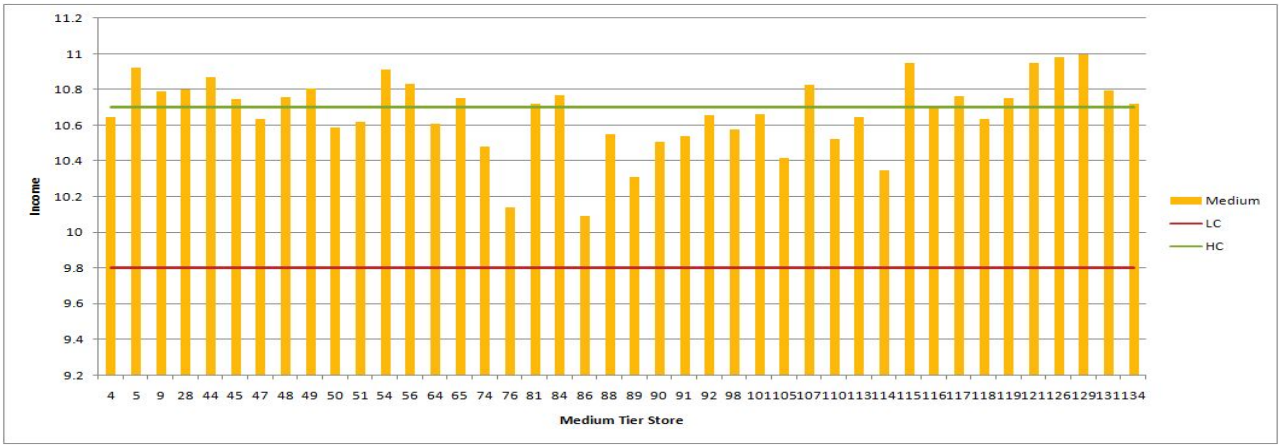
Justification: For example, graph shows that average income of families around store 67 and 112 is more than average income of high tier stores (10.8). Store should reconsider tier of these stores.

ERD:



Medium Tier:

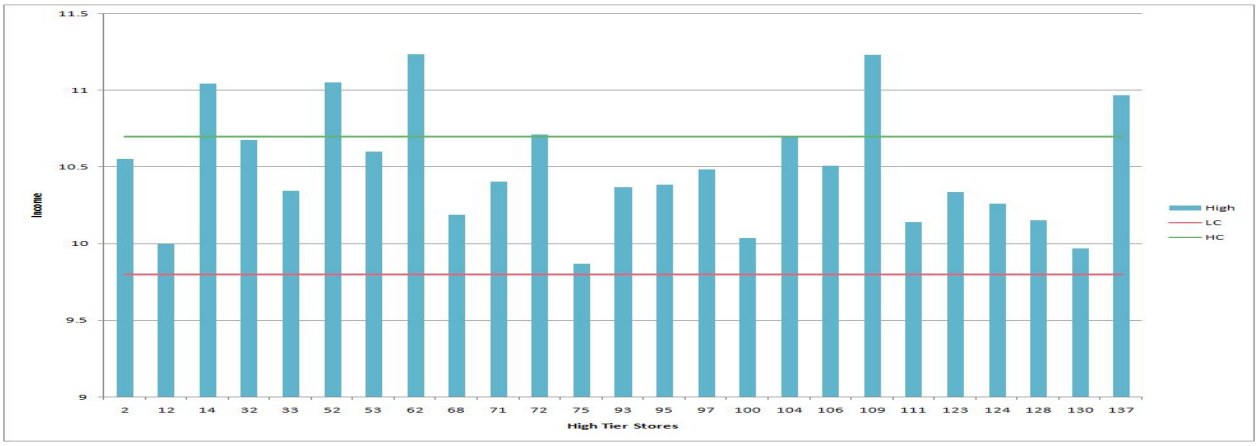
Pivot



Justification: Income of populations around medium tier stores show that there are many stores that cross 10.8 (lower range of high tier stores). These stores should be reclassified to high tier if other factors are minute. This will change the product price and product range according to high tier leading to increase in revenue.

High tier:

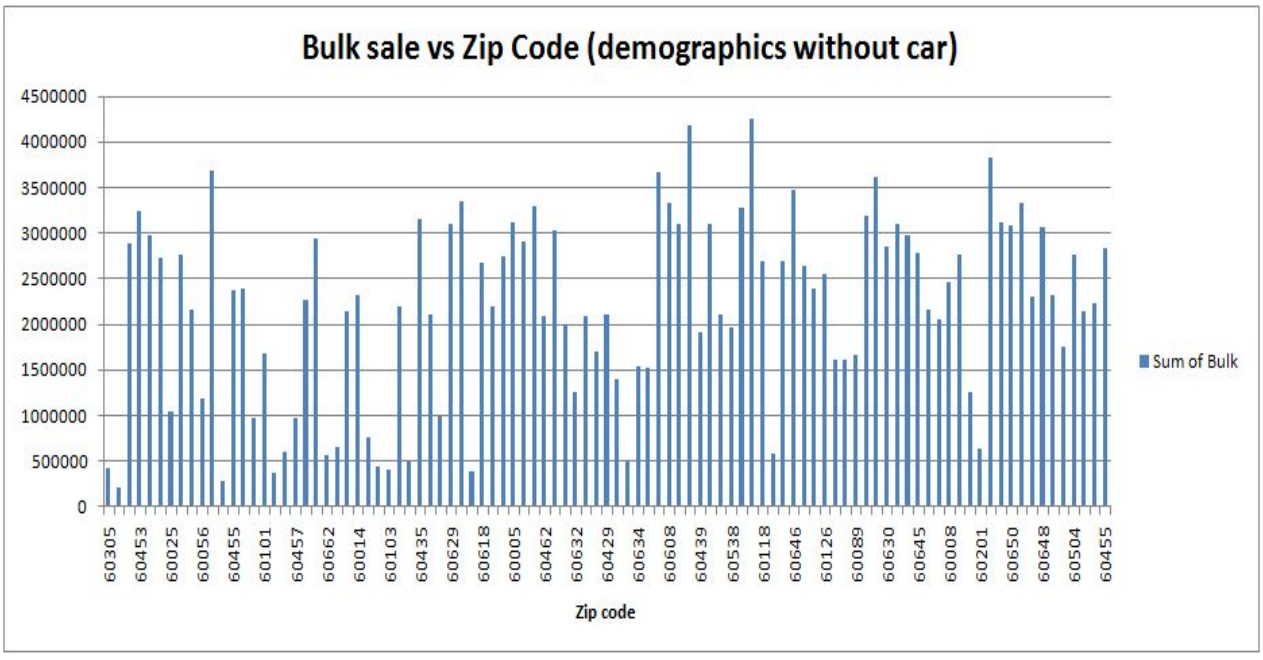
Pivot



Justification: Graph shows that store 75 and 130 are near 9.8 but are considered as high tier store. These should be re-categorized as low or medium stores.

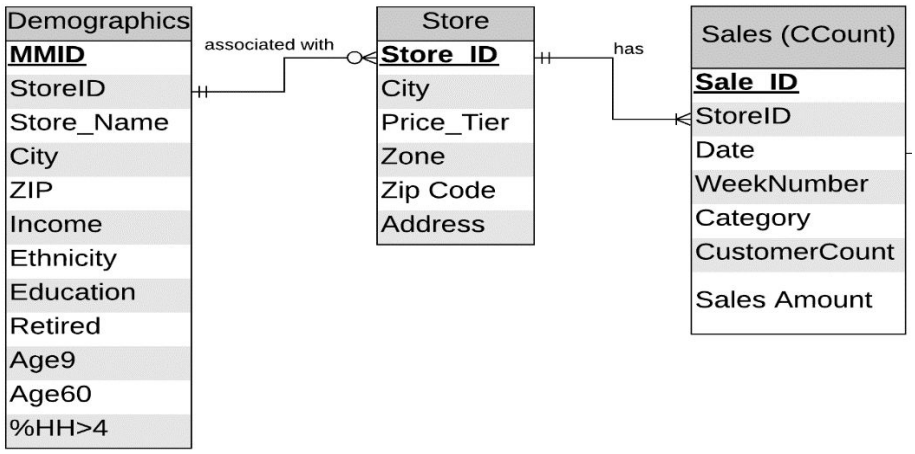
2.7 For the stores where the customer population without car is high, find out the areas in which sale of bulk products is high?

Pivot



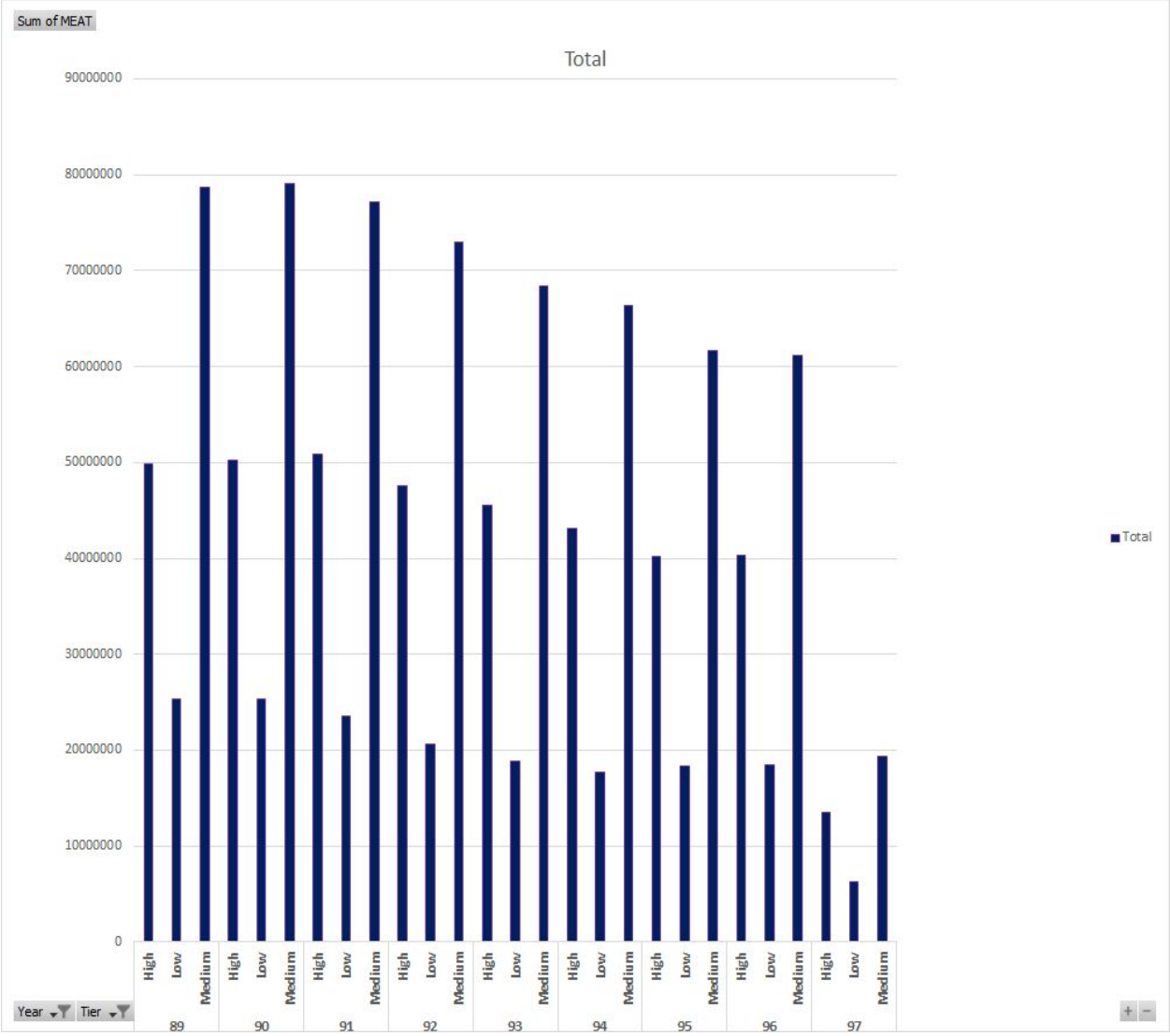
Justification: To compete with e-commerce Dominick should start home delivery options. To start with home delivery options, Dominick chain should start with the areas where number of people with no car are more and stores where bulk product sale is more. This data indicates that stores in zip code 60056, 60608, 60118, 60648 have high sales of bulk product with maximum population without car. Enabling home delivery will have positive impact on sales of these area.

ERD



2.8 What is the effect of bonus buy and simple discount on the sale of meat based on tiers?

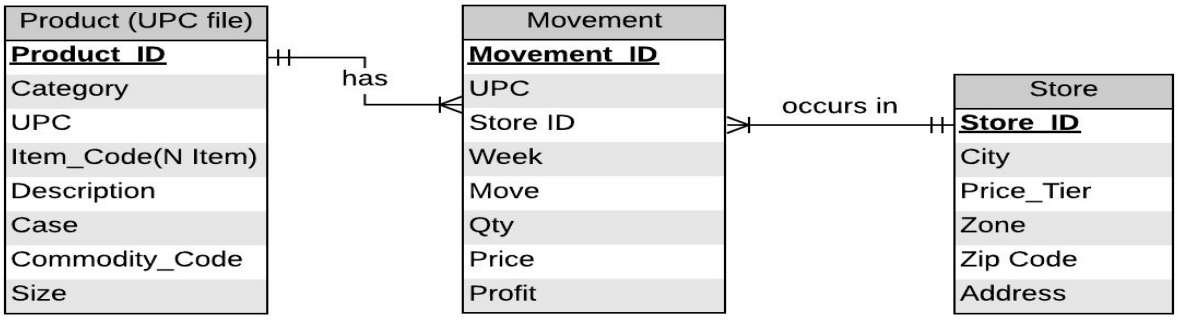
Pivot



Justification:

The CCount file has data which tells us about the meat sales date-wise and week-wise. Our rationale to evaluate meat sales was to understand the impact of tiers on sale based on yearly data. We wanted to evaluate if there is any difference in the sales for high, medium tiers as meat is a popular category. On analysis, we found that the medium tier especially had high net sales as seen above. We expected the sales to be greater for high tier too. But compared to the high tier for all years, medium tier showed relatively high sales. Noticeably, we can see that there is a decline in the sale over the years from 1998-1997. DFF can benefit by analyzing the cause of this decline and coming up with measures to make it an increasing trend over the next few years.

ERD

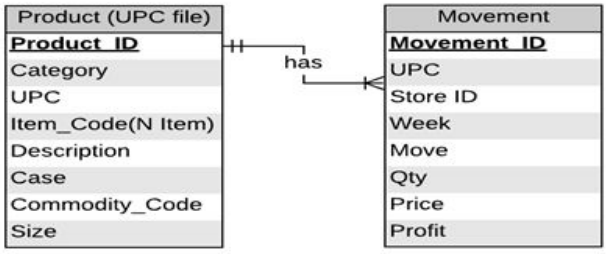


2.9 When toilet papers are bundled, then is there any difference in the sales and profit because of bundling?

Pivot

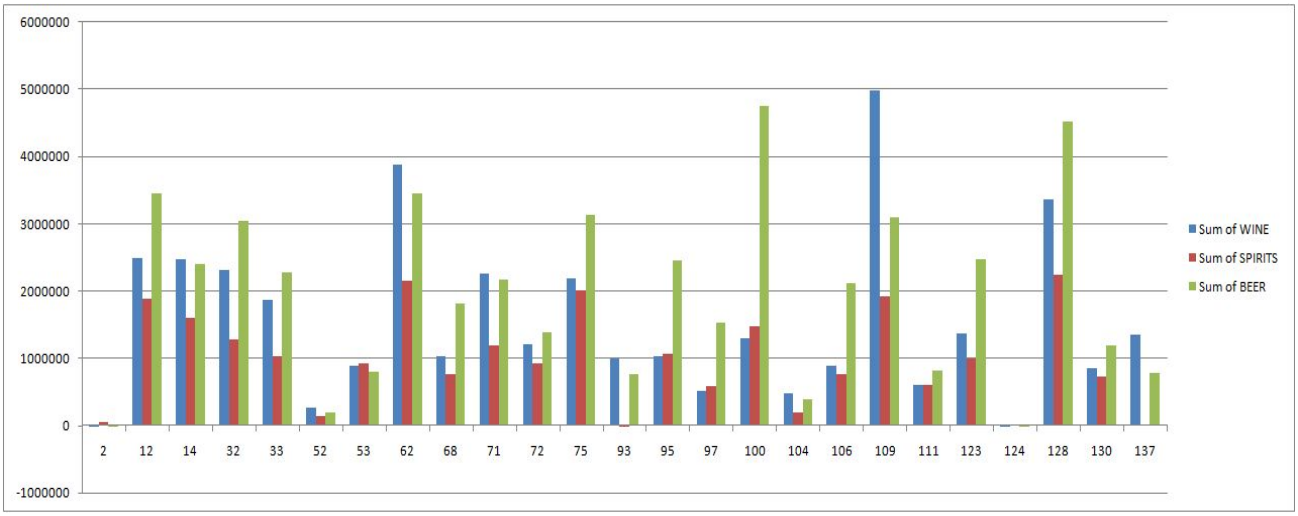
Justification: We have data for each category and bundles in which they are sold, and we think that bundling will have an impact on certain products. We took the example of toilet paper as usually customers tend to buy bundles of toilet paper in one go. When we performed analysis on bundled data for toilet papers, we discovered a trend which suggests that when toilet paper is bundled in a group of 3 then it has the highest sales and profits. DFF can increase their sale even more by focusing on the bundles of 3. Moreover, we observed that the bundles of 7 have relatively lower sales but high profits. So DFF can also focus on these bundles furthermore to increase their profitability.

ERD



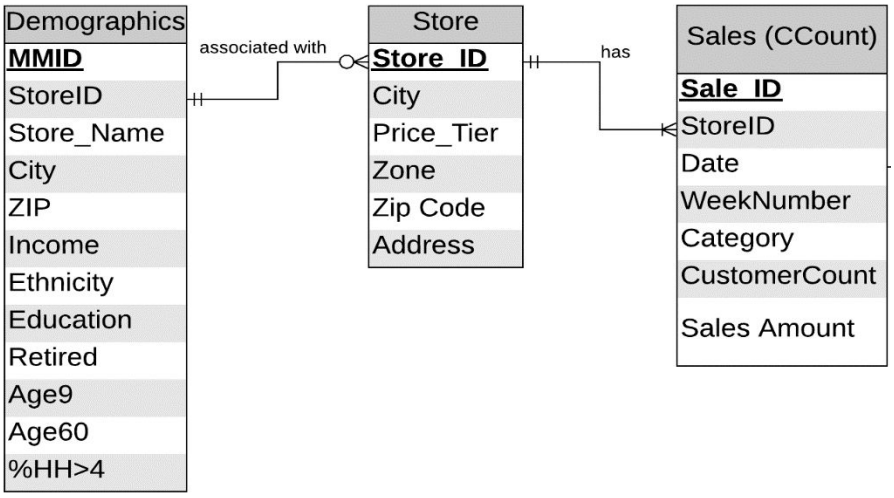
2.10 In high tier stores, find out which of the alcohol-based products dominate sales?

Pivot



Justification: In high tier stores, a major part of sales is due to beer (green) as compared to Wine & Spirit. In order to increase sales from high tier stores, where median income of population is high, stocks of high quality and expensive beer can be increased. This can increase revenue significantly.

ERD


Demographics
MMID
StoreID
Store_Name
City
ZIP
Income
Ethnicity
Education
Retired
Age9
Age60
%HH>4
associated with
Store
Store_ID
City
Price_Tier
Zone
Zip Code
Address
has
Sales (CCount)
Sale_ID
StoreID
Date
WeekNumber
Category
CustomerCount
Sales Amount

3. Data marts and mapping tables

3.1 Kimball's Matrix for Data Marts:

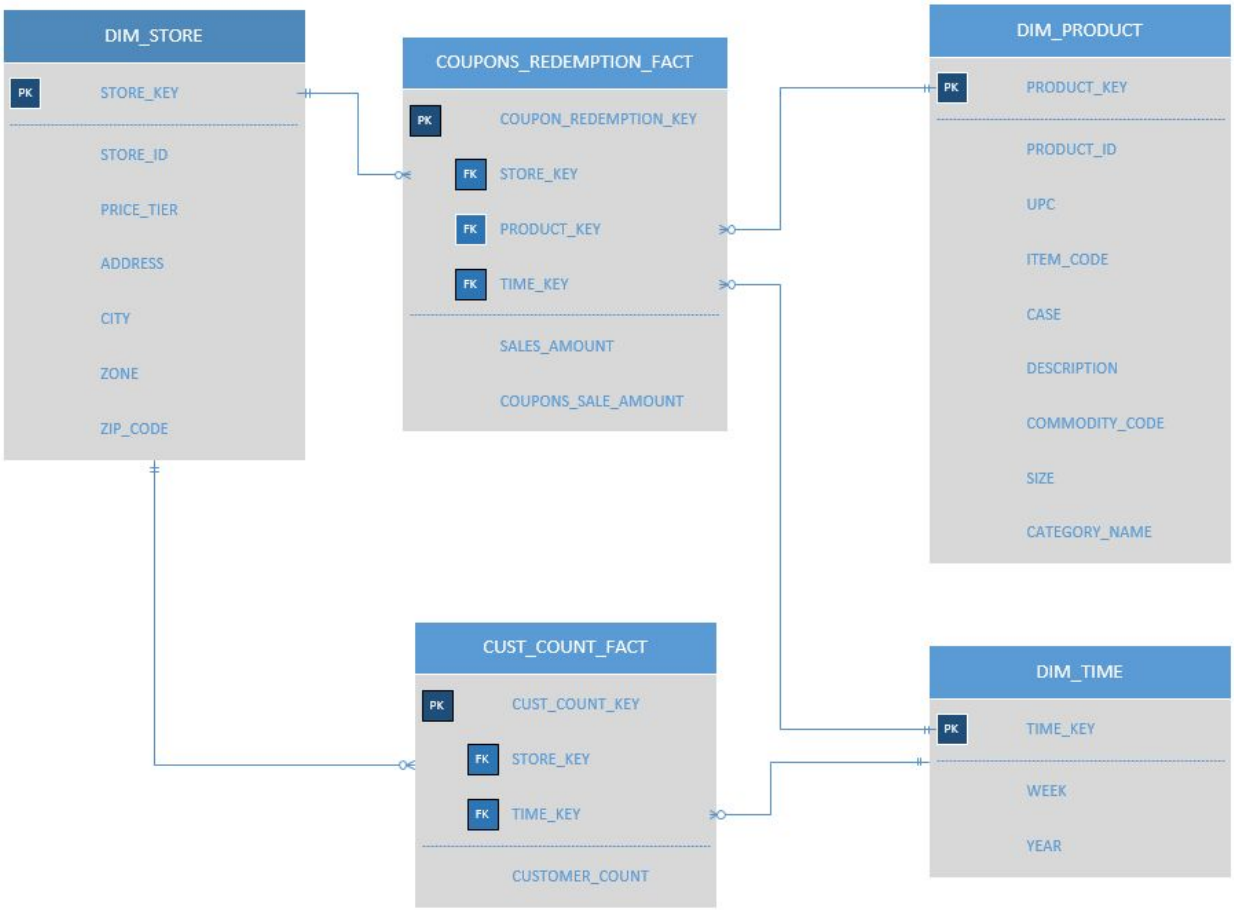
Data Marts	Time	Product	Store Demo	Demographic
Customer Count & Coupon Redemption Sales	X	X	X	
Product Sales	X	X	X	

The Data Mart Matrix

3.2 Data marts

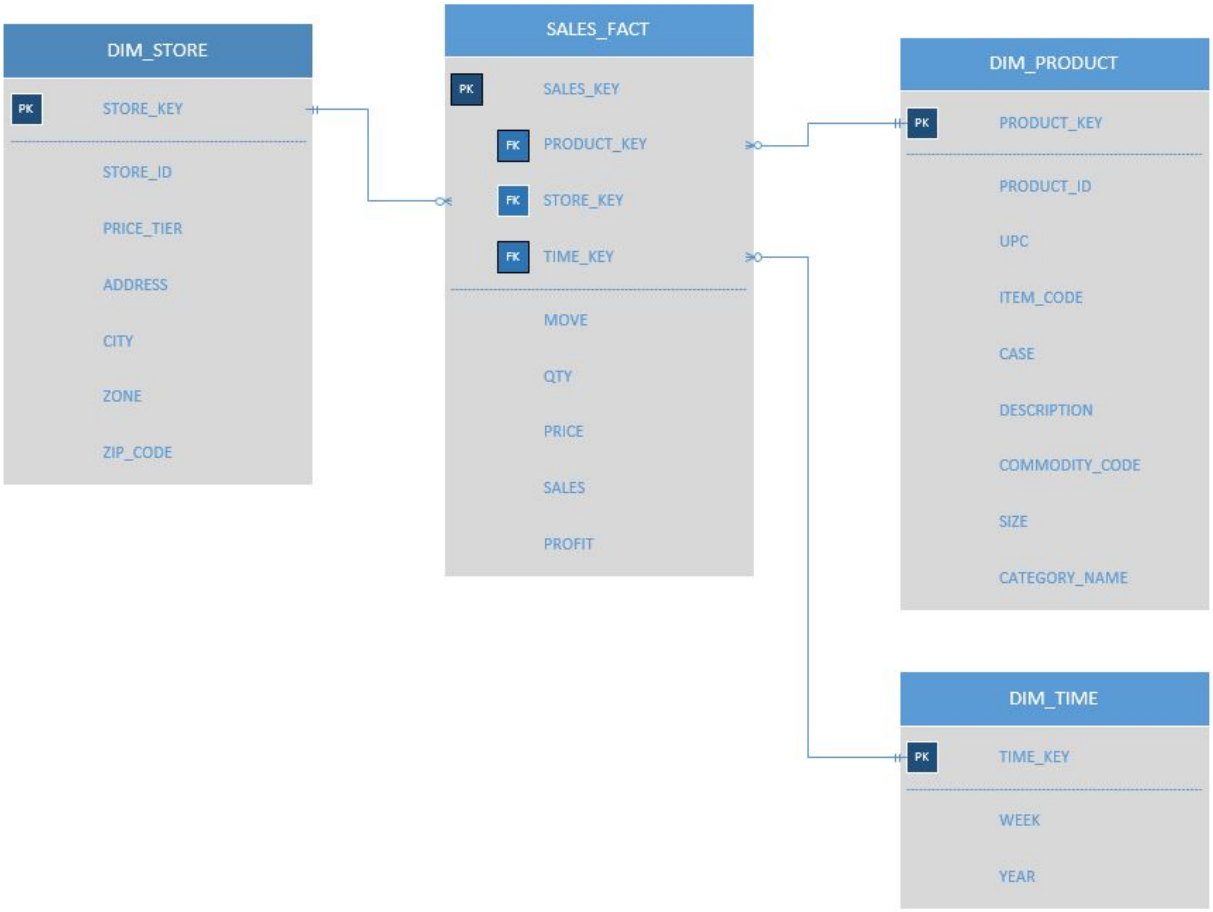
(Please refer to the business question 1-5 for the approach to develop below marts)

3.2.1 Coupon sales & Customer Count Data Mart



Schema Justification: The first data mart is created using the models created for Q1 & Q5. We combined the models to have two fact tables, one for the Customer Count related facts and the other for Sales amount related to coupons. Rationale behind keeping two fact table is that one question demands fact measured at customer level while other business question demands facts at store level. The other dimensions Time is constant.

3.2.2 Sales & Profit Data Mart:



Schema Justification: The remaining questions Q2, Q3, Q4 require us to calculate sales or profits for products or for a category. In essence, we need a sales fact table in all three questions. Since granularity and other factors were same, we merged all 3-fact table to create our second data mart with the fact table as SALES_FACT and related dimension tables: DIM_STORE, DIM_PRODUCT & DIM_TIME.

3.3 Mapping Tables:

STORE:

DW Target Table	DW Target Attribute	Target Datatype	Source Table	Source Column	Mapping Function	Others
DIM_STORE	STORE_KEY	Numeric				Surrogate key
DIM_STORE	STORE_ID	Numeric	Dominick's dataset-Store	STOREID		
DIM_STORE	PRICE_TIER	String	Dominick's dataset-Store	TIER		
DIM_STORE	ADDRESS	String	Dominick's dataset-Store	ADDRESS		
DIM_STORE	CITY	String		CITY		
DIM_STORE	ZONE	String		ZONE		
DIM_STORE	ZIP_CODE	Numeric		ZIP_CODE		

PRODUCT:

DW Target Table	DW Target Attribute	Target Datatype	Source Table	Source Column	Mapping Function	Others
DIM_PRODUCT	PRODUCT_KEY	Numeric				Surrogate key
DIM_PRODUCT	PRODUCT_ID	Numeric		Generated in ERD		Primary key
DIM_PRODUCT	UPC	String	Dominick's dataset-Store	UPC		
DIM_PRODUCT	ITEM_CODE	String	Dominick's dataset-Store	ITEM_CODE		
DIM_PRODUCT	CASE	Numeric	Dominick's dataset-Store	CASE		
DIM_PRODUCT	ZONE	String	Dominick's dataset-Store	ZONE		
DIM_PRODUCT	DESCRIPTION	String	Dominick's dataset-Store	DESCRIPTION		
DIM_PRODUCT	COMMODITY_CODE	String	Dominick's dataset-Store	COMMODITY_CODE		
DIM_PRODUCT	SIZE	String	Dominick's dataset-Store	SIZE		
DIM_PRODUCT	CATEGORY_NAME	String	Dominick's dataset-Store	CATEGORY_NAME		

TIME:

DW Target Table	DW Target Attribute	Target Datatype	Source Table	Source Column	Mapping Function	Others
DIM_TIME	TIME_KEY	Numeric				Surrogate key
DIM_TIME	WEEK	Numeric	Dominick's dataset-Store	WEEK_NUMBER		
DIM_TIME	YEAR	Numeric	Dominick's dataset-Store	YEAR		

SALES_FACT:

DW Target Table	DW Target Attribute	Target Datatype	Source Table	Source Column	Mapping Function	Others
SALES_FACT	SALES_KEY	Numeric				
SALES_FACT	PRODUCT_KEY	Numeric	DIM_PRODUCT	PRODUCT_KEY		
SALES_FACT	STORE_KEY	Numeric	DIM_STORE	STORE_KEY		
SALES_FACT	MOVE	Numeric	Dominick's dataset-Store	MOVE	sum(move) from movement group by week	
SALES_FACT	QTY	Numeric	Dominick's dataset-Store	QTY	sum(qty) from movement group by week	
SALES_FACT	PRICE	Numeric	Dominick's dataset-Store	PRICE	sum(price) from movement group by week	
SALES_FACT	SALES	Numeric	Dominick's dataset-Store	SALES	sum(sales) group by week	

COUPONS_REDEMPTION_FACT:

DW Target Table	DW Target Attribute	Target Datatype	Source Table	Source Column	Mapping Function	Others
COUPONS_REDEEMPTION_FACT	COUPON_REDEMPTION_KEY	Numeric				Primary key
COUPONS_REDEEMPTION_FACT	PRODUCT_KEY	Numeric	DIM_PRODUCT	PRODUCT_KEY		
COUPONS_REDEEMPTION_FACT	STORE_KEY	Numeric	DIM_STORE	STORE_KEY		
COUPONS_REDEEMPTION_FACT	TIME_KEY	Numeric	DIM_TIME	TIME_KEY		

COUPONS_REDEEMPTION_FACT	SALES_AMOUNT	Numeric	Dominick's dataset-Store	SALES_AMOUNT	Sum (sales_amount) from sales_table/ccount group by week	
COUPONS_REDEEMPTION_FACT	COUPON_SALE_AMOUNT	Numeric	Dominick's dataset-Store	SALES_AMOUNT	Sum (sales_amount_ from sales_table/ccount where category group by week	

CUST_COUNT_FACT:

DW Target Table	DW Target Attribute	Target Datatype	Source Table	Source Column	Mapping Function	Others
CUST_COUNT_FACT	CUST_COUNT_KEY	Numeric				Primary key
CUST_COUNT_FACT	STORE_KEY	Numeric	DIM_STORE	STORE_KEY		
CUST_COUNT_FACT	TIME_KEY	Numeric	DIM_TIME	TIME_KEY		
CUST_COUNT_FACT	CUSTOMER_COUNT	Numeric	SALES/ MOVEMENT	SALES		

4. ETL Development Plan and Implementation

4.1 Data Quality

Data which is fit for the purpose it is intended for is called data quality. The data in DFF data sets had many quality issues. The data after being extracted into the staging area had data type varchar (255)/nvarchar (255). There were lot of junk data cells which has special characters in columns which should be numeric in value. There were few missing values such as week 0 had to be added later on to make the data consistent with the data in Movement and CCount file data. The data format in the input file is '*890301'*. This had to be made consistent throughout to a standard date format *'1989-03-01'*. There was missing data with many of the fields blank in the files. For example, the first 1155 rows of CCount consists of gibberish values or blank rows. The data in Movement and CCount has values for StoreId which are greater than 139. For this case, the Store table has no data after StoreId after 139. So, all the data in CCount and Movement which has StoreId>139 will not have referential integrity with the Store table. Few StoreIds, zip code and price tiers were also missing in the Store table. The information in Store table is valuable for business and any missing values definitely reduces the data quality.

4.2 Development of ETL Plan

Our development plan includes target data, all data sources, data mappings, extraction rules, transformation rules, cleaning rules and aggregated rules.

4.2.1 Target Data

Our solution for the data warehouse consists of 3 fact tables and 3 dimension tables. The target data is shown below:

Dimension Tables:

Target table	**Target Column**	**Target Column Datatype**
602_Group6_Warehouse.DIM_STORE	STORE_KEY	INT
	STORE_ID	INT
	PRICE_TIER	VARCHAR
	ADDRESS	VARCHAR
	CITY	VARCHAR
	ZONE	VARCHAR
	ZIP_CODE	VARCHAR

Target table	Target Column	Target Column Datatype
602_Group6_Warehouse.DIM_WEEK	WEEK_KEY	INT
	WEEK_NUMBER	INT
	START	DATE
	END	DATE
	SPECIAL_EVENTS	VARCHAR

Target table	Target Column	Target Column Datatype
602_Group6_Warehouse.DIM_PRODUCT	PRODUCT_KEY	INT
	PRODUCT	INT
	ITEM_CODE	INT
	UPC	INT
	SIZE	VARCHAR
	CASE	INT
	CATEGORY	VARCHAR
	DESCRIPTION	VARCHAR
	COMMODITY_CODE	INT

Fact Tables:

Target table	Target Column	Target Column Datatype
602_Group6_Warehouse.SALES_MOVE_FACT	SALES_MOVE_KEY	INT
	PRODUCT_KEY	INT
	WEEK_KEY	INT
	STORE_KEY	INT
	MOVE	INT
	QTY	INT
	PRICE	FLOAT
	SALE	VARCHAR
	PROFIT	FLOAT

	CALCULATED_SALES_AMOUNT	FLOAT
	CALCULATED_PROFIT	FLOAT

Target table	Target Column	Target Column Datatype
602_Group6_Warehouse.CUST_COUNT_FACT	CUST_COUNT_KEY	INT
	CUSTOMER_COUNT	INT
	WEEK_KEY	INT
	STORE_KEY	INT

Target table	Target Column	Target Column Datatype
602_Group6_Warehouse.COUPON_REDEMPTION_FACT	COUPON_REDEMPTION_KEY	INT
	STORE_KEY	INT
	WEEK_KEY	INT
	PRODUCT_KEY	INT
	SALES_AMOUNT	FLOAT

Data Sources

The data sources are the files given in the Dominick data set. For the business questions that we need to focus on, we used the CSV files provided which are CCount, Movement, UPC and Store files.

For one business question, we require data of customer count. This data is available in the CCount file. Another question required us to import data from CCount because we needed to find the sales data for coupons redemption for a category. We will use the columns needed for these questions from CCount file. For three questions, we need the sales and profit, so we will make use of the Movement and UPC files for this. Additionally, we will use the Store table given in the Dominick data manual to create a store dimension as we have questions which use the store data.

4.3 Data Mapping

DIM_STORE

Store.csv — *Generated from the data given in Dominick' guide*

Loading Data from CSV

DBO.StoreTemp

Cleaned and Corrected Store data

DBO.Store

Creating Dimension Table for store

DBO.DIM_STORE

DIM_PRODUCT

UPC.csv

Multiple UPC files having required product data

DBO.PRODUCT_CategoryName

Deriving required column & UNION all

DBO.PRODUCT_TEMP

Cleaned and Corrected Store data

DBO.DIM_PRODUCT

DIM_WEEK

WEEK.csv — *Generated from the data given in Dominick' guide*

Exporting csv to SQL server

DBO.WEEKTABLE

Extracting only required fields

DBO.DIM_WEEK

CUSTOMER_COUNT_FACT

CCOUNT.csv

Exporting csv to SQL server

DBO.CCOUNT

Selecting only required columns
cleaning data by taking only 0-9 characters

DBO.SALES_CCF_TEMP1

Further cleaning by converting values in INT and removing wrong data

DBO.SALES_CCF_TEMP2

SSIS operations

DBO.CUSTOMER_COUNT_FACT

COUPON_REDEMPTION_FACT

CCOUNT.csv

Exporting csv to SQL server

DBO.CCOUNT

Selecting only required columns
cleaning data by taking only 0-9 characters

DBO.SALES_TEMP

Un-pivoting required column

DBO.SALES

Further cleaning by converting values in INT and removing wrong data

DBO.SALES_FINAL

SSIS operations of selecting required column, grouping by week and store, summing sales_amount, look up

DBO.COUPON_REDEMPTION_FACT

SALES_MOVE_FACT

MOVE_CATEGORY_NAME.csv

Exporting MULTIPLE MOVE csv to SQL server

DBO.MOVE_CATEGORY_NAME

Union of all move files into one

DBO.MOVE_TEMP

Selecting only required columns
cleaning data by taking only 0-9 characters

DBO.MOVE

SSIS operations of selecting required column, grouping by week and store, summing sales amount, look up

DBO.SALES_MOVE_FACT

4.4 Data Extraction rules

The extraction process will involve loading data from the source files to the staging area. Since we are not going to take care of updates to the data, we are going to use the Full Extraction process. We will take the CCount file and directly import it to the staging area as CCOUNT. For the UPC and Movement files, we will take the files we need for our questions and load them into the staging area. For example, for frozen entrees we will load the UPC file into a table called *product_frozenentree* and movement table for frozen entrée products into the *move_frozenentree* table into the staging area. After this, we will combine all such *product_xxx* tables into a final PRODUCT table and all such *move_xxx* tables into final SALES table. The extraction of all the store details will be stored in the STORE table. The week and date table provided to us will be loaded into the week table in the staging area.

Additionally, while exporting data from CSV we made sure that the column names are not in " ".

Following is the raw data after loading CSVs into Staging area:

CCount

	DATE	GROCERY	DAIRY	FROZEN	BOTTLE	MVPCLUB	GROCCOUP	MEAT	MEATFROZ	MEATCOUP	FISH	FISHCOUP	PROMO	PROMCOUP	PRODUCE	BULK	SALADBAR	PRODCOUP	BULKCOUP	SALCOUP	FLORAL	FLO
1	920712	14347.01	4201.57	2996.52	-1.6	11.98	-100.85	3849.39	272.54	-6.57	259.86	0	230.39	-72.7	4963.31	237.01	1.21	0	0	0	230.97	0
2	920713	12309.58	3335.8	2367.1	-10.1	5.99	-123.02	3272.53	156.04	0	266.22	0	54.59	-17.8	3797.05	202.25	17.31	0	0	0	95.78	0
3	920714	10454.18	2979.68	2344.59	0	21.87	-170.83	3034.77	153.32	-2.79	363.4	0	148.89	-38.1	3364.55	318.44	7.09	0	0	0	149.09	0
4	920715	11246.74	3110.77	2379.47	-0.8	19.96	-130.48	3175.7	180.71	-5.58	380.53	0	98.47	-47.89	3530.08	186.79	15.58	0	0	0	163.72	0
5	920716	12216.94	3378.75	2580.76	-0.7	29.95	-75.93	3579.46	246.83	0	729.27	0	249.54	-97.9	3764.57	391.32	7.59	0	0	0	260	0
6	920717	13195.79	3607.79	2702.63	0	92.99	-87.25	3658.12	180.66	0	668.13	0	268.27	-63.6	4230.81	343.99	5.83	0	0	0	433.55	0
7	920718	16207.97	4347.12	3223.69	-4.8	81.99	-91.34	4904.44	234.73	-2.18	524.49	0	62.01	-9.9	4955.34	435.78	9.05	0	0	0	380.85	0
8	920719	14581.12	4118.43	2992.9	-2.4	81.41	-65.45	3936.24	281.79	-2.18	312.95	0	37.64	0	4890.12	366.32	14.21	0	0	0	382.79	0
9	920720	11606.58	3435.3	2092.76	-5.6	134.81	-56.71	3319.94	193.7	0	406.05	0	44.82	-14.4	3824.7	254.9	5.49	-0.9	0	0	284.98	0
10	920721	11744.11	3607.61	2445.6	-1.5	10.99	-48.56	3452.33	225.75	0	419.84	0	150.19	-57.2	3488.18	268.7	5	0	0	0	274.03	0
11	920722	10533.25	2924.68	2063.4	-1.6	18.47	-44.2	2724.83	174.86	-4.36	478.94	0	102.74	-43.5	3057.63	261.59	11.42	0	0	0	186.38	0
12	920723	13613.08	3603.18	2450.4	-1.8	21.98	-82.13	4759.88	297.31	-8	629.45	0	214.15	-58.8	4501.6	349.57	12.61	0	0	0	368.33	0
13	920724	14302.29	3512.18	2681.97	-0.8	37.05	-110.64	4798.56	299.84	-9	794.37	0	123.25	-32.4	4718.09	303.8	7.83	0	0	0	225.24	0
14	920725	19007.5	4733.75	3483.44	-4.3	55.94	-118.96	5887.19	477.87	-5	777.28	0	157.89	-26.4	5792.8	372.8	7.29	0	0	0	330.92	0
15	920726	15544.37	4091.81	3019.99	-3.9	12.49	-91.87	4172.79	302.66	-4	236.82	0	81.17	-20.8	4995.65	285.58	7.82	0	0	0	368.8	0
16	920727	12347.84	3381	2400.59	0	17.36	-72.39	3679.27	231.67	-8	246.68	0	87.96	-20.8	4075.39	252.82	13.59	0	0	0	182.48	0
17	920728	11051.37	3092.88	2508.87	-4.7	67.17	-56.95	3039.53	259.45	-7.79	568.32	0	32.68	-14.4	3934.39	199.46	6.9	0	0	0	205.71	0
18	920729	10572	2643	3304	0	0	0	3167	0	0	811	0	0	0	2778	0	0	0	0	0	169	0
19	920730	11936.06	3131.25	2345.58	0	21.87	-104.94	3600.69	224.75	-2	854.35	0	39.77	-14.8	3665.88	216.24	5.84	0	0	0	196.61	-51.
20	920731	14683.97	3464.56	2611.78	0	14.58	-159.74	3741.54	265.7	0	932.37	0	148.72	-10.4	4556.2	286.12	6.18	0	0	0	373.11	-88.
21	920801	18081.58	4284.34	3191.35	-4.1	21.87	-141.24	5523.07	268.22	-4	778.22	0	130.43	-37.1	5139.35	306.01	19.25	0	0	0	533.86	-13
22	920802	16676	3982	4231	0	0	0	4183	0	0	142	0	0	0	3873	0	0	0	0	0	215	0
23	920803	12514.36	3164.93	2155.72	-1.6	7.29	-104.34	3299.55	209.22	0	496.35	0	42.89	-25.5	3948.05	220.12	8.56	0	0	0	253.49	-76.
24	920804	11279	2776	3297	0	0	0	3285	0	0	400	0	0	0	2933	0	0	0	0	0	147	0
25	920805	11626.82	2847.31	2136.72	-1.6	11.98	-53.21	3318.23	213.56	-2	586.78	0	62.91	-10	3512.3	303.22	8.34	0	0	0	201.57	-25.
26	920806	12147.67	4346.25	2371.89	0	0	-705.57	3656.33	157.25	-2.79	749.26	0	600.47	-297.9	4270.81	278.17	12.14	0	0	0	165.54	0
27	920807	12544.97	4229.57	2415.15	-0.8	0	-625.58	3760.69	198.84	0	566.53	0	574.74	-347.4	4335.91	266.42	17.87	0	0	0	166.17	0
28	920808	18011.41	5716.3	3714.65	0	0	-716.12	5510.15	297.83	-13.95	739.76	0	650.42	-339.5	5925.87	276.61	13.19	0	0	0	325.84	0
29	920809	12568.89	4260.32	2992.76	-2.4	19.17	-413.07	3437.99	253.37	0	157.11	0	264.9	-161.6	4830.1	199.39	12.53	0	0	0	248.85	0
30	920810	11663.66	3875.41	2387.86	-0.2	6.39	-395.26	3012.17	229.02	-2.79	288.73	0	472.35	-264.8	3986.37	232.81	24.27	0	0	0	213.24	0
31	920811	11716.51	3753.71	2309.91	-0.2	0	-345.42	3134.59	231.05	-5.58	341.72	0	497.18	-334.9	3631.84	229.67	5.95	0	0	0	115.89	0
32	920812	11677.72	3860.84	2356.51	-0.6	19.17	-399.32	3101	195.36	-2.79	201.76	0	446.84	-338.7	3327.86	249.4	6.61	0	0	0	198.34	0
33	920813	13170.15	3366.49	2443.31	0	6.39	-70.17	4072.16	248.97	-2	634.97	0	103.31	-36	5360.36	265.18	2.85	0	0	0	268.72	0
34	920814	14489.94	3566.31	2716.32	0	6.39	-84.14	3921.16	319.45	0	719.59	0	105.41	-36.6	4880.32	261.69	10.84	0	0	0	275.43	0

move_frozenentree

Results Messages

	STORE	UPC	WEEK	MOVE	QTY	PRICE	SALE	PROFIT	OK
1	134	1380010154	362	4	1	2.89		32.99	1
2	134	1380010154	363	1	1	2.89		32.76	1
3	134	1380010154	364	4	1	2.89		34.75	1
4	134	1380010154	365	29	1	1.93	S	12.02	1
5	134	1380010154	366	1	1	2.89		41.24	1
6	134	1380010154	367	3	1	2.89		41.23	1
7	134	1380010154	368	7	1	1.93	S	11.96	1
8	134	1380010154	369	3	1	2.89		41.21	1
9	134	1380010154	370	1	1	2.89		32.56	1
10	134	1380010154	371	2	1	2.89		32.56	1
11	134	1380010154	372	2	1	2.89		43.66	1
12	134	1380010154	373	2	1	2.89		43.66	1
13	134	1380010154	374	3	1	2.89		36.85	1
14	134	1380010154	375	6	1	2.89		36.85	1
15	134	1380010154	376	3	1	2.89		33.42	1
16	134	1380010154	377	0	1	0		0	1
17	134	1380010154	378	3	1	2.89		33.07	1
18	134	1380010154	379	2	1	2.89		33.07	1
19	134	1380010154	380	2	1	2.89		38.23	1
20	134	1380010154	381	24	1	1.93	B	17.11	1
21	134	1380010154	382	14	1	1.93	B	17.15	1
22	134	1380010154	383	19	1	1.98	B	19.26	1
23	134	1380010154	384	4	1	2.89	B	44.67	1
24	134	1380010154	385	1	1	2.89		44.67	1
25	134	1380010154	386	23	1	2.89		44.67	1
26	134	1380010154	387	5	1	2.89		44.67	1
27	134	1380010154	388	3	1	2.89		44.67	1
28	134	1380010154	389	3	1	2.89		44.67	1
29	134	1380010154	390	8	1	2.89		44.67	1
30	134	1380010154	391	30	1	2.5	S	36.04	1
31	134	1380010154	392	2	1	2.89	S	44.67	1
32	134	1380010154	393	0	1	0		0	1
33	134	1380010154	394	2	1	2.89		44.67	1
34	134	1380010154	395	2	1	2.89		44.67	1

product_frozenentree

Results Messages

	COM_CODE	UPC	DESCRIP	SIZE	CASE	NITEM
1	105	1242409401	WOLFGANG PUCK 4 CHS	13.5	8	9310050
2	105	1242409402	WOLFGANG PUCK MSH/SP	13.5	8	9310060
3	105	1242409403	WOLFGANG PUCK CHN RA	13.5 O	8	9310010
4	105	1242409404	WOLFGANG PUCK SWTPPO	13.5 O	8	9310020
5	105	1242409406	WOLFGANG PUCK MSH SP	15 OZ	8	9310090
6	105	1242409407	WOLFGANG PUCK EGPLNT	15 OZ	8	9310080
7	105	1242409408	WOLFGANG PUCK SP CKN	13.5 O	8	9310030
8	105	1380010002	STFRS BEEF CHOP SUEY	12 OZ	12	9129041
9	105	1380010011	STOUFFER'S BEEF STR	9.7 OZ	12	9110430
10	105	1380010012	STOFR BEEF TERIYAKI	10 OZ	12	9111070
11	105	1380010017	STOFFERS CHILI W/BEA	8.75 O	12	9126951
12	105	1380010018	STFRS CRMD CHP BEEF	11 OZ	12	9124101
13	105	1380010019	STFRS IRZ CHILI REAL	9.2 OZ	12	912398
14	105	1380010021	STFR LXP ORIENTAL B	9.625	12	9120041
15	105	1380010023	STOUFFERS CHDR PASTA	11 OZ	12	9124741
16	105	1380010025	STFRS R C BEEF POT R	9.25 O	12	9134181
17	105	1380010032	STFRS GREEN PEPPER S	10.5 O	12	9124551
18	105	1380010036	STFRS R C BEEF DIJON	9.5 OZ	12	9134201
19	105	1380010037	STFRS R C BEEF CACCI	10.1 O	12	9134051
20	105	1380010040	STFRS TORTILLA GRAND	9.6 OZ	12	9124431
21	105	1380010045	STFRS H/S RIGATONI W	9 OZ	12	9124261
22	105	1380010050	LC BEEF/BEAN ENCHANA	9.25..	12	9310761
23	105	1380010055	STFRS IRZ JAMBALAYA	10 OZ	12	912400
24	105	1380010060	STOFR SALISBURY STEA	9.78 O	12	9129420
25	105	1380010065	STOFR RIBS OF BEEF	9 OZ	12	9129550
26	105	1380010066	STOUFFERS SNGL SERVE	10 OZ	12	9124311
27	105	1380010067	STFRS STUFFED PEPPER	15.5 O	12	9123901
28	105	1380010068	STFRS SWEDISH MTBALL	11 OZ	12	9129001
29	105	1380010070	STFRS H/S SALISBURY	8.63 O	12	9124191
30	105	1380010071	STFRS H/S VEAL PARMI	9.25 O	12	9124251
31	105	1380010072	STFRS H/S MEATLOAF	9.88 O	12	9124211
32	105	1380010073	STFRS H/S BEEF & NOO	7.13 O	12	9124231
33	105	1380010074	STFRS H/S BEEF POT R	9.5 OZ	12	9124221
34	105	1380010075	STFRS BEEF FAJITAS	6.9 OZ	12	9124501

WeekTable

Results Messages

	Week Number	Start	End	Special Events
1	1	9/14/1989	9/20/1989	
2	2	9/21/1989	9/27/1989	
3	3	9/28/1989	10/4/1989	
4	4	10/5/1989	10/11/1989	
5	5	10/12/1989	10/18/1989	
6	6	10/19/1989	10/25/1989	
7	7	10/26/1989	11/1/1989	Halloween
8	8	11/2/1989	11/8/1989	
9	9	11/9/1989	11/15/1989	
10	10	11/16/1989	11/22/1989	
11	11	11/23/1989	11/29/1989	Thanksgiving
12	12	11/30/1989	12/6/1989	
13	13	12/7/1989	12/13/1989	
14	14	12/14/1989	12/20/1989	
15	15	12/21/1989	12/27/1989	Christmas
16	16	12/28/1989	1/3/1990	New-Year
17	17	1/4/1990	1/10/1990	
18	18	1/11/1990	1/17/1990	
19	19	1/18/1990	1/24/1990	
20	20	1/25/1990	1/31/1990	
21	21	2/1/1990	2/7/1990	
22	22	2/8/1990	2/14/1990	
23	23	2/15/1990	2/21/1990	Presidents Day
24	24	2/22/1990	2/28/1990	
25	25	3/1/1990	3/7/1990	
26	26	3/8/1990	3/14/1990	
27	27	3/15/1990	3/21/1990	
28	28	3/22/1990	3/28/1990	Easter
29	29	3/29/1990	4/4/1990	
30	30	4/5/1990	4/11/1990	
31	31	4/12/1990	4/18/1990	
32	32	4/19/1990	4/25/1990	
33	33	4/26/1990	5/2/1990	
34	34	5/3/1990	5/9/1990	

Store

Results Messages

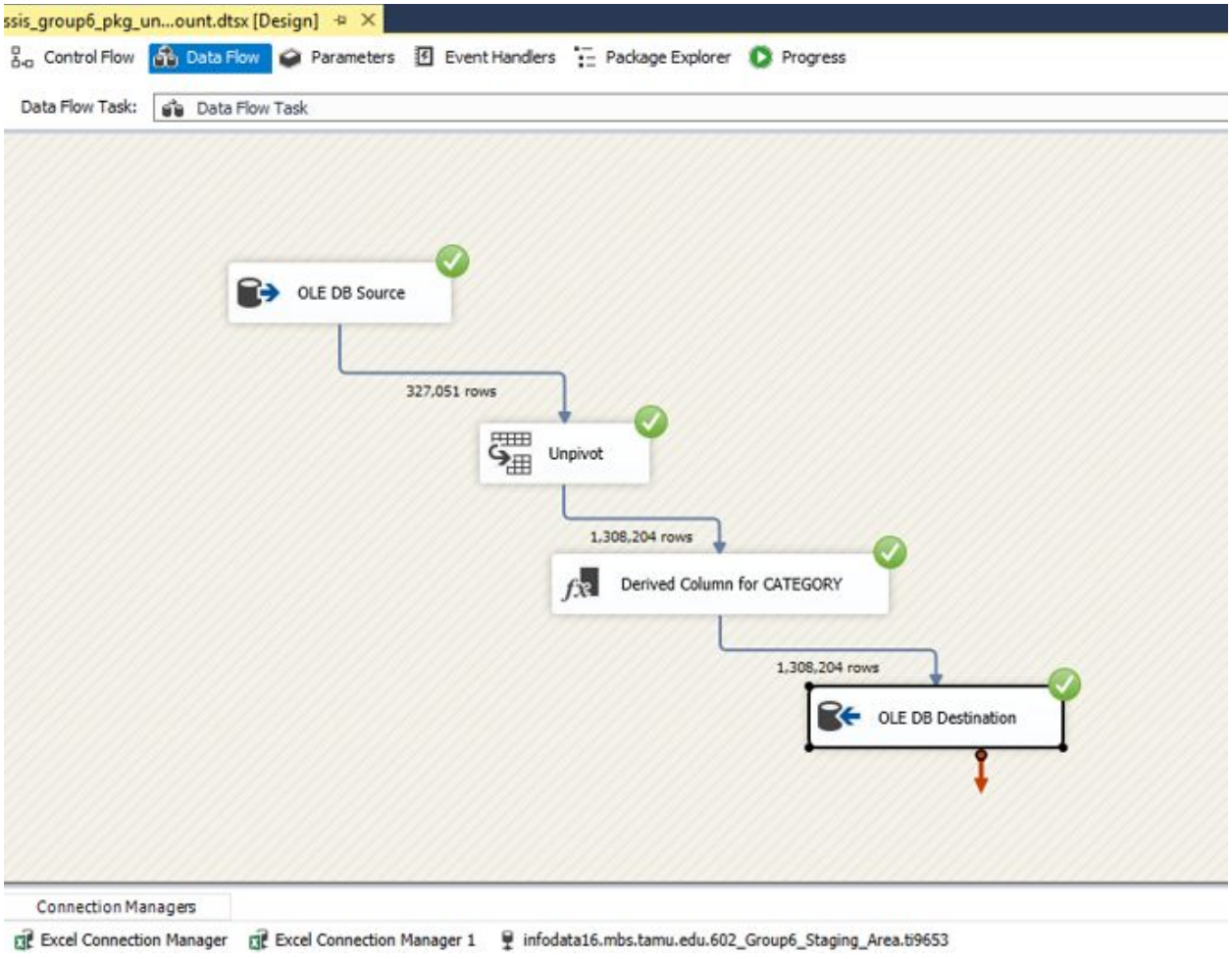
	Store	City	Price Tier	Zone	Zip Code	Address
1	2	River Forest	High	1	60305	7501 W. North Ave.
2	4	Park Ridge	Medium	2	60068	Closed
3	5	Palatine	Medium	2	60067	223 Northwest HWY.
4	8	Oak Lawn	Low	5	60435	8700 S. Cicero Ave.
5	9	Morton Grove	Medium	2	60053	6931 Dempster
6	12	Chicago	High	7	60660	6009 N. Broadway Ave.
7	14	Glenview	High	1	60025	1020 Waukegan Rd.
8	18	River Grove	Low	5	60171	8355 W. Belmont Ave.
9	19	Glen Ellyn	None	None	60137	Closed
10	21	Hanover Park	CubFighter	6	60103	1440 Irving Park Rd.
11	25	Chicago	None	None	60639	Closed
12	28	Mt. Prospect	Medium	2	60054	1145-55 Mt Prospect Pz.
13	32	Park Ridge	High	1	60068	1900 S. Cumberland Ave.
14	33	Chicago	High	7	60657	3012 N. Broadway Ave.
15	39	Waukegan	None	None	60085	Closed
16	40	Bridgeview	CubFighter	6	60455	8825 S. Harlem
17	44	Western Spring	Medium	2	60558	14 Garden Market
18	45	Wheeling	Medium	2	60090	550 W. Dundee Rd.
19	46	Carol Stream	Low	5	60187	Closed
20	47	Addison	Medium	2	60101	545 W. Lake St.
21	48	Schaumburg	Medium	2	60193	20 E. Golf Rd.
22	49	Downers Grove	Medium	2	60515	120 E. Ogden Ave.
23	50	Hickory Hills	Medium	2	60457	8631 W. 95th St.
24	51	Palos Heights	Medium	3	60463	6401 W. 127th St.
25	52	Northbrook	High	1	60062	4125 Dundee Rd.
26	53	Chicago	High	7	60662	3145 W. Pratt Ave.
27	54	Naperville	Medium	2	60540	1295 E. Ogden Ave.
28	55	Tinley Park	None	None	60577	Closed
29	56	Countryside	Medium	2	60525	6704 Joliet Rd.
30	59	Crystal Lake	CubFighter	6	60014	6000 Northwest Hwy.
31	60	Downers Grove	None	None	60515	Closed
32	62	Northfield	High	1	60093	1822 Willow Rd.
33	64	Villa Park	Medium	2	60181	302 W. North Ave.
34	65	Hanover Park	Medium	2	60103	Closed

4.5 Data Transformation and Cleansing rules

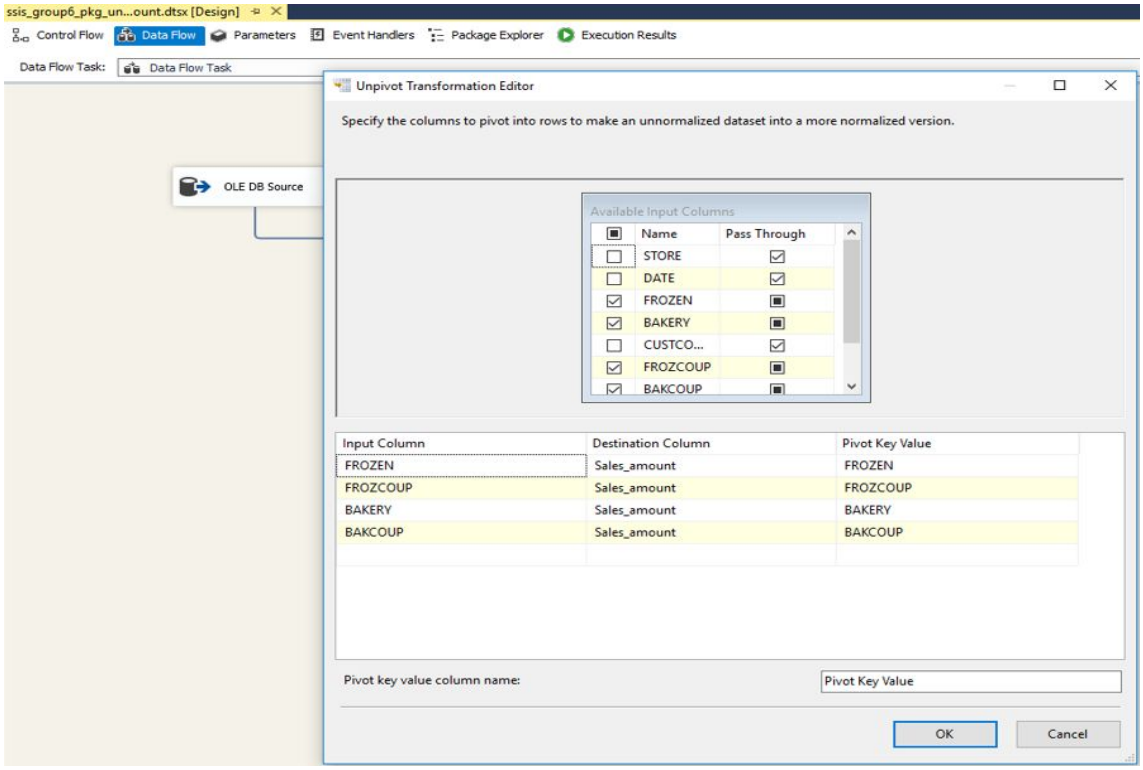
Transformation 1: For CCount, the data we need the data in the format as shown below:

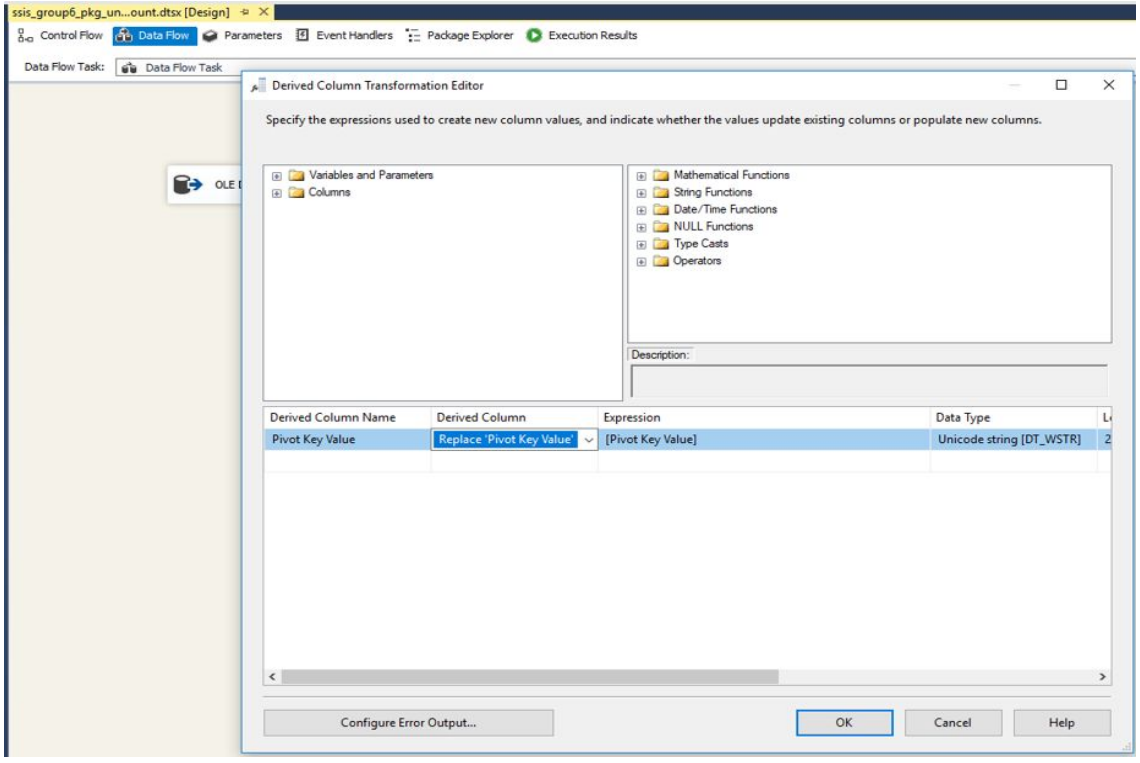
Sales ID	StoreID	Date	Category	Sales	Customer Count
1	47	880101	GROCERY	14900	1546
2	47	880101	DAIRY	3321	1546

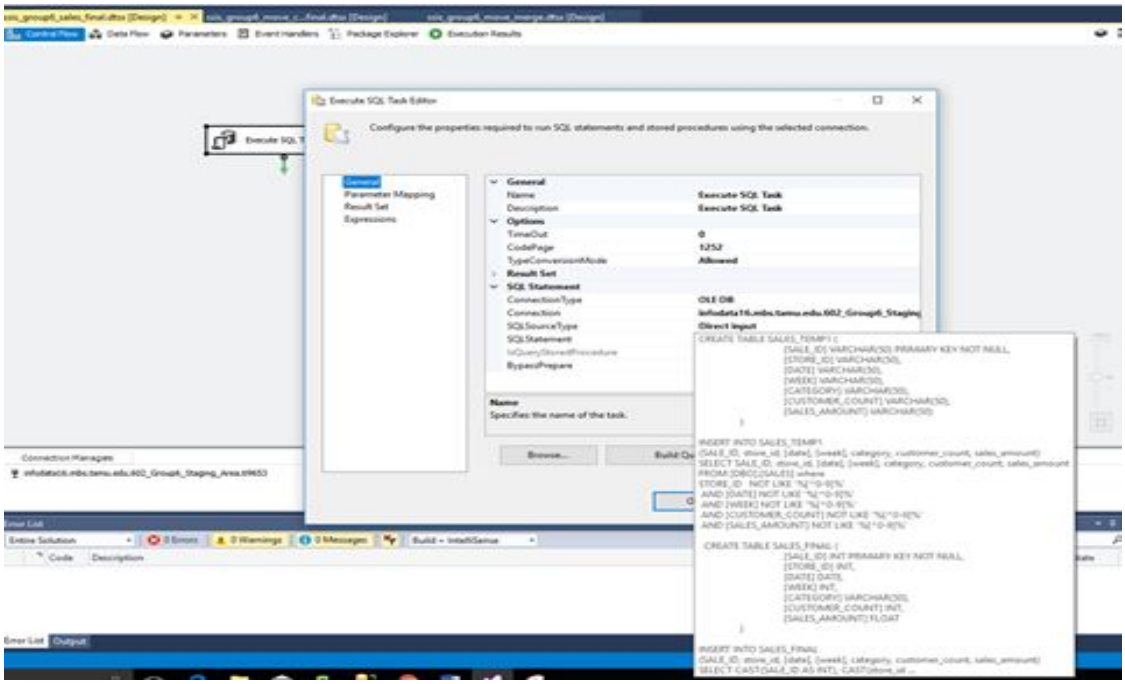
For this purpose, we need to apply transformation to this *CCount.*


ssis_group6_pkg_un...ount.dtsx [Design]
Control Flow
Data Flow
Parameters
Event Handlers
Package Explorer
Progress
Data Flow Task:
Data Flow Task
OLE DB Source
327,051 rows
Unpivot
1,308,204 rows
Derived Column for CATEGORY
1,308,204 rows
OLE DB Destination
Connection Managers
Excel Connection Manager
Excel Connection Manager 1
infodata16.mbs.tamu.edu.602_Group6_Staging_Area.ti9653

Next, we used derived column to store the category (i.e., column name in CCOUNT)







```
CREATE TABLE SALES_TEMP1 (
                [SALE_ID] VARCHAR(50) PRIMARY KEY NOT NULL,
                [STORE_ID] VARCHAR(50),
                [DATE] VARCHAR(50),
                [WEEK] VARCHAR(50),
                [CATEGORY] VARCHAR(50),
                [CUSTOMER_COUNT] VARCHAR(50),
                [SALES_AMOUNT] VARCHAR(50)
        )

INSERT INTO SALES_TEMP1
(
SALE_ID, store_id, [date], [week], category, customer_count, sales_amount)
SELECT SALE_ID, store_id, [date], [week], category, customer_count, sales_amount
FROM [DBO].[SALES] where
STORE_ID   NOT LIKE '%[^0-9]%'
 AND [DATE] NOT LIKE '%[^0-9]%'
 AND [WEEK] NOT LIKE '%[^0-9]%'
 AND [CUSTOMER_COUNT] NOT LIKE '%[^0-9]%'
 AND [SALES_AMOUNT] NOT LIKE '%[^0-9]%'
)

CREATE TABLE SALES_FINAL (
        [SALE_ID] INT PRIMARY KEY NOT NULL,
        [STORE_ID] INT,
        [DATE] DATE,
        [WEEK] INT,
        [CATEGORY] VARCHAR(50),
        [CUSTOMER_COUNT] INT,
        [SALES_AMOUNT] FLOAT
)
```

```
INSERT INTO SALES_FINAL
(SALE_ID, store_id, [date], [week], category, customer_count, sales_amount)
SELECT CAST(SALE_ID AS INT), CAST(store_id AS INT), convert(varchar(10), cast([DATE] as date), 101), CAST([week] AS INT),
category, CAST(customer_count AS FLOAT), CAST(sales_amount AS FLOAT)
FROM [DBO].[SALES_TEMP1] WHERE cast(STORE_ID as INT) <140
```

Transformation 2: Store

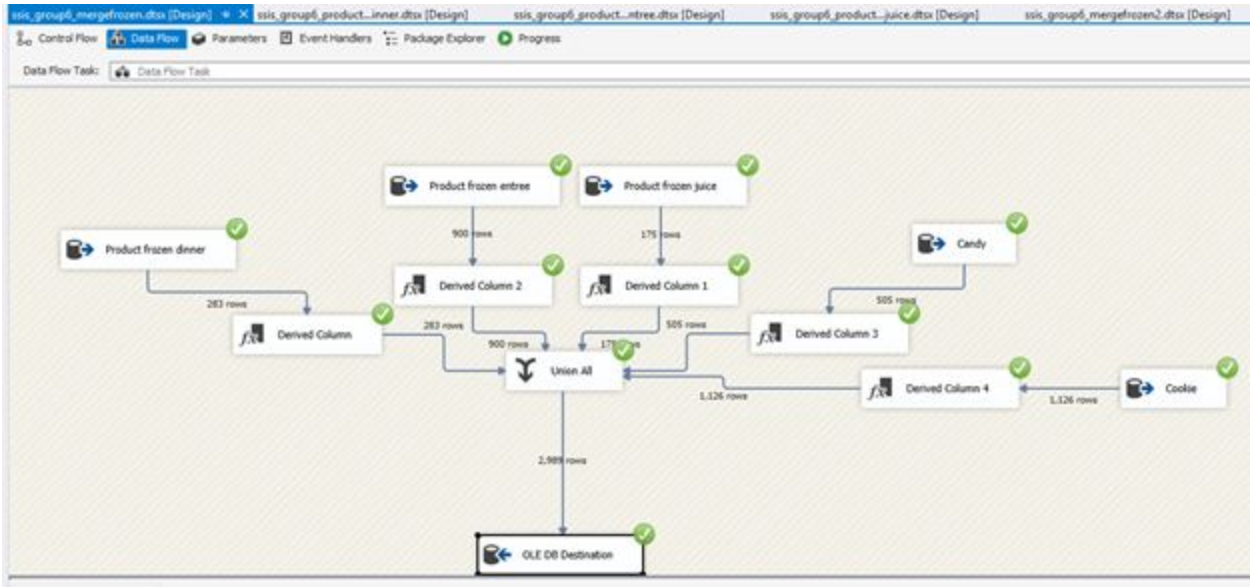
1. The store table after extraction to staging area had all the data types as varchar(255)/nvarchar(255). In order to create the dimension table from this, we will convert the value to appropriate data types.
2. The Store number will be converted to integer value to suit our needs
3. The other columns were kept as varchar and their sizes will be changed from 255 to needed number
4. Since we did not want to lose any data from this master table, we will add a value 'None' to all the column values which were NULL or empty strings. For example, we need the price tier column for one question, so we will change the value to 'None' wherever this value was NULL

Transformation 3: Week

1. For the week data taken from the Dominick's data, after extraction into the staging area, we will need to a new week 0 was added into the week table as there is existing data in the sales and movement data

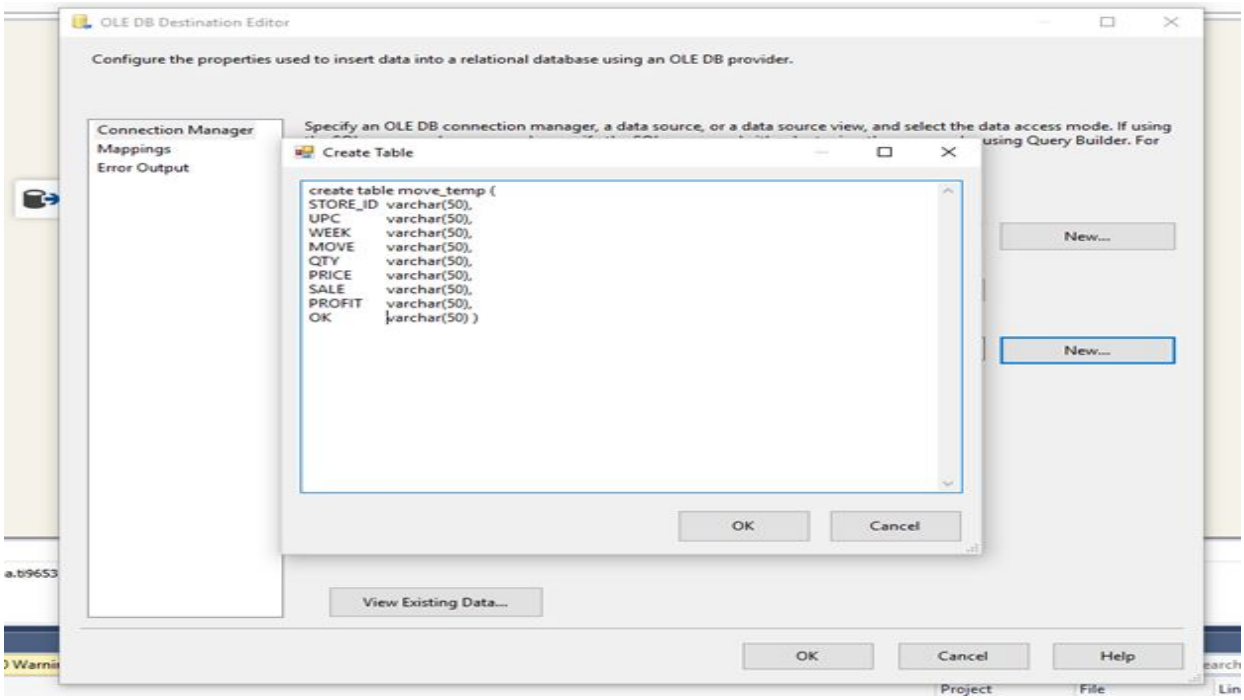
Transformation 4: Product

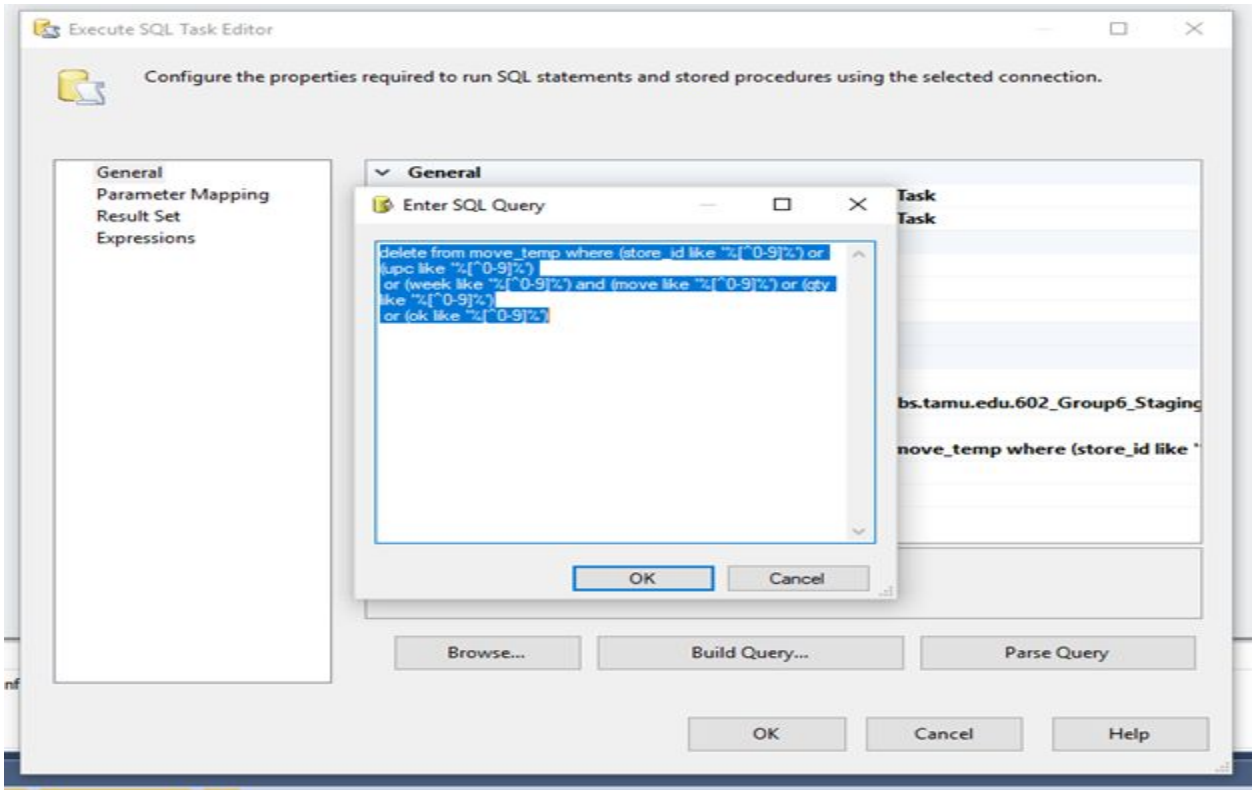
1. After loading the data for the products we need into the staging area, we will use SSIS to integrate all the tables and use derived column to add a new column
2. This new column is the 'Category' column we need to distinguish the products into a unique category
3. After this, we will store it into the Product table in the staging area



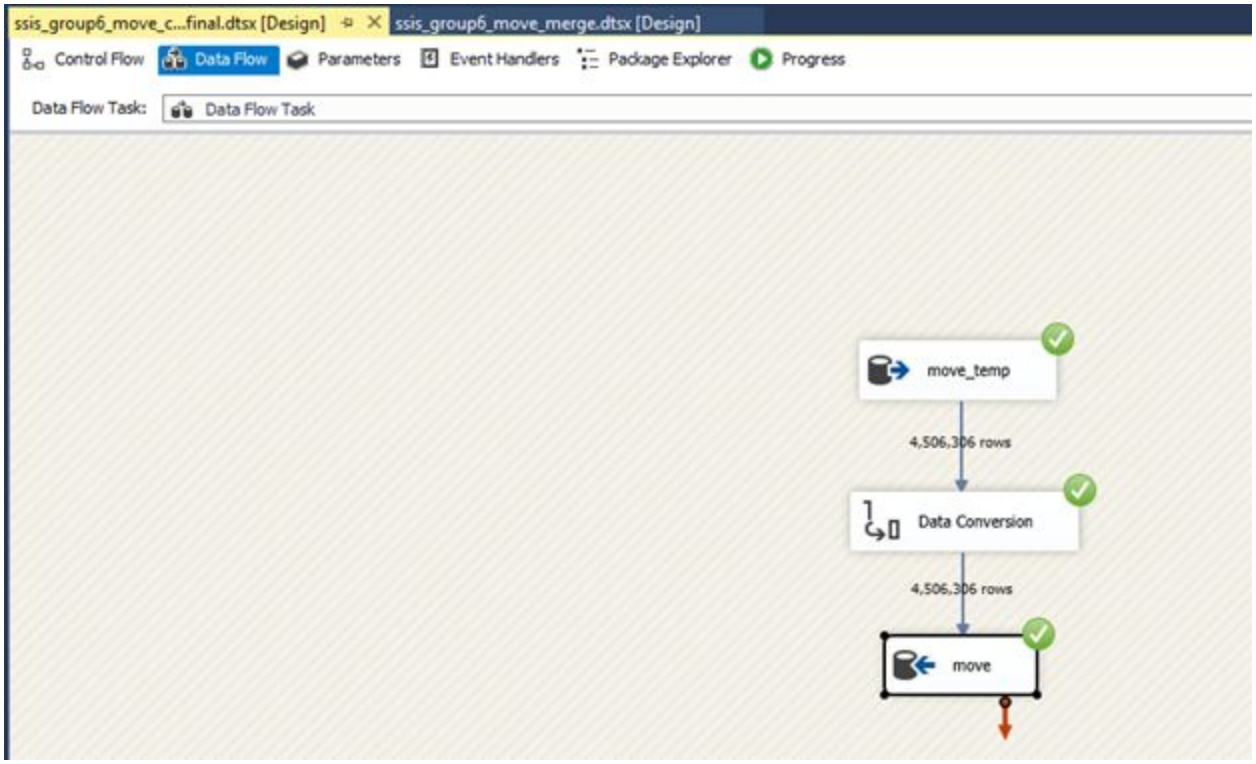
Transformation 5: Movement

1. After loading the data for the Movement we need into the staging area, we will use SSIS to integrate all the tables
2. After this, we will store it into a temporary Move table in the staging area




Execute SQL Task Editor
Configure the properties required to run SQL statements and stored procedures using the selected connection.
General
Parameter Mapping
Result Set
Expressions
General
Enter SQL Query
delete from move_temp where (store_id like "%[^0-9]%") or
(upc like "%[^0-9]%")
or (week like "%[^0-9]%") and (move like "%[^0-9]%") or (qty
like "%[^0-9]%")
or (ok like "%[^0-9]%")
OK
Cancel
Browse...
Build Query...
Parse Query
OK
Cancel
Help


ssis_group6_move_merge.dtsx [Design]
Control Flow
Data Flow
Parameters
Event Handlers
Package Explorer
Progress
Data Flow Task:
Data Flow Task
move_frozendinner
move_cookie
move_frozenentree
562,715 rows
move_candy
797,921 rows
1,048,575 rows
1,048,575 rows
move_frozenjuice
Union All
4,586,361 rows
move_temp



4.6 Aggregate tables

Our aggregation plans included aggregation in the fact tables as the lowest granularity is week. Data is given date wise for Movement, UPC and CCount. So, to bring it to the required granularity level, we will aggregate the data store wise and week wise in our fact tables.

4.7 Organization of data staging area

1. We will load the raw data into tables in the staging area as it is and create tables such as
   - dbo.CCOUNT
   - dbo.move_frozendinner
   - dbo.move_frozenentree
   - dbo.move_frozenjuice
   - dbo.move_cookie
   - dbo.move_candy
   - dbo.product_frozendinner
   - dbo.product_frozenentree
   - dbo. product_frozenjuice
   - dbo. product_cookie
   - dbo. product_candy

2. After this we will clean all the data, apply transformations, integrate the product tables into one product table, and integrate movement tables into one table to create the sales table
3. In between the processes, we will be using temporary tables to apply transformations and at the end we will drop these temporary tables to clean the staging area

Integrated tables:

Move

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [STORE_ID]
      ,[UPC]
      ,[WEEK]
      ,[MOVE]
      ,[QTY]
      ,[PRICE]
      ,[SALE]
      ,[PROFIT]
      ,[OK]
  FROM [602_Group6_Staging_Area].[dbo].[move]
```

100 %

Results | Messages

	STORE_ID	UPC	WEEK	MOVE	QTY	PRICE	SALE	PROFIT	OK
1	124	1070000339	202	66	1	0.42	B	61.19	1
2	124	1070000339	203	78	1	0.42	B	61.42	1
3	124	1070000339	204	86	1	0.42	B	60.71	1
4	124	1070000339	205	91	1	0.42	B	53.8	1
5	124	1070000339	206	62	1	0.42	B	48.57	1
6	124	1070000339	207	43	1	0.42	B	48.57	1
7	124	1070000339	208	61	1	0.45		52	1
8	124	1070000339	209	43	1	0.45		58.66	1
9	124	1070000339	210	66	1	0.45		60.88	1
10	124	1070000339	211	58	1	0.46		59.13	1
11	124	1070000339	212	54	1	0.49		51.02	1
12	124	1070000339	213	49	1	0.49		50.4	1
13	124	1070000339	214	27	1	0.49		50.4	1
14	124	1070000339	215	48	1	0.49		49.79	1
15	124	1070000339	216	37	1	0.49		49.79	1
16	124	1070000339	217	40	1	0.49		49.59	1
17	124	1070000339	218	66	1	0.47		46.38	1
18	124	1070000339	219	0	1	0		0	0
19	124	1070000339	220	76	1	0.39	B	33.84	1
20	124	1070000339	221	47	1	0.49		47.34	1
21	124	1070000339	222	64	1	0.49		47.14	1
22	124	1070000339	223	61	1	0.49		47.14	1
23	124	1070000339	224	59	1	0.49		46.53	1
24	124	1070000339	225	76	1	0.49		45.3	1
25	124	1070000339	226	86	1	0.49		45.3	1
26	124	1070000339	227	73	1	0.49		43.67	1
27	124	1070000339	228	73	1	0.49		43.67	1
28	124	1070000339	229	75	1	0.49		43.46	1
29	124	1070000339	230	73	1	0.49		42.65	1

Product

```
SELECT TOP (1000) [PRODUCT]
      ,[ITEM_CODE]
      ,[UPC]
      ,[SIZE]
      ,[CASE]
      ,[CATEGORY]
      ,[DESCRIPTION]
      ,[COMMODITY_CODE]
  FROM [602_Group6_Staging_Area].[dbo].[PRODUCT]
```

100 %

Results | Messages

	PRODUCT	ITEM_CODE	UPC	SIZE	CASE	CATEGORY	DESCRIPTION	COMMODITY_CODE
1	1	9309691	1380013201	13.2OZ	12	Frozen Dinner	LC HP CHICKEN FLOREN	104
2	2	9309711	1380013202	14 OZ	12	Frozen Dinner	LC HP ROASTED TURKEY	104
3	3	9309771	1380013203	14.25O	12	Frozen Dinner	LC HP SRLN BF TIPS	104
4	4	9309791	1380013204	14 OZ	12	Frozen Dinner	LC HP GRLD CHKN W/PE	104
5	5	9309801	1380013205	15.3OZ	12	Frozen Dinner	LC HP JUMBO RIGATONI	104
6	6	9309861	1380013206	14 OZ	12	Frozen Dinner	LC HP ORIENTAL GLAZE	104
7	7	9309651	1380013207	14 OZ	12	Frozen Dinner	LC HP BEEF LO MEIN	104
8	8	9309671	1380013208	12.5 O	12	Frozen Dinner	LC HP ROASTED CHICKE	104
9	9	9310121	1380013209	15 OZ	12	Frozen Dinner	LC HEARTY PORTIONS L	104
10	10	9310141	1380013210	15.5 O	12	Frozen Dinner	LC HRTY PORTIONS CHS	104
11	11	9310041	1380013304	17 OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
12	12	9309931	1380013305	16 OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
13	13	9310051	1380013306	15.1OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
14	14	9309951	1380013307	16.75Z	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
15	15	9309991	1380013308	16 OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
16	16	9310001	1380013309	17.5OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
17	17	9310131	1380013310	16 OZ	12	Frozen Dinner	STOUFFERS HP CNTRY F	104
18	18	9310011	1380013311	13.5 O	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
19	19	9309881	1380013312	15.4 O	12	Frozen Dinner	STOUFFERS HEARTY POR	104
20	20	9043031	2113150434	17 OZ	8	Frozen Dinner	MARIE CALLENDAR SPAG	104
21	21	9043081	2113150440	16 OZ	8	Frozen Dinner	MARIE CALLENDER RAVI	104
22	22	9043041	2113150475	13 OZ	8	Frozen Dinner	FETTUCINI W/BROCCOLI	104
23	23	9043001	2113150560	14 OZ	8	Frozen Dinner	MARIE CALLENDER MEAT	104
24	24	9043051	2113150575	13 OZ	8	Frozen Dinner	ESCALLOPED NOODLES &	104
25	25	9043061	2113150595	15 OZ	8	Frozen Dinner	MARIE CALLENDER LASA	104

Sales_Final

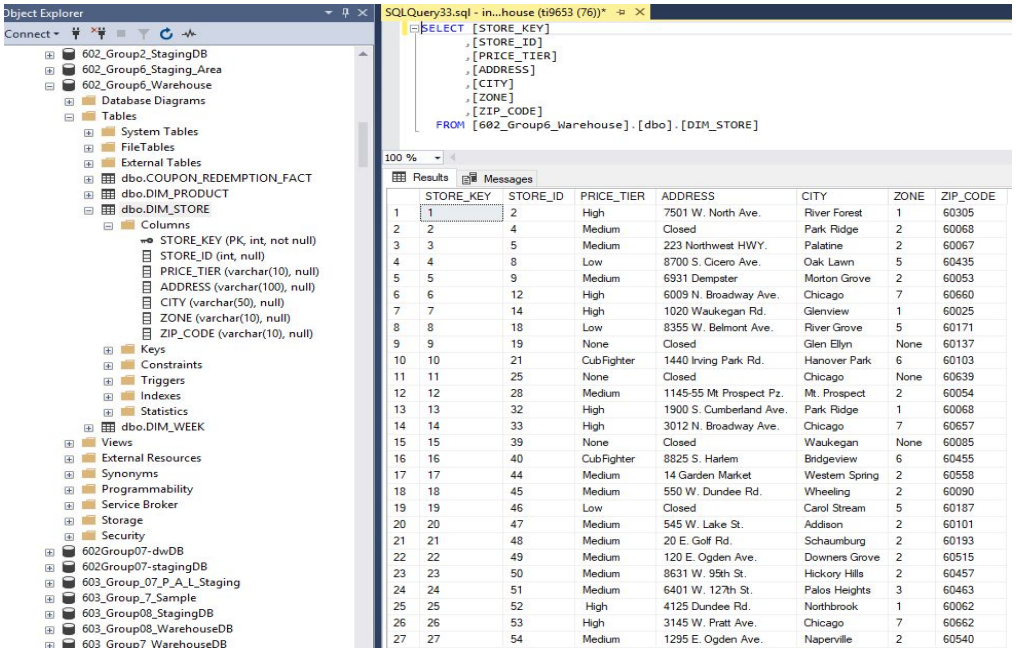
```
SELECT TOP (1000) [SALE_ID]
      ,[STORE_ID]
      ,[DATE]
      ,[WEEK]
      ,[CATEGORY]
      ,[CUSTOMER_COUNT]
      ,[SALES_AMOUNT]
  FROM [602_Group6_Staging_Area].[dbo].[SALES_FINAL]
```

00 %

Results | Messages

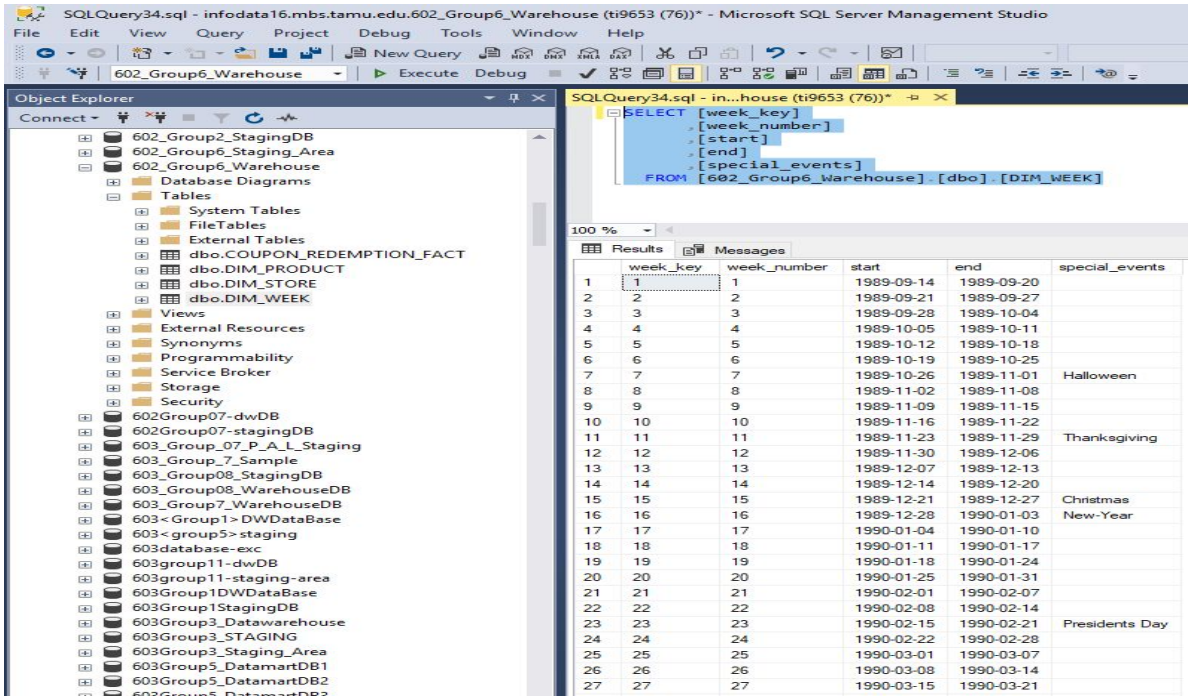
	SALE_ID	STORE_ID	DATE	WEEK	CATEGORY	CUSTOMER_COUNT	SALES_AMOUNT
1	1	68	1992-07-12	148	BAKCOUP	2670	0
2	3	68	1992-07-12	148	FROZCOUP	2670	0
3	5	68	1992-07-13	148	BAKCOUP	2336	0
4	7	68	1992-07-13	148	FROZCOUP	2336	0
5	9	68	1992-07-14	148	BAKCOUP	2378	0
6	11	68	1992-07-14	148	FROZCOUP	2378	0
7	13	68	1992-07-15	148	BAKCOUP	2539	0
8	15	68	1992-07-15	148	FROZCOUP	2539	0
9	17	68	1992-07-16	149	BAKCOUP	2487	0
10	19	68	1992-07-16	149	FROZCOUP	2487	0
11	21	68	1992-07-17	149	BAKCOUP	2554	0
12	23	68	1992-07-17	149	FROZCOUP	2554	0
13	25	68	1992-07-18	149	BAKCOUP	2722	0
14	27	68	1992-07-18	149	FROZCOUP	2722	0
15	29	68	1992-07-19	149	BAKCOUP	2713	0
16	31	68	1992-07-19	149	FROZCOUP	2713	0
17	33	68	1992-07-20	149	BAKCOUP	2379	0
18	35	68	1992-07-20	149	FROZCOUP	2379	0
19	37	68	1992-07-21	149	BAKCOUP	2466	0
20	39	68	1992-07-21	149	FROZCOUP	2466	0
21	41	68	1992-07-22	149	BAKCOUP	2274	0
22	43	68	1992-07-22	149	FROZCOUP	2274	0
23	45	68	1992-07-23	150	BAKCOUP	2802	0
24	47	68	1992-07-23	150	FROZCOUP	2802	0

DIM_STORE



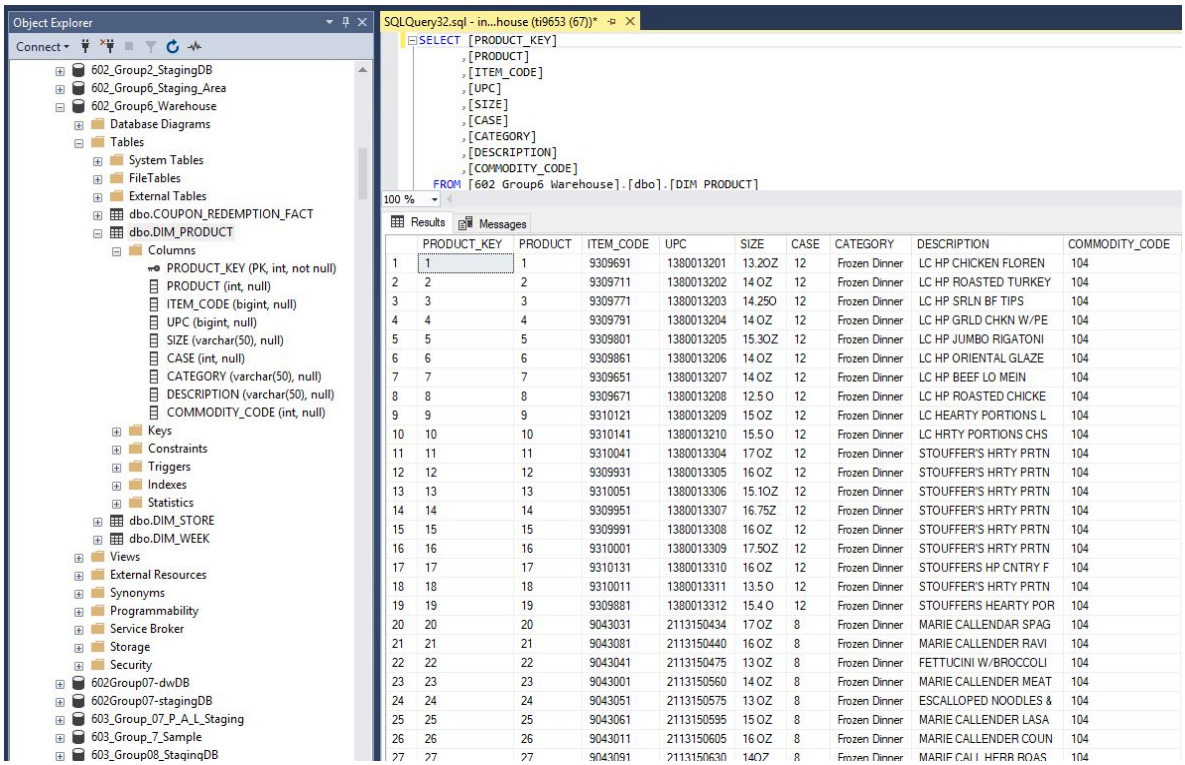
	STORE_KEY	STORE_ID	PRICE_TIER	ADDRESS	CITY	ZONE	ZIP_CODE
1	1	2	High	7501 W. North Ave.	River Forest	1	60305
2	2	4	Medium	Closed	Park Ridge	2	60068
3	3	5	Medium	223 Northwest HWY.	Palatine	2	60067
4	4	8	Low	8700 S. Cicero Ave.	Oak Lawn	5	60435
5	5	9	Medium	6931 Dempster	Morton Grove	2	60053
6	6	12	High	6009 N. Broadway Ave.	Chicago	7	60660
7	7	14	High	1020 Waukegan Rd.	Glenview	1	60025
8	8	18	Low	8355 W. Belmont Ave.	River Grove	5	60171
9	9	19	None	Closed	Glen Ellyn	None	60137
10	10	21	CubFighter	1440 Irving Park Rd.	Hanover Park	6	60103
11	11	25	None	Closed	Chicago	None	60639
12	12	28	Medium	1145-55 Mt Prospect Pz.	Mt. Prospect	2	60054
13	13	32	High	1900 S. Cumberland Ave.	Park Ridge	1	60068
14	14	33	High	3012 N. Broadway Ave.	Chicago	7	60657
15	15	39	None	Closed	Waukegan	None	60085
16	16	40	CubFighter	8825 S. Harlem	Bridgeview	6	60455
17	17	44	Medium	14 Garden Market	Western Spring	2	60558
18	18	45	Medium	550 W. Dundee Rd.	Wheeling	2	60090
19	19	46	Low	Closed	Carol Stream	5	60187
20	20	47	Medium	545 W. Lake St.	Addison	2	60101
21	21	48	Medium	20 E. Golf Rd.	Schaumburg	2	60193
22	22	49	Medium	120 E. Ogden Ave.	Downers Grove	2	60515
23	23	50	Medium	8631 W. 95th St.	Hickory Hills	2	60457
24	24	51	Medium	6401 W. 127th St.	Palos Heights	3	60463
25	25	52	High	4125 Dundee Rd.	Northbrook	1	60062
26	26	53	High	3145 W. Pratt Ave.	Chicago	7	60662
27	27	54	Medium	1295 E. Ogden Ave.	Naperville	2	60540

DIM_WEEK



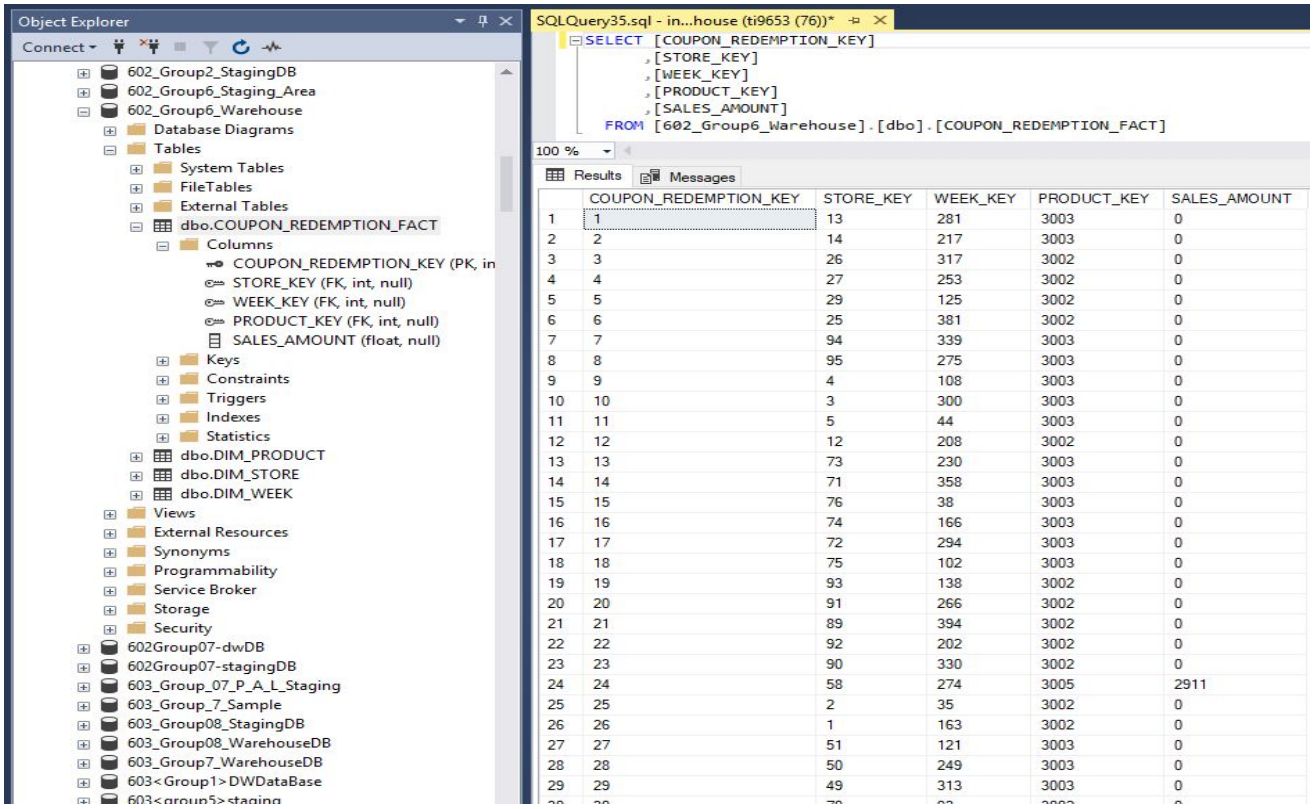
	week_key	week_number	start	end	special_events
1	1	1	1989-09-14	1989-09-20	
2	2	2	1989-09-21	1989-09-27	
3	3	3	1989-09-28	1989-10-04	
4	4	4	1989-10-05	1989-10-11	
5	5	5	1989-10-12	1989-10-18	
6	6	6	1989-10-19	1989-10-25	
7	7	7	1989-10-26	1989-11-01	Halloween
8	8	8	1989-11-02	1989-11-08	
9	9	9	1989-11-09	1989-11-15	
10	10	10	1989-11-16	1989-11-22	
11	11	11	1989-11-23	1989-11-29	Thanksgiving
12	12	12	1989-11-30	1989-12-06	
13	13	13	1989-12-07	1989-12-13	
14	14	14	1989-12-14	1989-12-20	
15	15	15	1989-12-21	1989-12-27	Christmas
16	16	16	1989-12-28	1990-01-03	New-Year
17	17	17	1990-01-04	1990-01-10	
18	18	18	1990-01-11	1990-01-17	
19	19	19	1990-01-18	1990-01-24	
20	20	20	1990-01-25	1990-01-31	
21	21	21	1990-02-01	1990-02-07	
22	22	22	1990-02-08	1990-02-14	
23	23	23	1990-02-15	1990-02-21	Presidents Day
24	24	24	1990-02-22	1990-02-28	
25	25	25	1990-03-01	1990-03-07	
26	26	26	1990-03-08	1990-03-14	
27	27	27	1990-03-15	1990-03-21	

DIM_PRODUCT



	PRODUCT_KEY	PRODUCT	ITEM_CODE	UPC	SIZE	CASE	CATEGORY	DESCRIPTION	COMMODITY_CODE
1	1	1	9309691	1380013201	13.2OZ	12	Frozen Dinner	LC HP CHICKEN FLOREN	104
2	2	2	9309711	1380013202	14 OZ	12	Frozen Dinner	LC HP ROASTED TURKEY	104
3	3	3	9309771	1380013203	14.25O	12	Frozen Dinner	LC HP SRLN BF TIPS	104
4	4	4	9309791	1380013204	14 OZ	12	Frozen Dinner	LC HP GRLD CHKN W/PE	104
5	5	5	9309801	1380013205	15.3OZ	12	Frozen Dinner	LC HP JUMBO RIGATONI	104
6	6	6	9309861	1380013206	14 OZ	12	Frozen Dinner	LC HP ORIENTAL GLAZE	104
7	7	7	9309651	1380013207	14 OZ	12	Frozen Dinner	LC HP BEEF LO MEIN	104
8	8	8	9309671	1380013208	12.5 O	12	Frozen Dinner	LC HP ROASTED CHICKE	104
9	9	9	9310121	1380013209	15 OZ	12	Frozen Dinner	LC HEARTY PORTIONS L	104
10	10	10	9310141	1380013210	15.5 O	12	Frozen Dinner	LC HRTY PORTIONS CHS	104
11	11	11	9310041	1380013304	17 OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
12	12	12	9309931	1380013305	16 OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
13	13	13	9310051	1380013306	15.1OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
14	14	14	9309951	1380013307	16.75Z	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
15	15	15	9309991	1380013308	16 OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
16	16	16	9310001	1380013309	17.5OZ	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
17	17	17	9310131	1380013310	16 OZ	12	Frozen Dinner	STOUFFERS HP CNTRY F	104
18	18	18	9310011	1380013311	13.5 O	12	Frozen Dinner	STOUFFER'S HRTY PRTN	104
19	19	19	9309881	1380013312	15.4 O	12	Frozen Dinner	STOUFFERS HEARTY POR	104
20	20	20	9043031	2113150434	17 OZ	8	Frozen Dinner	MARIE CALLENDAR SPAG	104
21	21	21	9043081	2113150440	16 OZ	8	Frozen Dinner	MARIE CALLENDER RAVI	104
22	22	22	9043041	2113150475	13 OZ	8	Frozen Dinner	FETTUCINI W/BROCCOLI	104
23	23	23	9043001	2113150560	14 OZ	8	Frozen Dinner	MARIE CALLENDER MEAT	104
24	24	24	9043051	2113150575	13 OZ	8	Frozen Dinner	ESCALLOPED NOODLES &	104
25	25	25	9043061	2113150595	15 OZ	8	Frozen Dinner	MARIE CALLENDER LASA	104
26	26	26	9043011	2113150605	16 OZ	8	Frozen Dinner	MARIE CALLENDER COUN	104
27	27	27	9043091	2113150630	14OZ	8	Frozen Dinner	MARIE CALL HERB ROAS	104

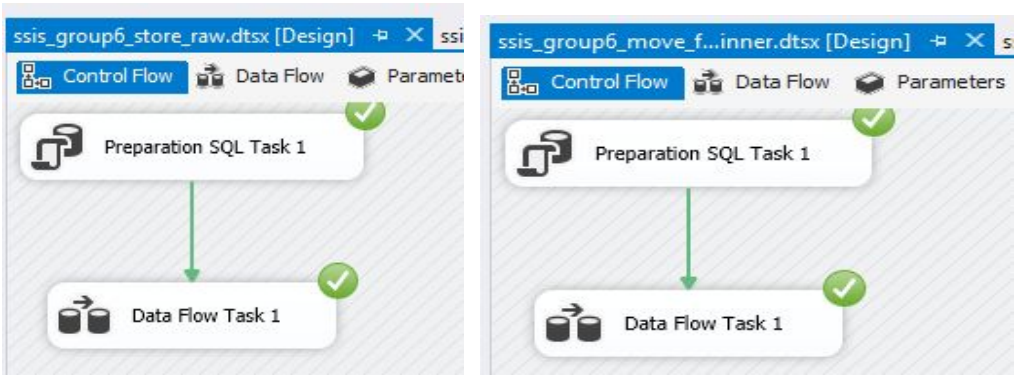
COUPON_REDEMPTION_FACT

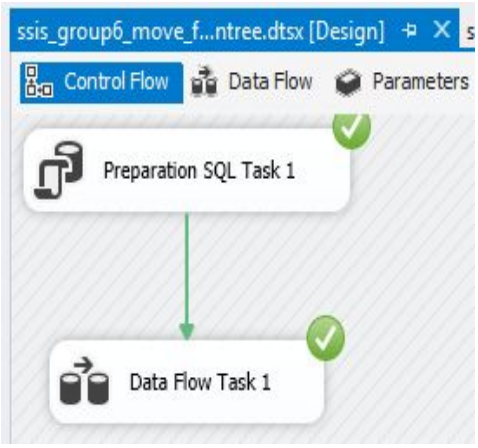


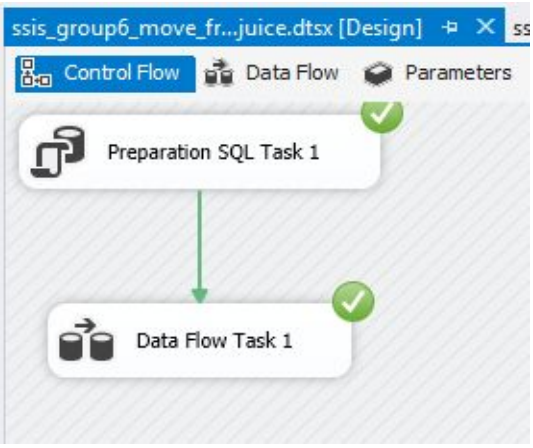
	COUPON_REDEMPTION_KEY	STORE_KEY	WEEK_KEY	PRODUCT_KEY	SALES_AMOUNT
1	1	13	281	3003	0
2	2	14	217	3003	0
3	3	26	317	3002	0
4	4	27	253	3002	0
5	5	29	125	3002	0
6	6	25	381	3002	0
7	7	94	339	3003	0
8	8	95	275	3003	0
9	9	4	108	3003	0
10	10	3	300	3003	0
11	11	5	44	3003	0
12	12	12	208	3002	0
13	13	73	230	3003	0
14	14	71	358	3003	0
15	15	76	38	3003	0
16	16	74	166	3003	0
17	17	72	294	3003	0
18	18	75	102	3003	0
19	19	93	138	3002	0
20	20	91	266	3002	0
21	21	89	394	3002	0
22	22	92	202	3002	0
23	23	90	330	3002	0
24	24	58	274	3005	2911
25	25	2	35	3002	0
26	26	1	163	3002	0
27	27	51	121	3003	0
28	28	50	249	3003	0
29	29	49	313	3003	0

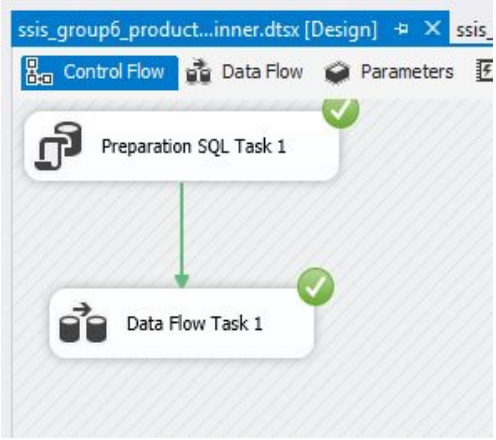
4.8 Procedures for all data extractions and loadings

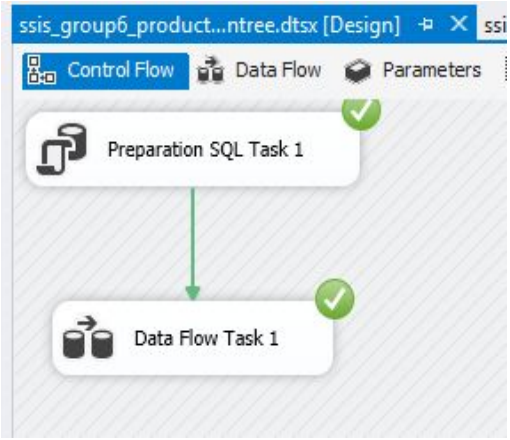
The sources for this project are the csv files given which are UPC, Movement, CCount, Demographics. Additionally, we have data for Store and Date dimension. The data extractions and load are shown in the SSIS package execution below.

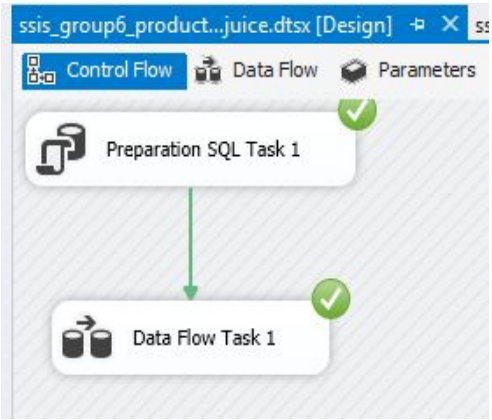


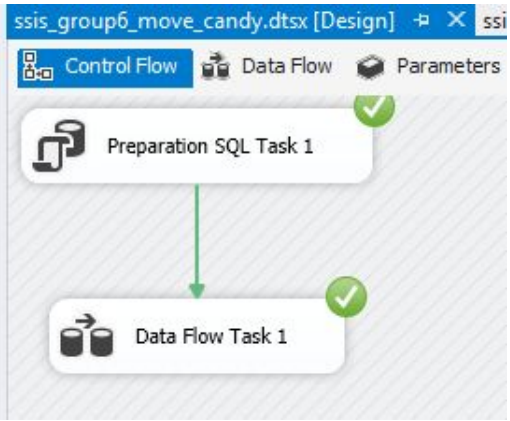

ssis_group6_move_f...ntree.dtsx [Design]
Control Flow
Data Flow
Parameters
Preparation SQL Task 1
Data Flow Task 1

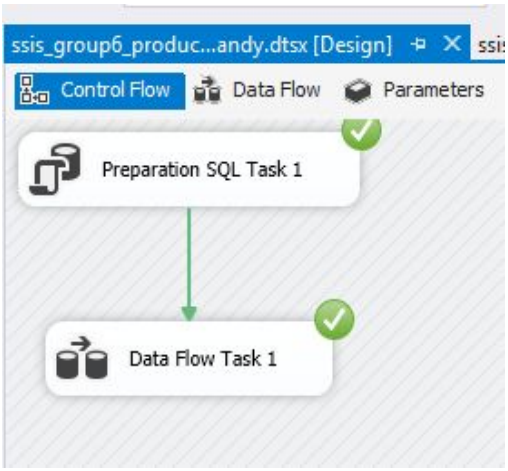

ssis_group6_move_fr...juice.dtsx [Design]
Control Flow
Data Flow
Parameters
Preparation SQL Task 1
Data Flow Task 1

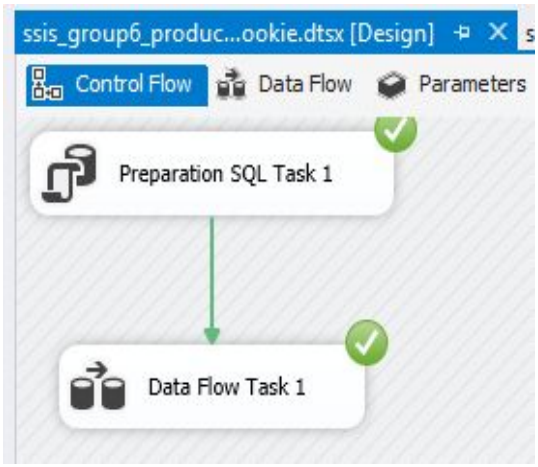

ssis_group6_product...inner.dtsx [Design]
Control Flow
Data Flow
Parameters
Preparation SQL Task 1
Data Flow Task 1

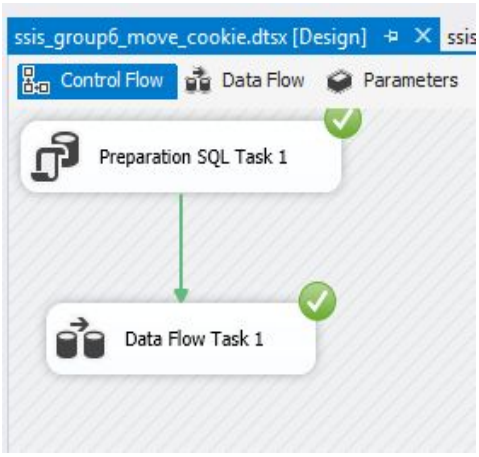

ssis_group6_product...ntree.dtsx [Design]
Control Flow
Data Flow
Parameters
Preparation SQL Task 1
Data Flow Task 1

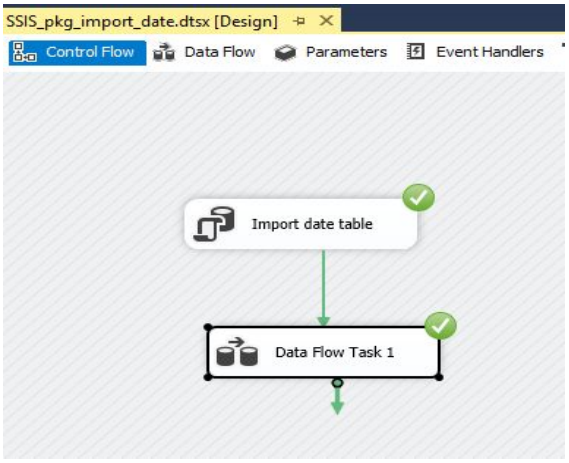

ssis_group6_product...juice.dtsx [Design]
Control Flow
Data Flow
Parameters
Preparation SQL Task 1
Data Flow Task 1


ssis_group6_move_candy.dtsx [Design]
Control Flow
Data Flow
Parameters
Preparation SQL Task 1
Data Flow Task 1





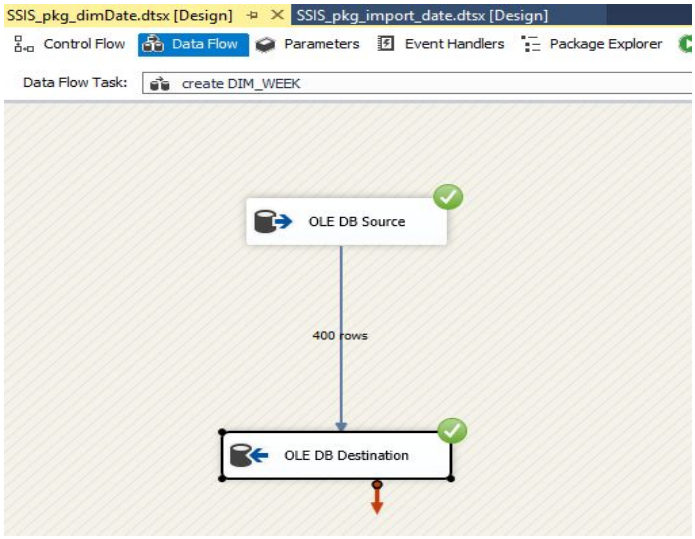




4.9 ETL for dimension tables

4.9.1 DIM_WEEK

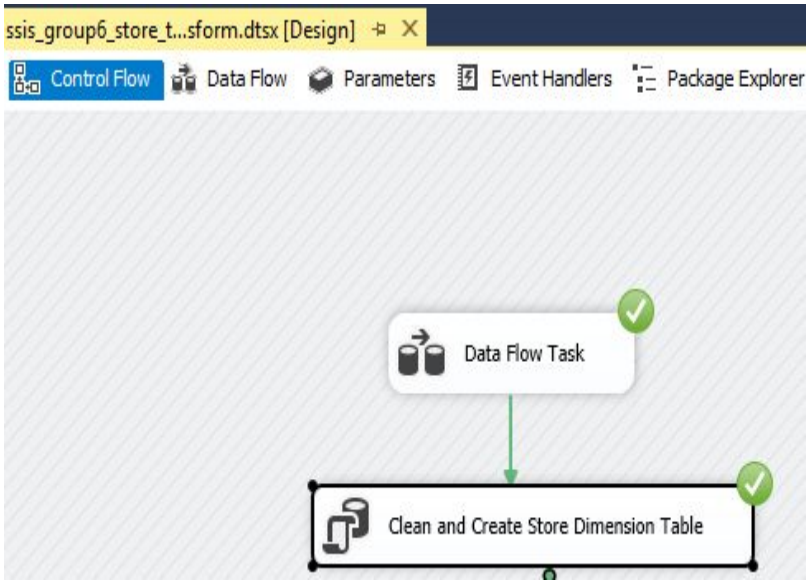
The week dimension is simply created from the WeekTable in the staging area.




```
CREATE TABLE [DIM_WEEK]
 (
   [WeekNumber] int,
   [Start] date,
   [End] date,
   [Special Events] varchar(50)
)

INSERT INTO DIM_STORE(STORE_ID ,PRICE_TIER ,ADDRESS ,CITY ,ZONE ,ZIP_CODE )
SELECT [Store],[Price Tier], [Address],[City], [Zone],
[Zip Code]
FROM STORE

INSERT INTO DIM_WEEK
SELECT
WEEK_KEY INT NOT NULL PRIMARY KEY IDENTITY (1,1),
[WeekNumber],
   [Start],
   [End],
   [Special Events]
FROM WEEKTABLE
```

4.9.2 DIM_STORE

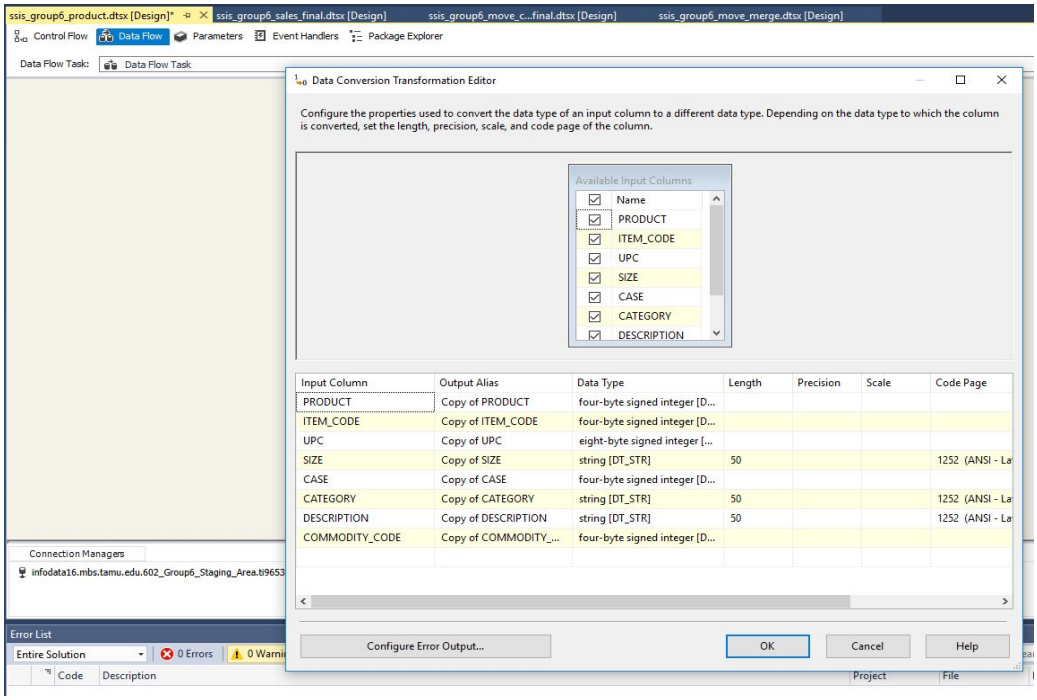
The store dimension is created from the table loaded ‘Store’ into the staging area. Transformations were applied to it before creating the dimension as mentioned in the transformation and cleaning phase above.

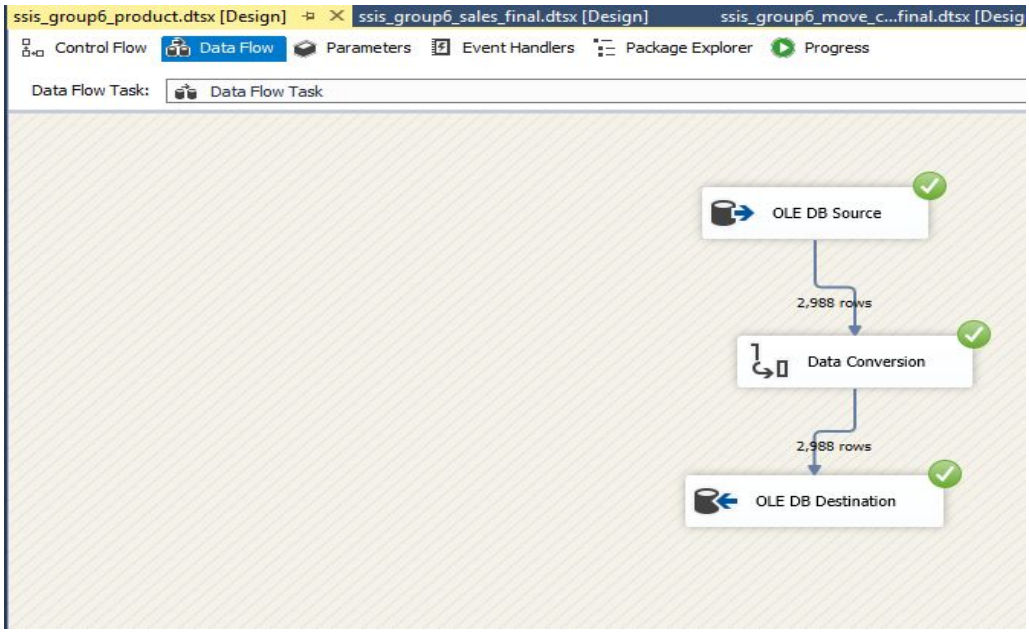



```
UPDATE [STORE]
SET [Price Tier]='None'
WHERE [Price Tier] IS NULL OR [Price Tier] ='';

UPDATE [STORE]
SET [Zone]='None'
WHERE [Zone] IS NULL OR [Zone] ='';

CREATE TABLE DIM_STORE
(
STORE_KEY INT NOT NULL PRIMARY KEY IDENTITY(1,1),
STORE_ID INT NOT NULL,
PRICE_TIER VARCHAR(10) NOT NULL,
ADDRESS  VARCHAR(100) ,
CITY VARCHAR(50) NOT NULL,
ZONE VARCHAR(10) ,
ZIP_CODE VARCHAR(10)

);

INSERT INTO DIM_STORE(STORE_ID ,PRICE_TIER ,ADDRESS ,CITY ,ZONE ,ZIP_CODE )
SELECT [Store],[Price Tier], [Address],[City], [Zone],
[Zip Code]
FROM STORE
```

4.9.3 DIM_PRODUCT

The product dimension is created from the integrated Product table in the staging area. The data types and length of the columns were changed in the SSIS as shown below.






```
CREATE TABLE [DIM_PRODUCT]
(
   [PRODUCT_KEY] int IDENTITY(1,1) PRIMARY KEY,
```

```
    [PRODUCT] int,
    [ITEM_CODE] bigint,
    [UPC] bigint,
    [SIZE] varchar(50),
    [CASE] int,
    [CATEGORY] varchar(50),
    [DESCRIPTION] varchar(50),
    [COMMODITY_CODE] int
)
```

4.10 ETL for fact tables

4.10.1 CUSTOMER_COUNT_FACT TABLE

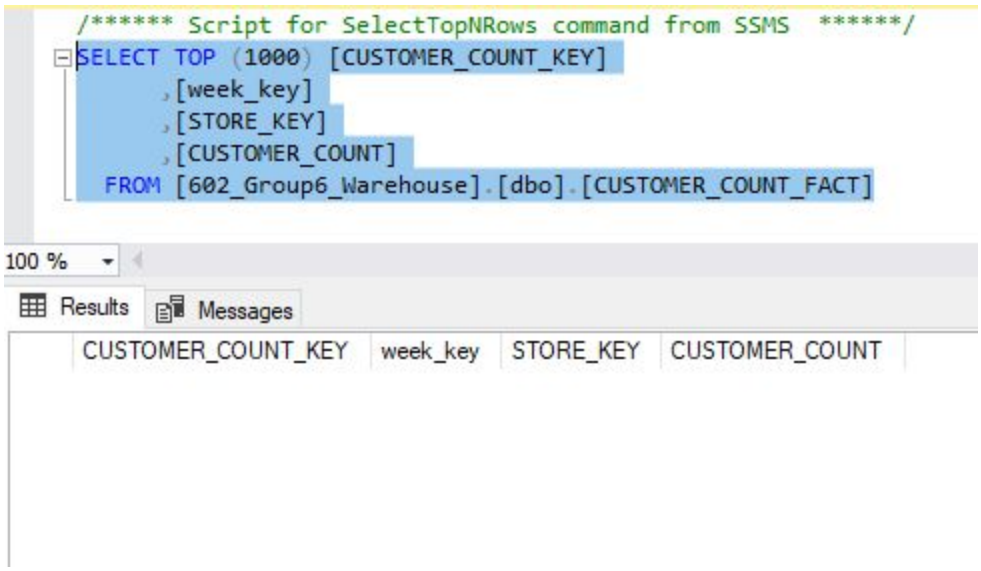
Step 1: Cleaning the required columns by only taking numerical values in table SALES_CCF_TEMP1

```
CREATE TABLE SALES_CCF_TEMP1 (
                        [STORE_ID] VARCHAR(50),
                        [WEEK] VARCHAR(50),
                        [CUSTOMER_COUNT] VARCHAR(50),
                       )

INSERT INTO SALES_CCF_TEMP1
(store_id, [week], customer_count)
SELECT store, [week], CUSTCOUN
FROM [DBO].[CCOUNT]  WHERE [WEEK] NOT LIKE '%[^0-9]%'
            AND [CUSTCOUN] NOT LIKE '%[^0-9]%'
                                                AND STORE   NOT LIKE '%[^0-9]%'
```

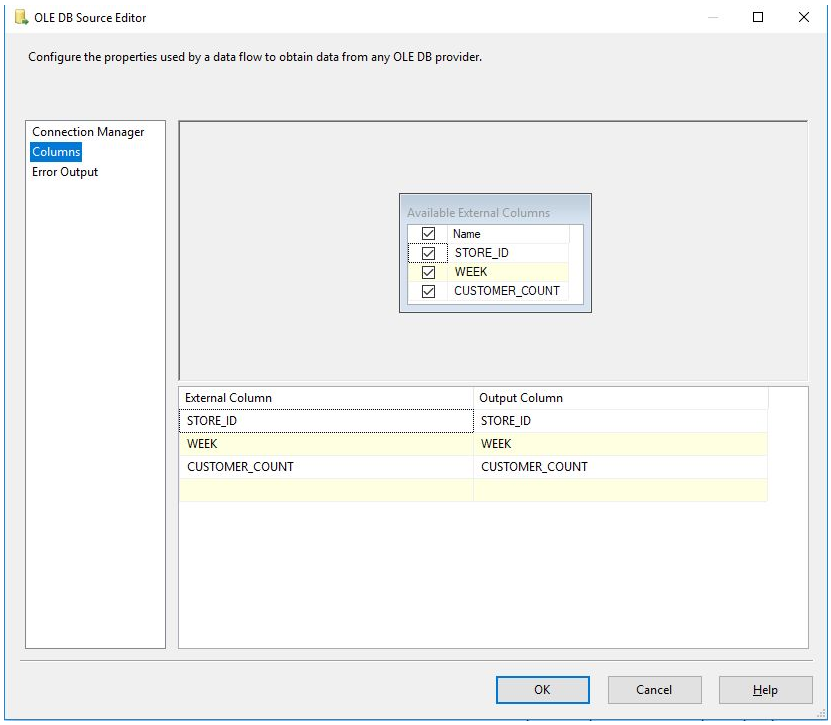
Step 2: Further cleaned table by converting values in integer and removing wrong values in the table SALES_CCF_TEMP2

```
CREATE TABLE SALES_CCF_TEMP2 (
                        [STORE_ID] INT,
                        [WEEK] INT,
                        [CUSTOMER_COUNT] INT,
            )


INSERT INTO SALES_CCF_TEMP2
( store_id, [week], customer_count)
SELECT CAST(store_id AS INT), CAST([week] AS INT), CAST(customer_count AS FLOAT)
FROM [DBO].[SALES_CCF_TEMP1] WHERE cast(STORE_ID as INT) <140
AND STORE_ID IS NOT NULL
AND WEEK IS NOT NULL
AND CUSTOMER_COUNT IS NOT NULL
AND STORE_ID NOT IN ('135','1','0');
```

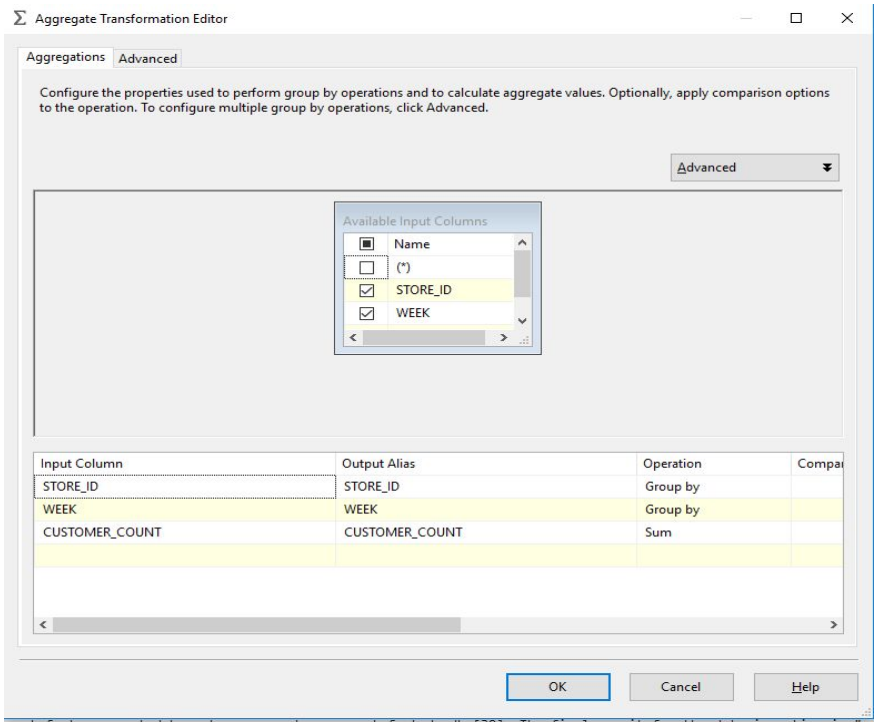
Step 3: Data before running SSIS commands



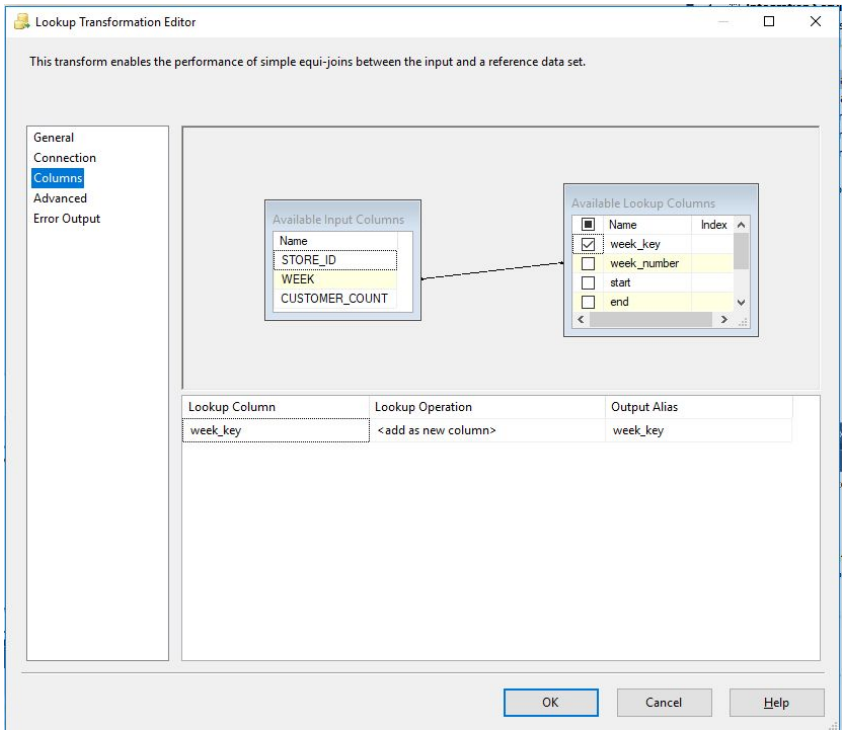
Step 4: Fetching store_id, week and customer count from SALES_CCF_TEMP2 TABLE



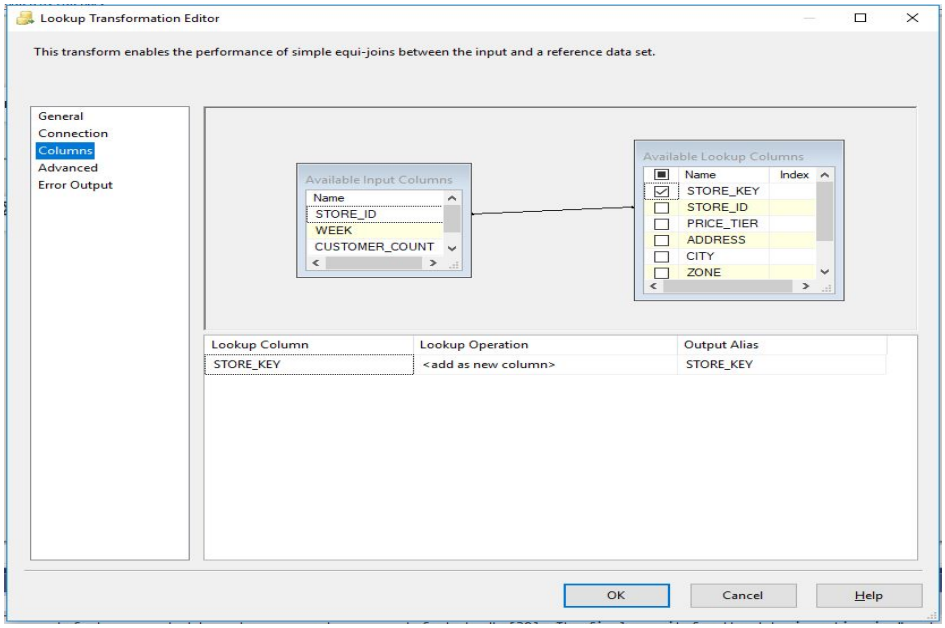
Step 5: Aggregating data on store_id and week and by summing the CUSTOMER_COUNT



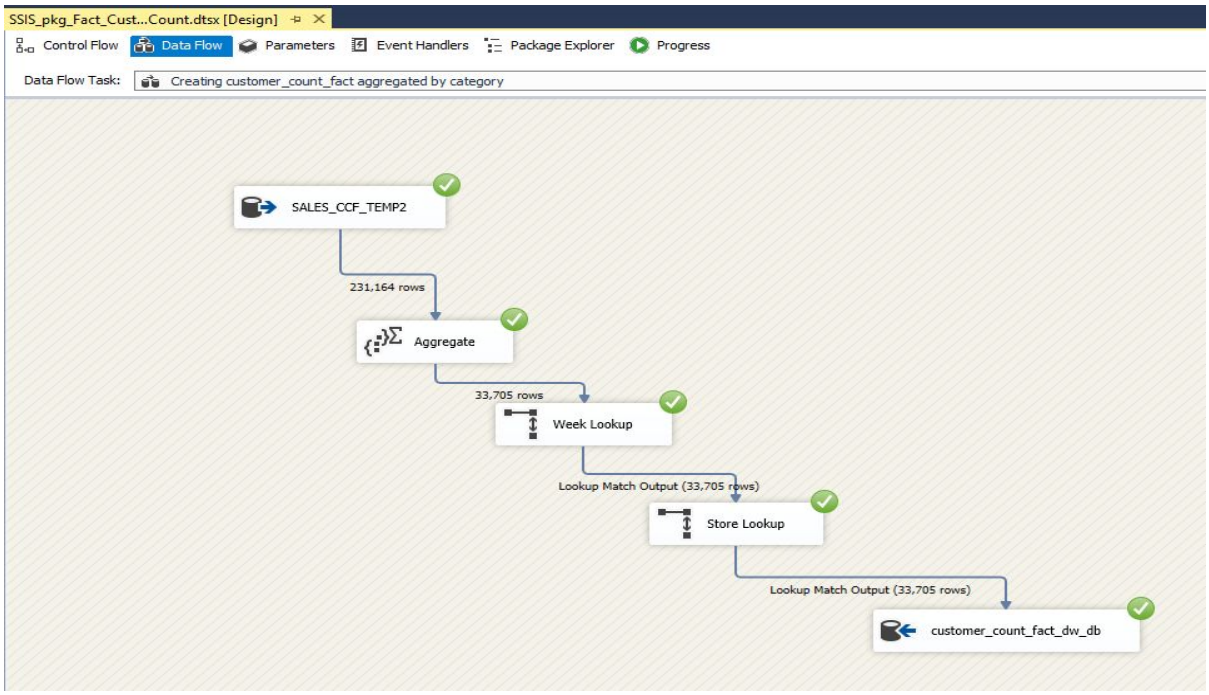
Step 6: Next, performing look up by DIM_WEEK (on week & WEEK_NUMBER) and selecting week_key



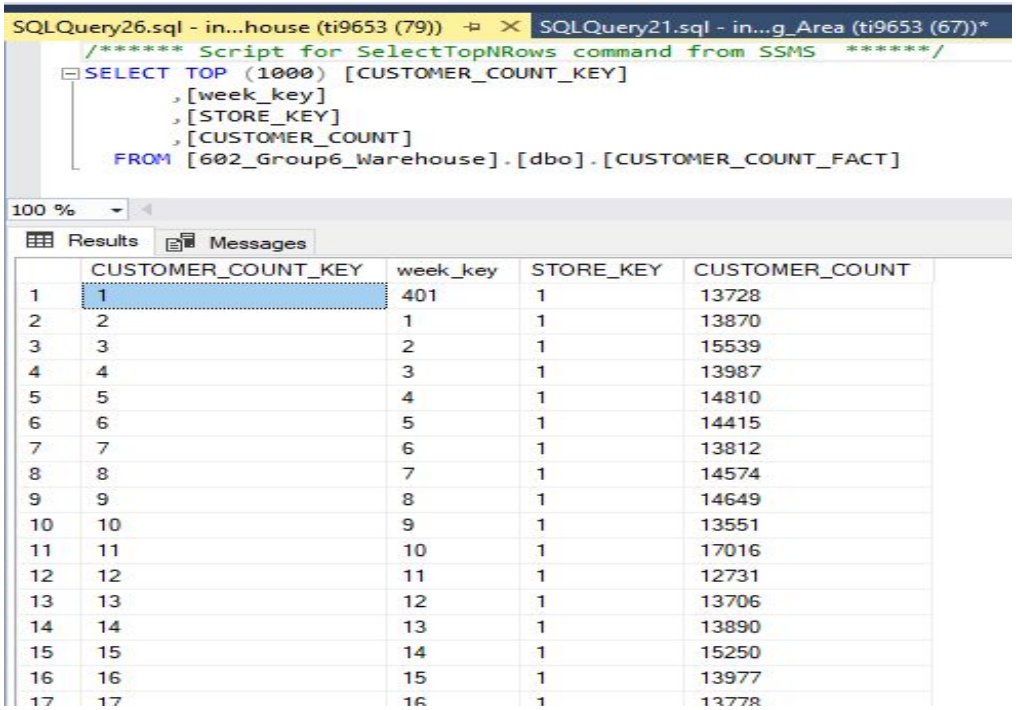
Step 7: Performing look up by DIM_STORE (on store_id and store_id) and selection STORE_KEY



Step 8: Final execution of "creating_customer_count_fact"



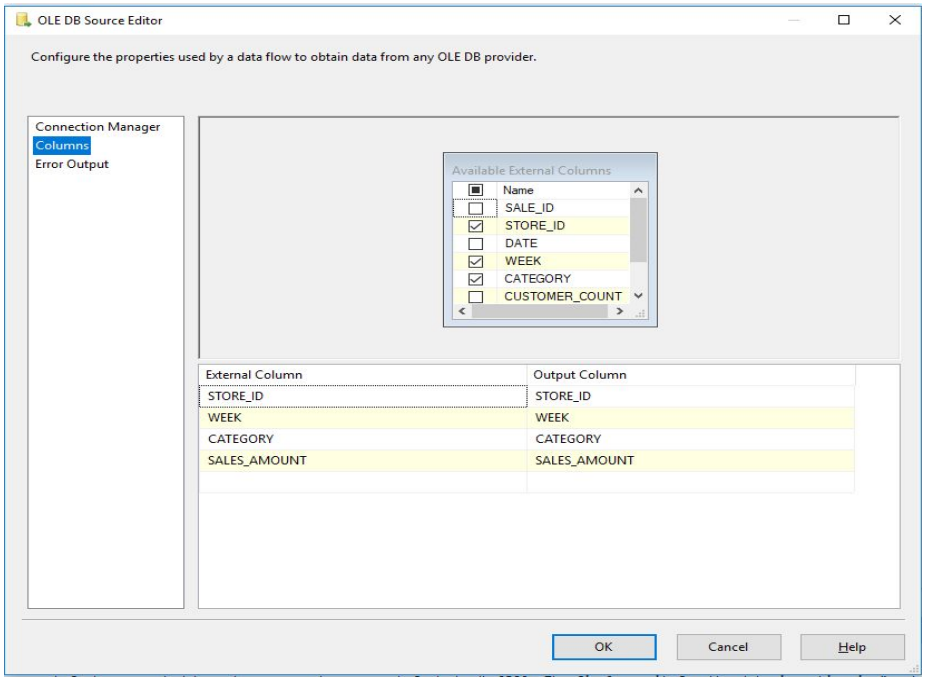
Step 9: Result after running above SSIS



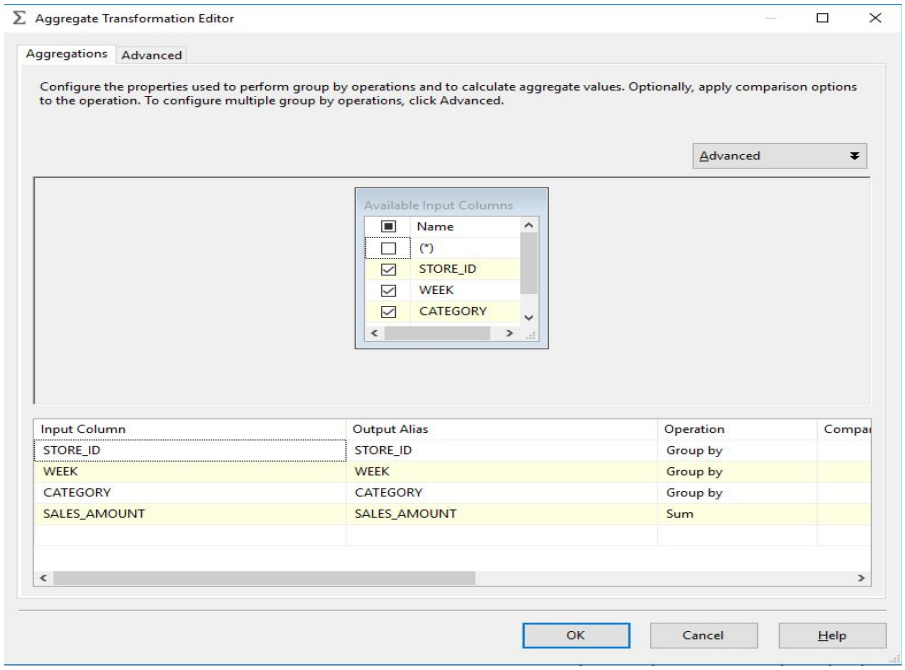
	CUSTOMER_COUNT_KEY	week_key	STORE_KEY	CUSTOMER_COUNT
1	1	401	1	13728
2	2	1	1	13870
3	3	2	1	15539
4	4	3	1	13987
5	5	4	1	14810
6	6	5	1	14415
7	7	6	1	13812
8	8	7	1	14574
9	9	8	1	14649
10	10	9	1	13551
11	11	10	1	17016
12	12	11	1	12731
13	13	12	1	13706
14	14	13	1	13890
15	15	14	1	15250
16	16	15	1	13977
17	17	16	1	13778

4.10.2 COUPONS_REDEMPTION_FACT

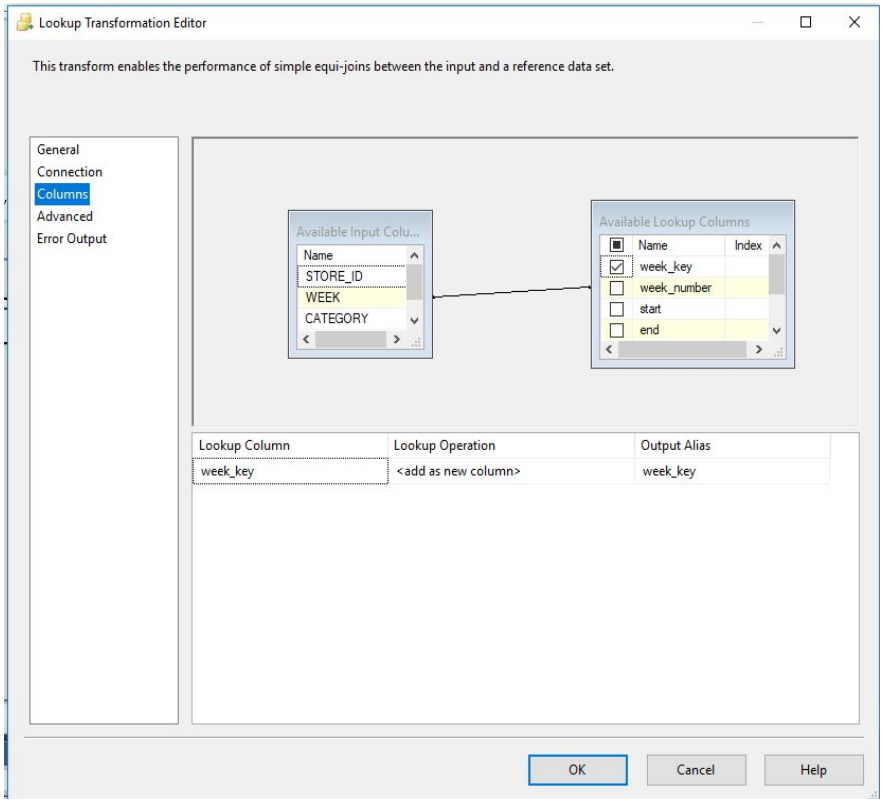
Step 1: Take source as SALES_FINAL (defined earlier how SALES_FINAL was formed) and selecting STORE_ID, WEEK, CATEGORY, SALES_AMOUNT



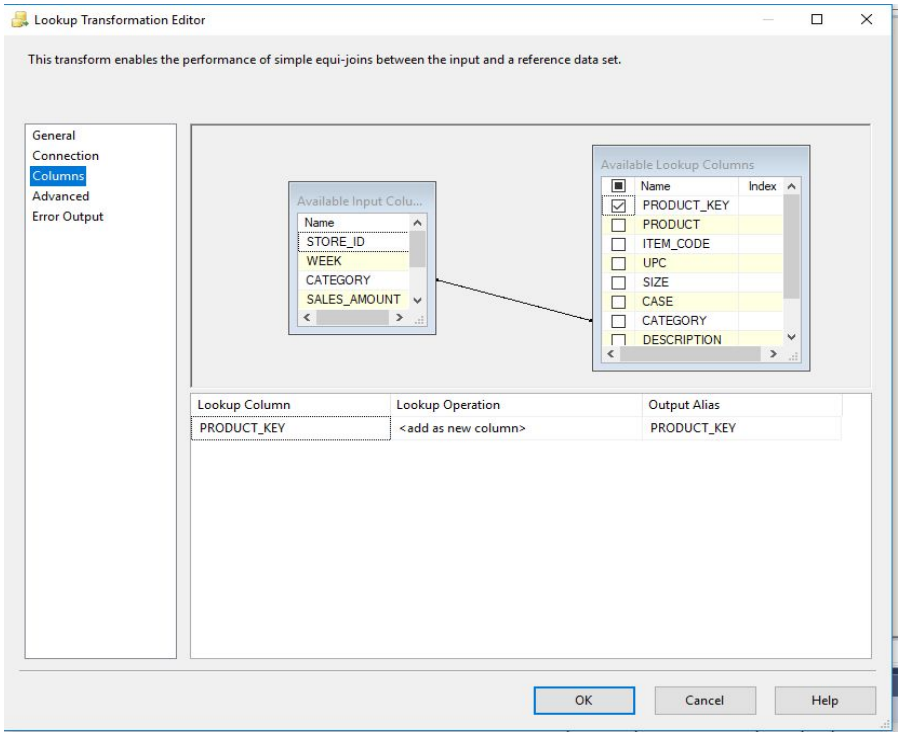
Step 2: Grouping by columns by store and week and category and by summing SALES_AMOUNT



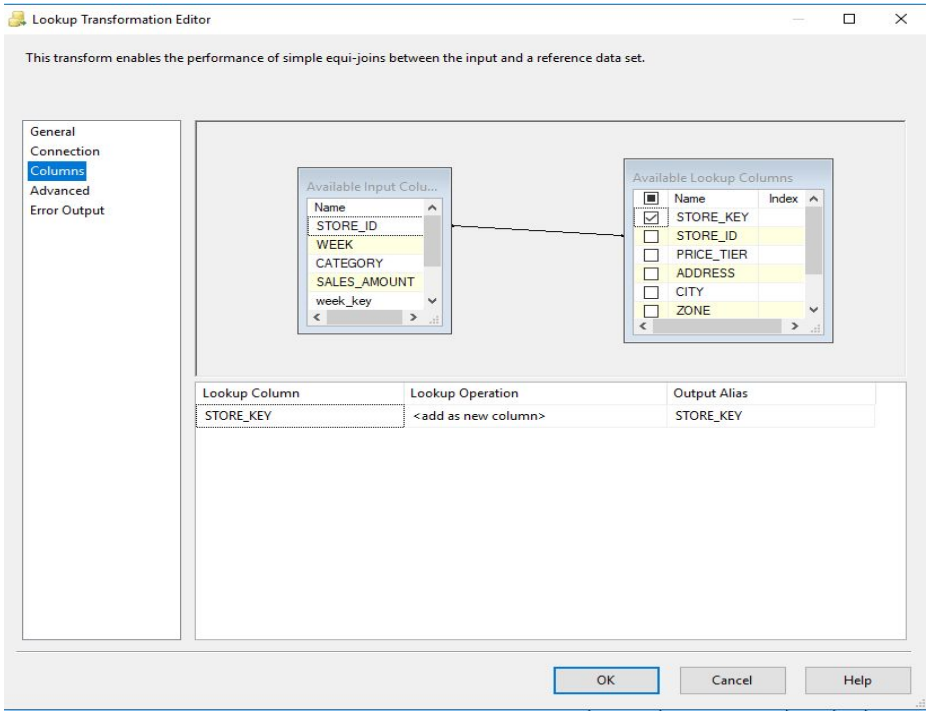
Step 3: Looking up by DIM_WEEK



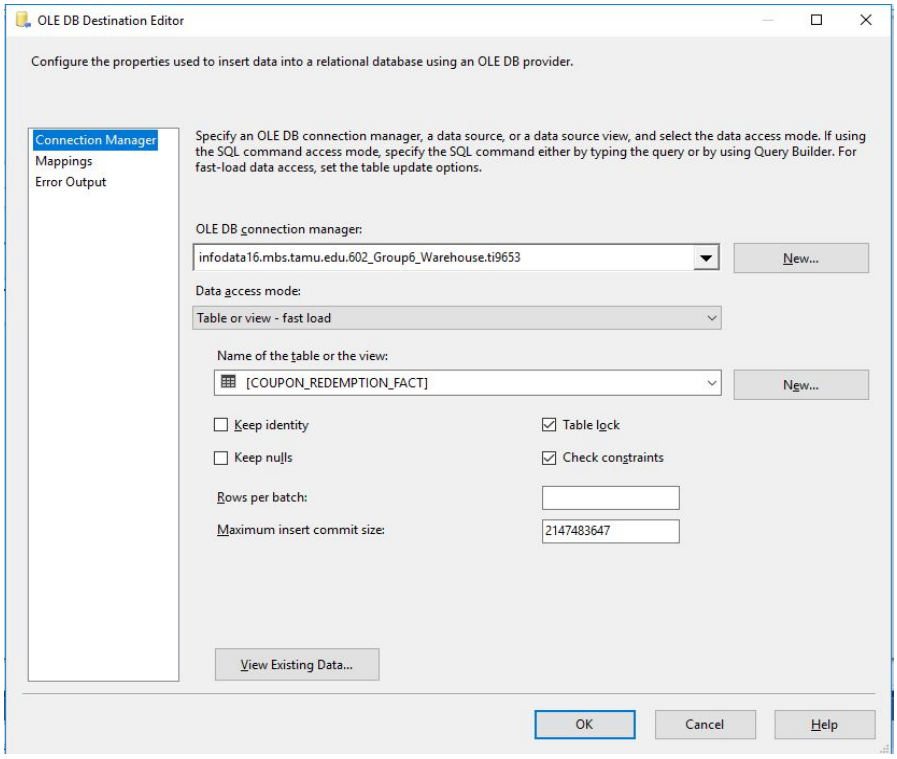
Step 4: Looking up by DIM_PRODUCT

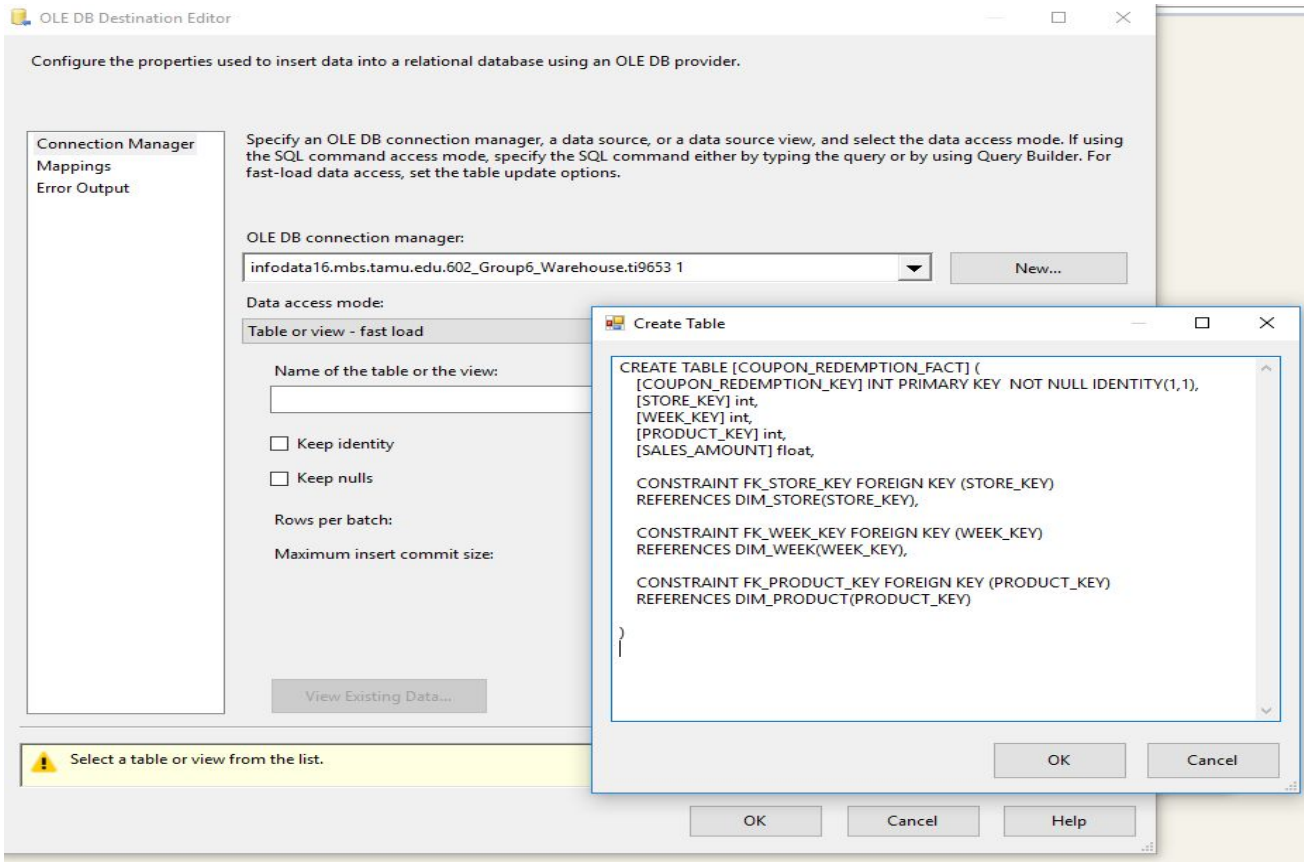


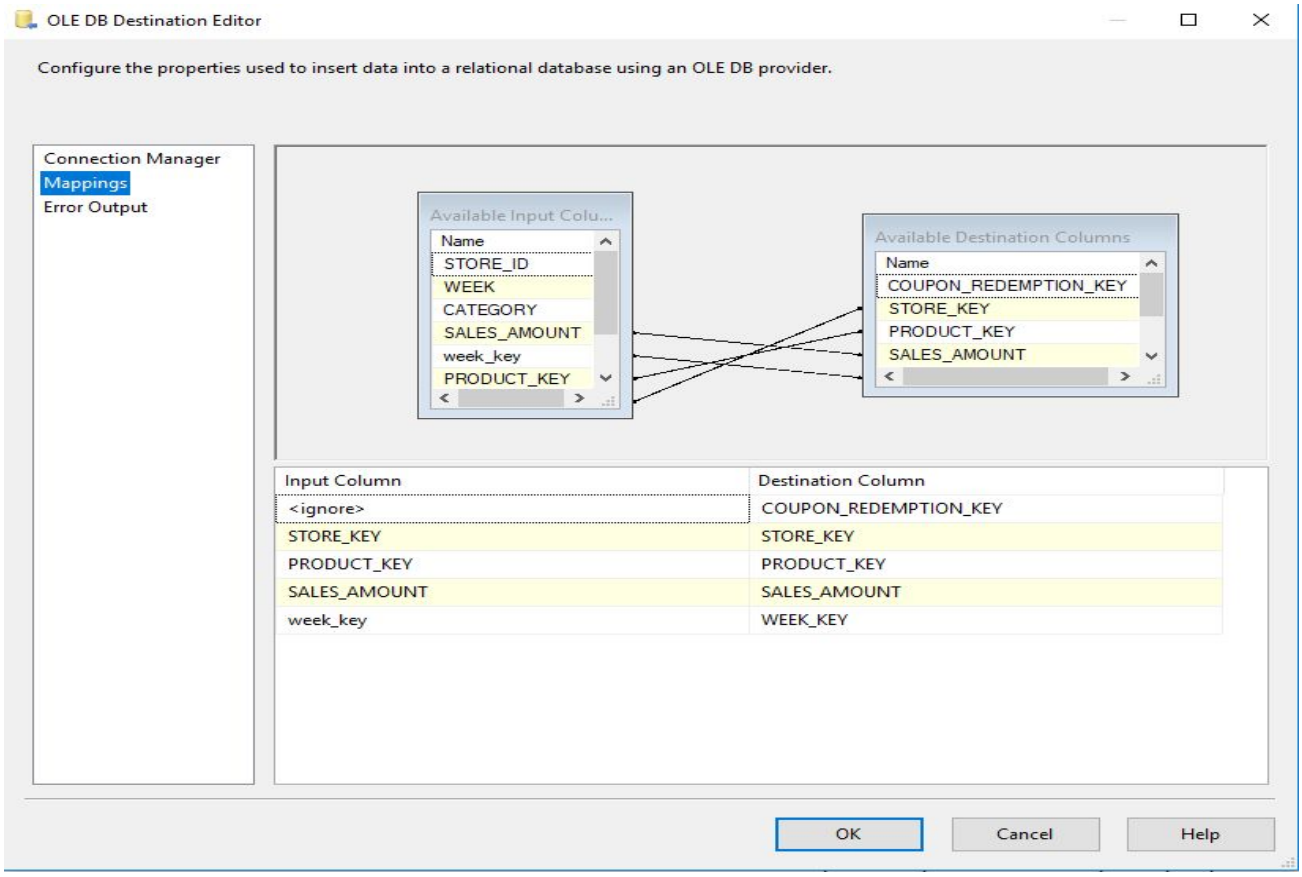
Step 5: Looking up by DIM_STORE



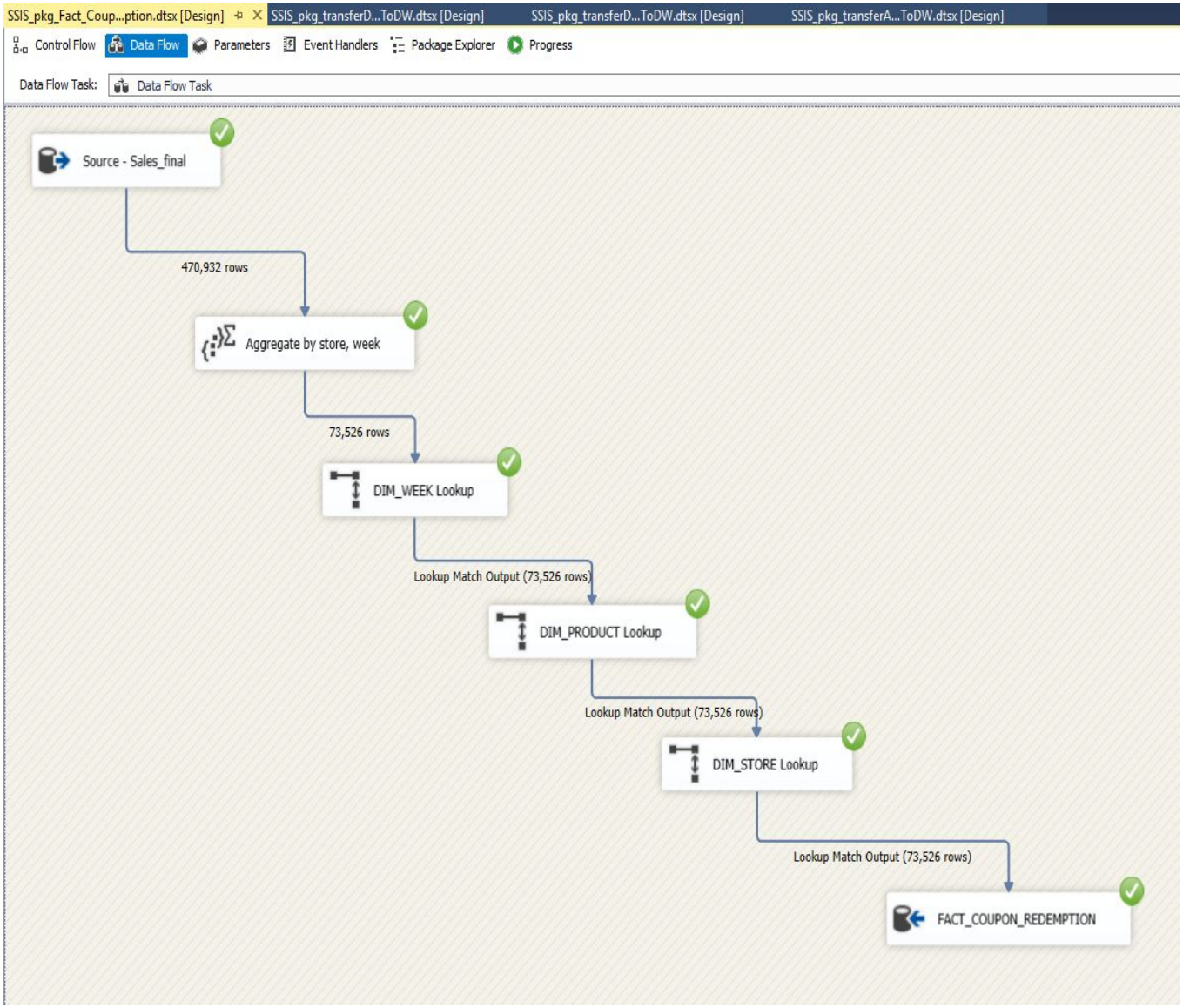
Step 6: Storing data in fact table in Data warehouse with name COUPOUN_REDEMPTION_FACT


OLE DB Destination Editor
Configure the properties used to insert data into a relational database using an OLE DB provider.
Connection Manager
Mappings
Error Output
Specify an OLE DB connection manager, a data source, or a data source view, and select the data access mode. If using the SQL command access mode, specify the SQL command either by typing the query or by using Query Builder. For fast-load data access, set the table update options.
OLE DB connection manager:
infodata16.mbs.tamu.edu.602_Group6_Warehouse.ti9653
New...
Data access mode:
Table or view - fast load
Name of the table or the view:
[COUPON_REDEMPTION_FACT]
New...
Keep identity
Table lock
Keep nulls
Check constraints
Rows per batch:
Maximum insert commit size:
2147483647
View Existing Data...
OK
Cancel
Help


OLE DB Destination Editor
Configure the properties used to insert data into a relational database using an OLE DB provider.
Connection Manager
Mappings
Error Output
Specify an OLE DB connection manager, a data source, or a data source view, and select the data access mode. If using the SQL command access mode, specify the SQL command either by typing the query or by using Query Builder. For fast-load data access, set the table update options.
OLE DB connection manager:
infodata16.mbs.tamu.edu.602_Group6_Warehouse.ti9653 1
New...
Data access mode:
Table or view - fast load
Name of the table or the view:
Keep identity
Keep nulls
Rows per batch:
Maximum insert commit size:
View Existing Data...
Select a table or view from the list.
OK
Cancel
Help
Create Table
CREATE TABLE [COUPON_REDEMPTION_FACT] (
[COUPON_REDEMPTION_KEY] INT PRIMARY KEY NOT NULL IDENTITY(1,1),
[STORE_KEY] int,
[WEEK_KEY] int,
[PRODUCT_KEY] int,
[SALES_AMOUNT] float,
CONSTRAINT FK_STORE_KEY FOREIGN KEY (STORE_KEY)
REFERENCES DIM_STORE(STORE_KEY),
CONSTRAINT FK_WEEK_KEY FOREIGN KEY (WEEK_KEY)
REFERENCES DIM_WEEK(WEEK_KEY),
CONSTRAINT FK_PRODUCT_KEY FOREIGN KEY (PRODUCT_KEY)
REFERENCES DIM_PRODUCT(PRODUCT_KEY)
)
OK
Cancel



Step 7: Running the SSIS



Step 8: Table after running SSIS

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [COUPON_REDEMPTION_KEY]
      ,[STORE_KEY]
      ,[WEEK_KEY]
      ,[PRODUCT_KEY]
      ,[SALES_AMOUNT]
  FROM [602_Group6_Warehouse].[dbo].[COUPON_REDEMPTION_FACT]
```

100 %

Results | Messages

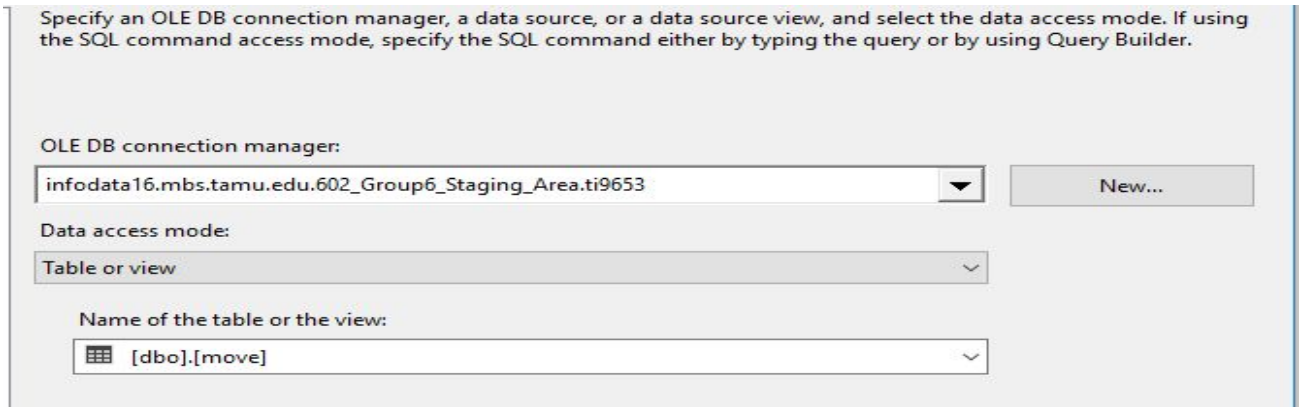
	COUPON_REDEMPTION_KEY	STORE_KEY	WEEK_KEY	PRODUCT_KEY	SALES_AMOUNT
1	1	13	281	3003	0
2	2	14	217	3003	0
3	3	26	317	3002	0
4	4	27	253	3002	0
5	5	29	125	3002	0
6	6	25	381	3002	0
7	7	94	339	3003	0
8	8	95	275	3003	0
9	9	4	108	3003	0
10	10	3	300	3003	0
11	11	5	44	3003	0
12	12	12	208	3002	0
13	13	73	230	3003	0
14	14	71	358	3003	0
15	15	76	38	3003	0
16	16	74	166	3003	0

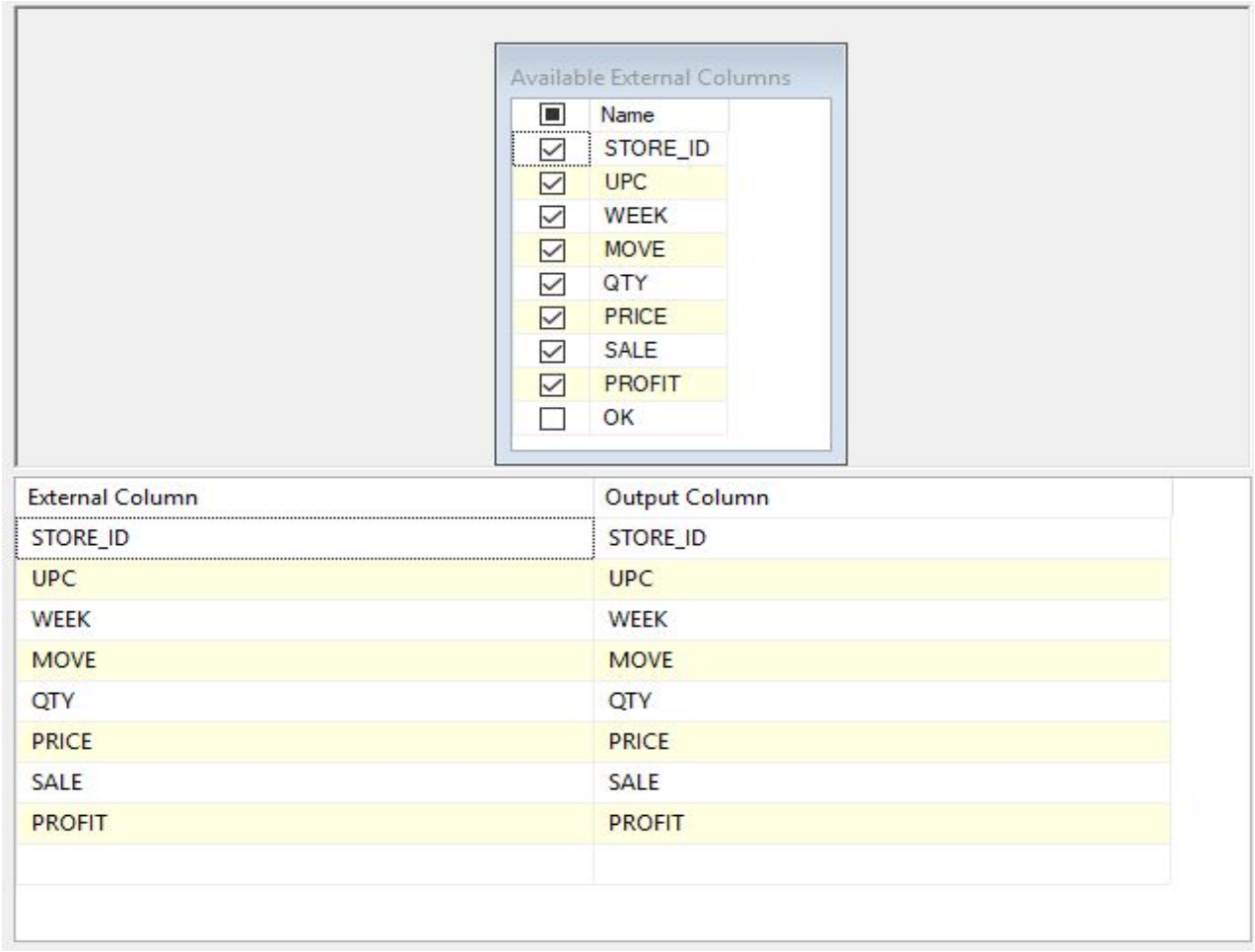
NOTE: Since data is taken from CCOUNT which has only category not product (based on UPC) we created some product keys with these categories to maintain referential integrity

```
INSERT INTO DIM_PRODUCT (PRODUCT, CATEGORY)
VALUES (3000, 'BAKCOUP'),
VALUES (3000, 'FROZCOUP'),
VALUES (3000, 'BAKERY'),
VALUES (3000, 'FROZEN');
```

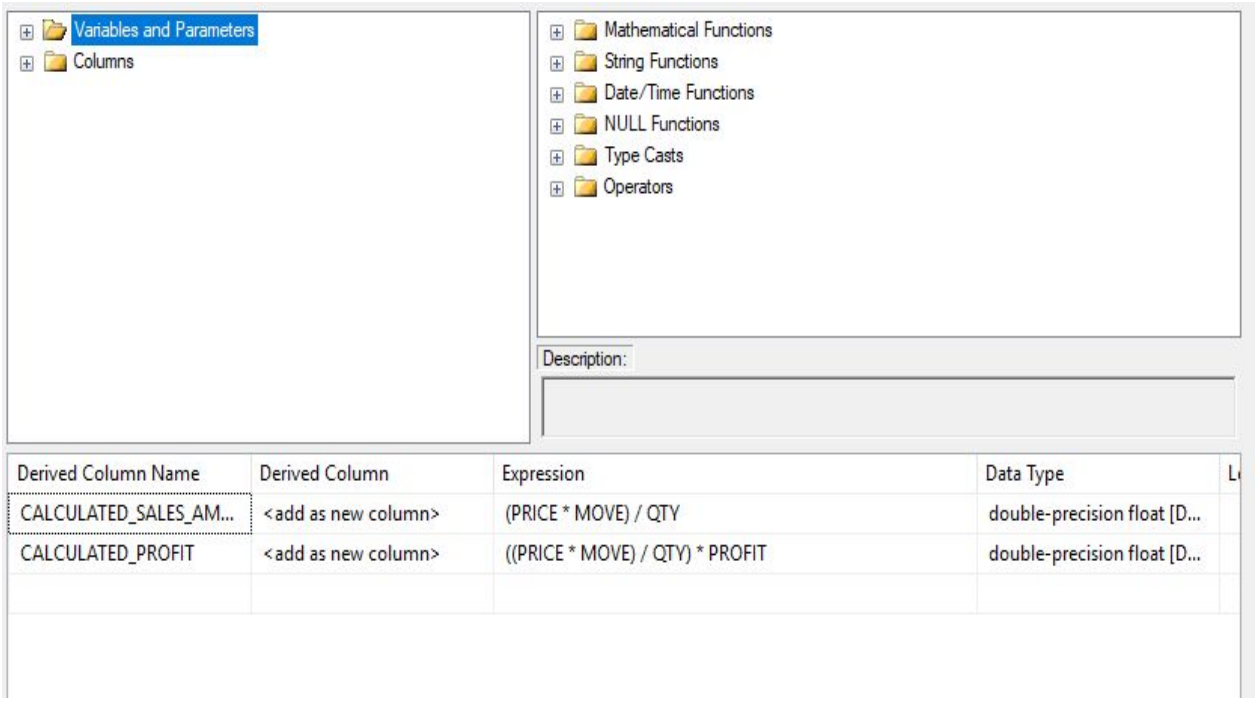
4.10.3 Creating SALES_MOVE_FACT

Step 1: Creating OLE source to fetch data from [DBO].[MOVE] (MOVE discussed in transformation)

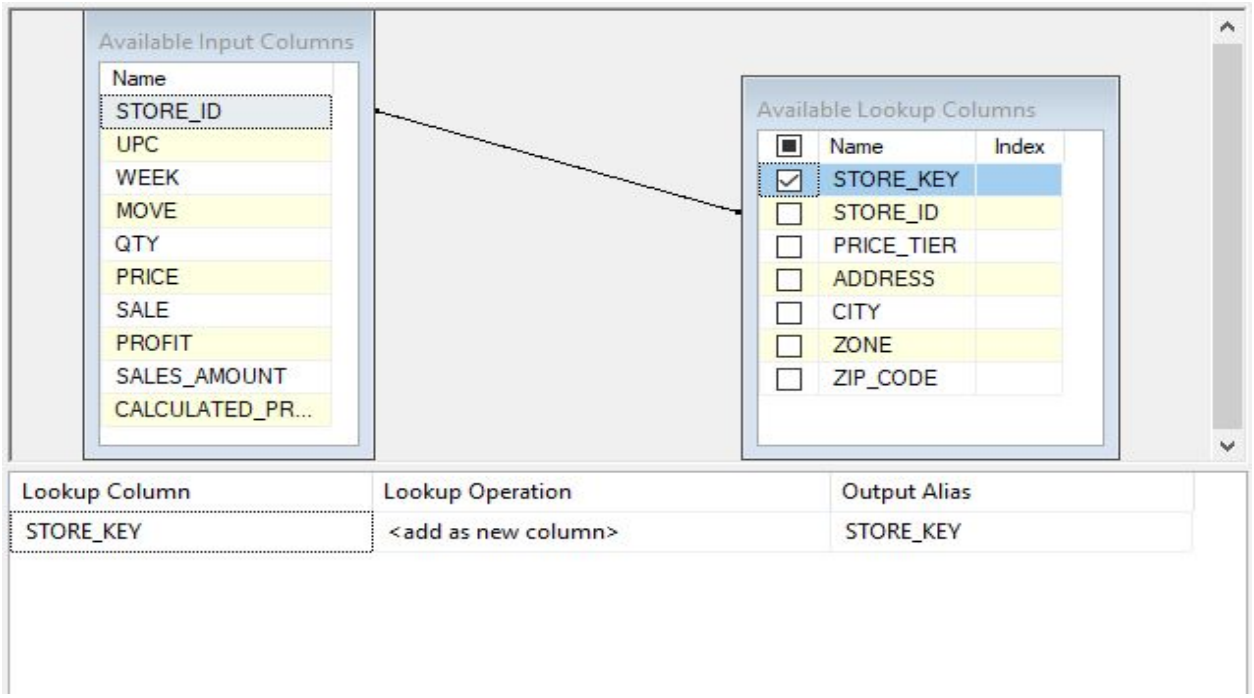




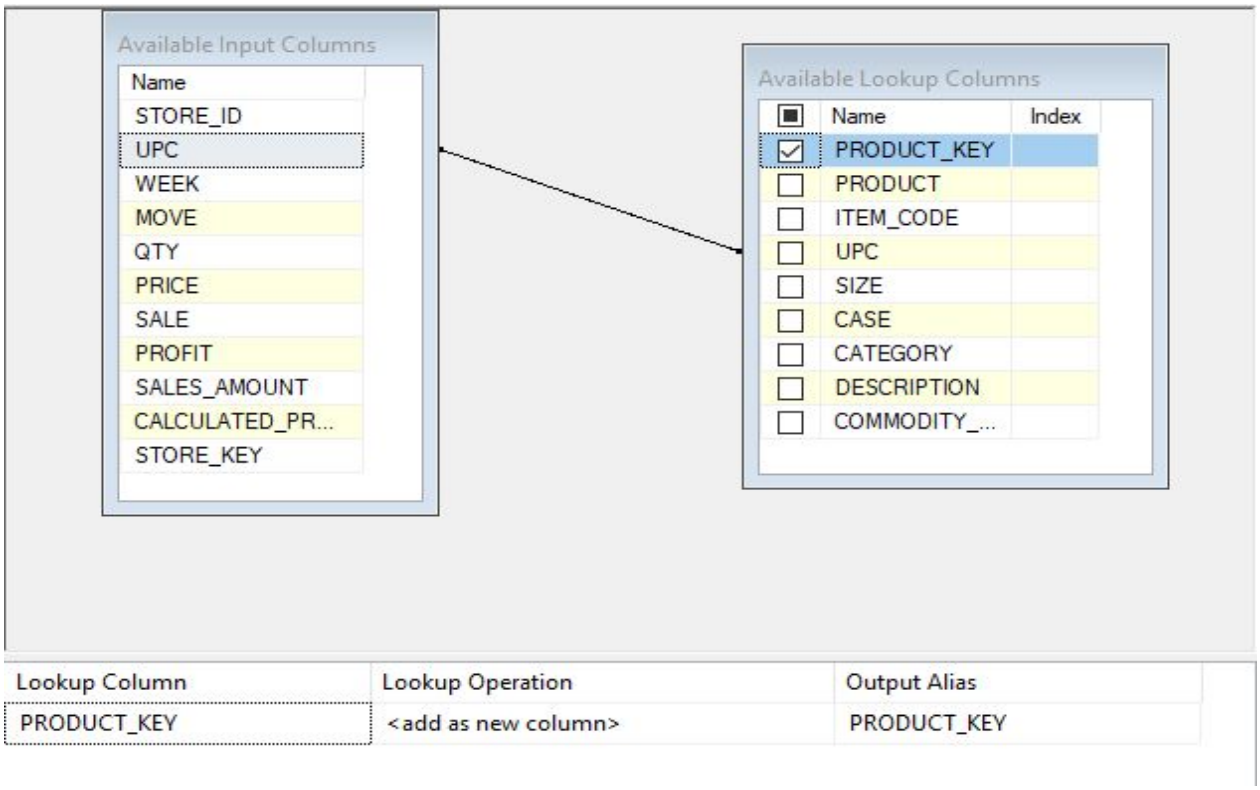
Step 2: To calculate sales and profit, we used derived column



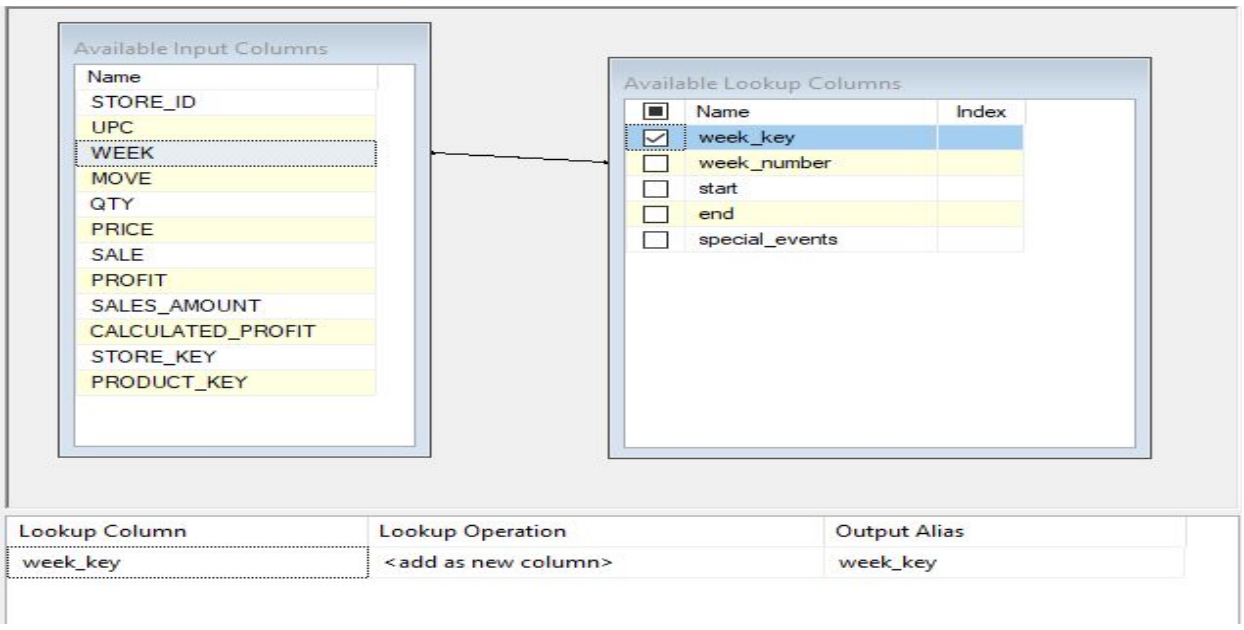
Step 3: Looking up by DIM_STORE



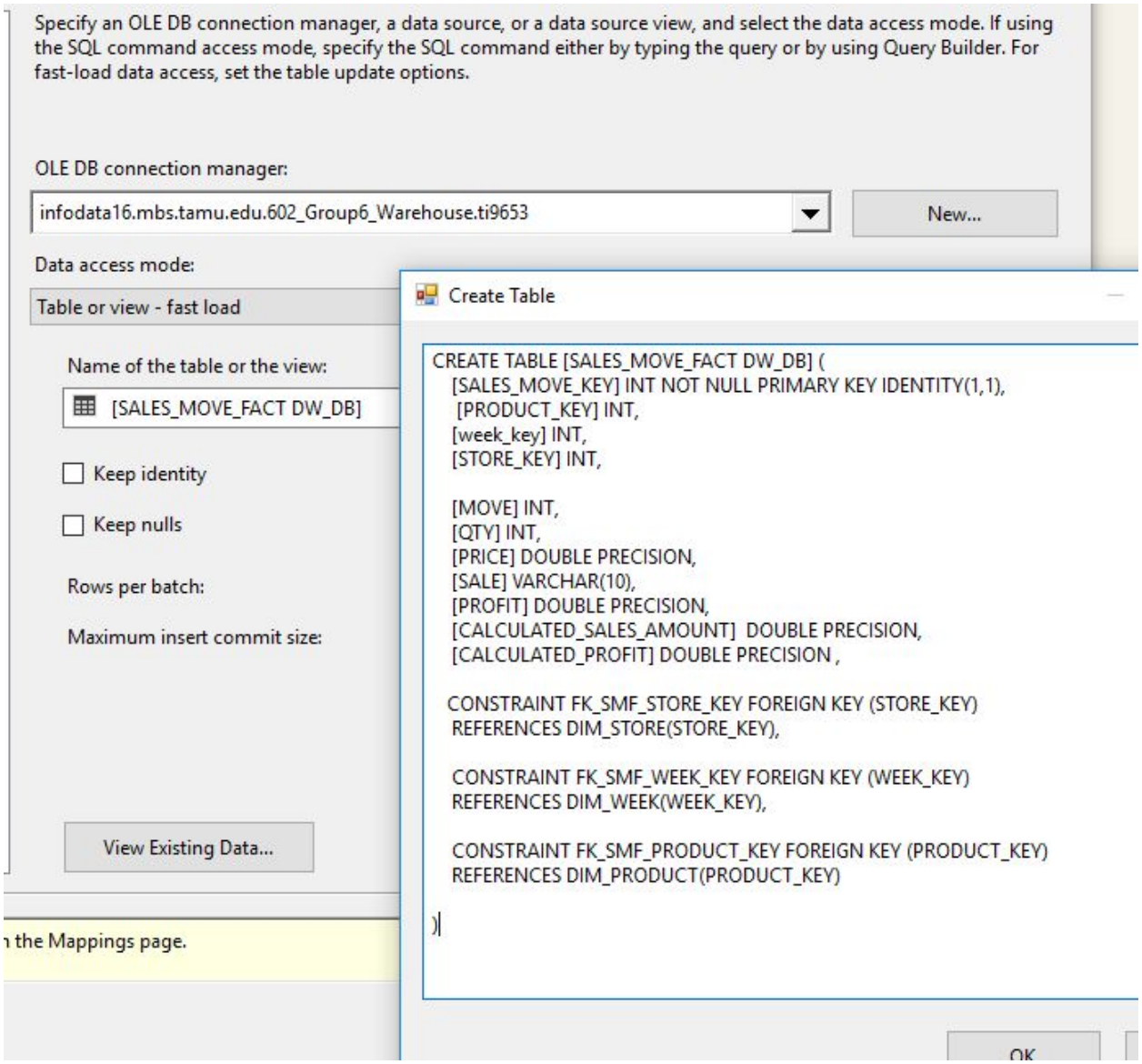
Step 4: Looking up by DIM_PRODUCT

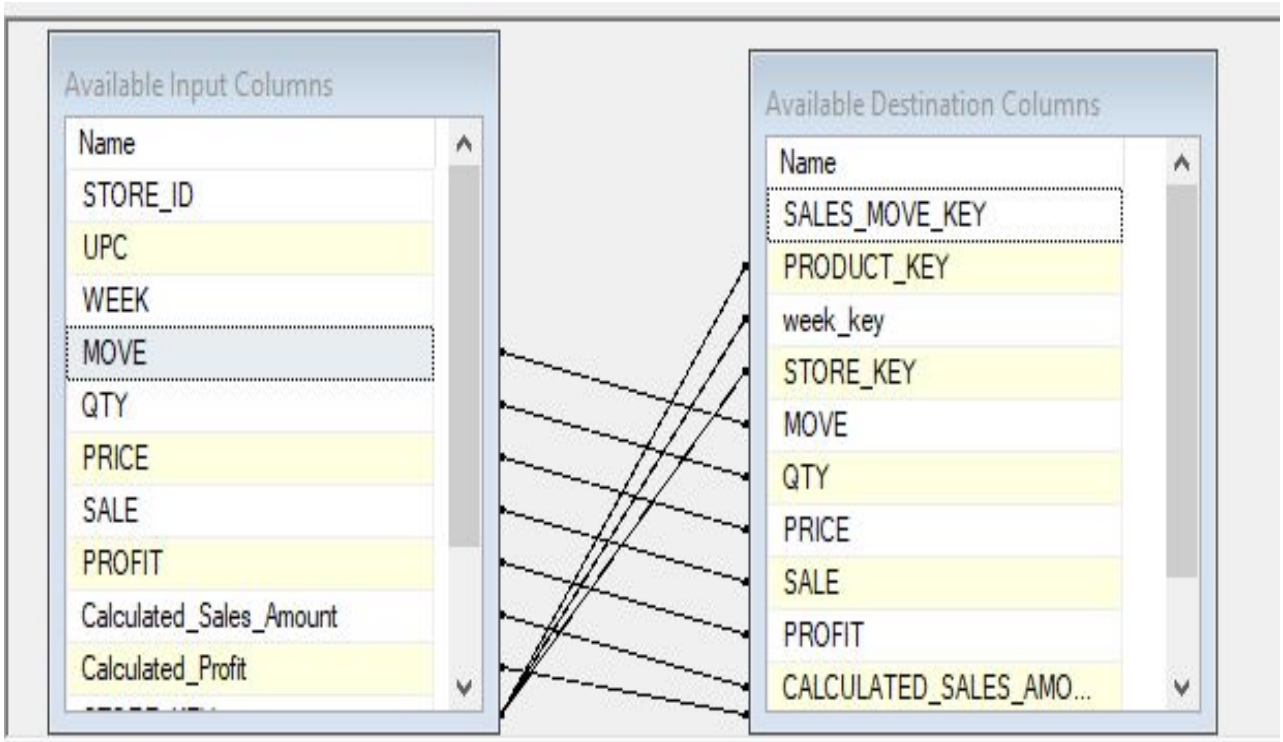


Step 5: Looking up by DIM_WEEK



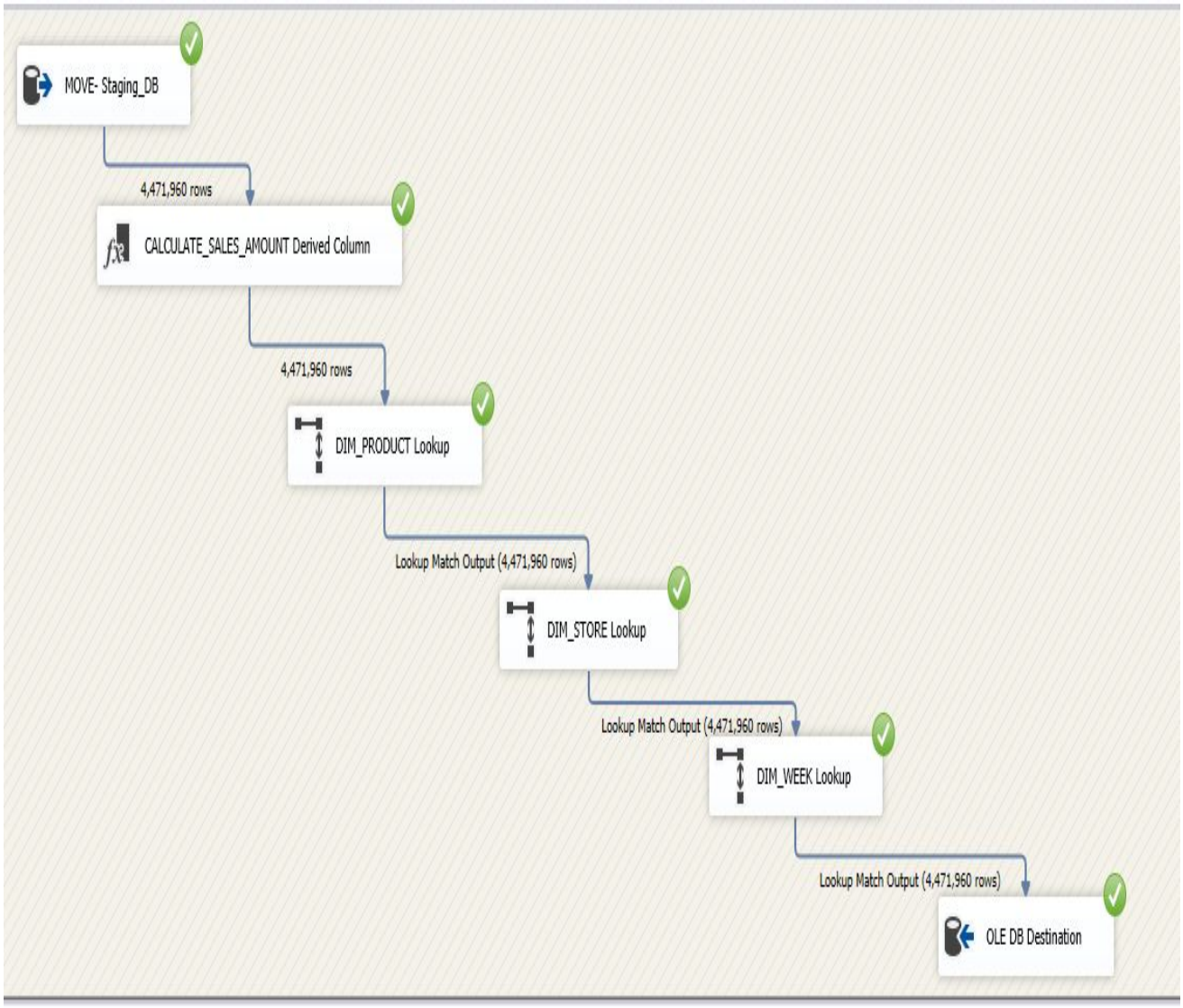
Step 6: Creating destination DB in Data warehouse


Specify an OLE DB connection manager, a data source, or a data source view, and select the data access mode. If using the SQL command access mode, specify the SQL command either by typing the query or by using Query Builder. For fast-load data access, set the table update options.
OLE DB connection manager:
infodata16.mbs.tamu.edu.602_Group6_Warehouse.ti9653
New...
Data access mode:
Table or view - fast load
Name of the table or the view:
[SALES_MOVE_FACT DW_DB]
Keep identity
Keep nulls
Rows per batch:
Maximum insert commit size:
View Existing Data...
the Mappings page.
Create Table
CREATE TABLE [SALES_MOVE_FACT DW_DB] (
[SALES_MOVE_KEY] INT NOT NULL PRIMARY KEY IDENTITY(1,1),
[PRODUCT_KEY] INT,
[week_key] INT,
[STORE_KEY] INT,
[MOVE] INT,
[QTY] INT,
[PRICE] DOUBLE PRECISION,
[SALE] VARCHAR(10),
[PROFIT] DOUBLE PRECISION,
[CALCULATED_SALES_AMOUNT] DOUBLE PRECISION,
[CALCULATED_PROFIT] DOUBLE PRECISION ,
CONSTRAINT FK_SMF_STORE_KEY FOREIGN KEY (STORE_KEY)
REFERENCES DIM_STORE(STORE_KEY),
CONSTRAINT FK_SMF_WEEK_KEY FOREIGN KEY (WEEK_KEY)
REFERENCES DIM_WEEK(WEEK_KEY),
CONSTRAINT FK_SMF_PRODUCT_KEY FOREIGN KEY (PRODUCT_KEY)
REFERENCES DIM_PRODUCT(PRODUCT_KEY)
)
OK



Input Column	Destination Column
PRODUCT_KEY	PRODUCT_KEY
week_key	week_key
STORE_KEY	STORE_KEY
MOVE	MOVE
QTY	QTY
PRICE	PRICE
SALE	SALE
PROFIT	PROFIT
Calculated_Sales_Amount	CALCULATED_SALES_AMOUNT
Calculated_Profit	CALCULATED_PROFIT

Step 7: Running SSIS Package



Step 8: SALES_MOVE_FACT table after running SSIS commands

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [SALES_MOVE_KEY]
      ,[PRODUCT_KEY]
      ,[week_key]
      ,[STORE_KEY]
      ,[MOVE]
      ,[QTY]
      ,[PRICE]
      ,[SALE]
      ,[PROFIT]
      ,[CALCULATED_SALES_AMOUNT]
      ,[CALCULATED_PROFIT]
  FROM [602_Group6_Warehouse].[dbo].[SALES_MOVE_FACT]
```

0 %

Results | Messages

	SALES_MOVE_KEY	PRODUCT_KEY	week_key	STORE_KEY	MOVE	QTY	PRICE	SALE	PROFIT	CALCULATED_SALES_AMOUNT	CALCULATED_PROFIT
1	1	292	202	85	66	1	0.42	B	61.19	27.72	1696.1868
2	2	292	203	85	78	1	0.42	B	61.42	32.76	2012.1192
3	3	292	204	85	86	1	0.42	B	60.71	36.12	2192.8452
4	4	292	205	85	91	1	0.42	B	53.8	38.22	2056.236
5	5	292	206	85	62	1	0.42	B	48.57	26.04	1264.7628
6	6	292	207	85	43	1	0.42	B	48.57	18.06	877.1742
7	7	292	208	85	61	1	0.45		52	27.45	1427.4
8	8	292	209	85	43	1	0.45		58.66	19.35	1135.071
9	9	292	210	85	66	1	0.45		60.88	29.7	1808.136
10	10	292	211	85	58	1	0.46		59.13	26.68	1577.5884
11	11	292	212	85	54	1	0.49		51.02	26.46	1349.9892
12	12	292	213	85	49	1	0.49		50.4	24.01	1210.104
13	13	292	214	85	27	1	0.49		50.4	13.23	666.792
14	14	292	215	85	48	1	0.49		49.79	23.52	1171.0608
15	15	292	216	85	37	1	0.49		49.79	18.13	902.6927
16	16	292	217	85	40	1	0.49		49.59	19.6	971.964

4.11 List of all temporary tables in the Staging area

- 602_Group6_Staging_Area. CCOUNT

- 602_Group6_Staging_Area.move
- 602_Group6_Staging_Area.move_candy
- 602_Group6_Staging_Area.move_cookie
- 602_Group6_Staging_Area.move_frozendinner
- 602_Group6_Staging_Area.move_frozenentree
- 602_Group6_Staging_Area.move_frozenjuice
- 602_Group6_Staging_Area.move_temp
- 602_Group6_Staging_Area.PRODUCT
- 602_Group6_Staging_Area.product_candy
- 602_Group6_Staging_Area.product_cookie
- 602_Group6_Staging_Area.product_frozendinner
- 602_Group6_Staging_Area.product_frozenentree
- 602_Group6_Staging_Area.product_frozenjuice
- 602_Group6_Staging_Area.SALES
- 602_Group6_Staging_Area.SALES_FINAL
- 602_Group6_Staging_Area.store
- 602_Group6_Staging_Area.WEEKTABLE

4.12 Data Granularity at the independent data mart level

Data Granularity refers to the level of detail that is included in the data marts based on the requirement. The data given in CCount is at date level but the data in Movement table, which eventually provides sales data is at week level. Thus, we have taken lowest granularity level at week for the time dimension. The week dimension also consists of Start and End date for the week, which can provide us with the year in case of roll up.
The granularity for the independent data marts is at store, week and product.

5. Physical Design

5.1 Aggregation Plan

We are storing the data at the lowest granularity level of time dimension i.e. week. Of the several types of aggregation, the most common is called a roll-up aggregation. In this case, we will take the customer count and daily sales data given in the Customer Count table and roll it up for weekly sales table. Additionally, we can use roll up for this same data to get the monthly and yearly sales tables. For the sales and profit data, we can roll up the sales amounts from weekly basis to monthly and yearly sales tables. These types of summaries are easily computed from the base data warehouse by using the SQL SUM operator.
Essentially, we can either aggregate at runtime or pre-aggregate the data offline, thus making the totals available without real-time computation. The option of calculation aggregate at runtime will provide with real time data but it may affect the performance. Hence, we have come up with the alternative to write to write SQL to pre-aggregate data according to the dimensions that end users will frequently want to see.

5.2 Indexing Plan

The following columns will be used as index for the corresponding tables. Binary tree is being used to enhance performance of the indexes. Primary key is considered index for all tables.

Indexes		
Table	**Index**	**Indexing schema**
DIM_STORE	STORE_KEY, STORE_ID	Binary Tree
DIM_PRODUCT	PRODUCT_KEY, PRODUCT_ID	
DIM_DATE	TIME_KEY, WEEK, YEAR	
COUPON_REDEMPTION_FACT	COUPON_REDEMPTION_KEY	
CUST_COUNT_FACT	CUST_COUNT_KEY	
SALES_FACT	SALES_KEY	

5.3 Data Standardization plan

The following naming standards are to be followed for the warehouse objects:

Naming Standards

Fact tables	Ending with "_FACT"
Dimension tables	Starts with "DIM_"
Staging tables	Starts with "STAG_"
Aggregated tables	Starts with "AGGR"

The following standards for the name length will be followed along with the general guidelines for the naming conventions in Microsoft SQL Server databases:

Name Length	
Table	30
Column Headers	20
Keys	20

5.4 Storage plan

The table below mentions are rough estimate for table sizes with the available data with us. This size is going to vary with cleanup and addition/deletion of tuples. The estimation is done by taking size of data types and multiplying by the data available with the number of rows and columns.

Warehouse Table Size (in Megabytes)	
DIM_STORE	~ 0.30 (3 numeric,3 string, 140 rows)
DIM_PRODUCT	~ 6 (3 numeric, 6 string, 18k rows)
DIM_TIME	~ 0.04 (3 numeric, 1 string, 400 rows)
COUPONS_REDEMPTION_FACT	~ 10 (6 numeric, 350k rows, divide by 7*)
CUST_COUNT_FACT	~ 7 (4 numeric, 350k rows, divide by 7*)
SALES_FACT	~ 2000 (7 numeric, 90M rows)

Estimated table growth every year: 10 %

Additional Table Size	
Temp area	~ 500 MB (auto grow by 128 MB)

Staging area	~ 2000 MB
Indexes	~ 500 MB
OLAP system files	~ 1500 MB
Application	~ 2000 MB

Estimated growth every year: 15 %

5.5 Partitioning Plan

The tables to be partitioned:

- DIM_PRODUCT: Since it has many columns and huge data, this dimension table has to be partitioned vertically.
- SALES_FACT: Since this table contains millions of rows, this table should be horizontally partitioned.

Also, the corresponding queries need to be optimized for recognizing the partitions.

6. BI Reporting

6.1 Reporting plan

6.1.1 Target Reports & Template

a. Weekly trend of customer in traffic for store 2 between 1995 and 1996

Report using SSRS

This report will have two columns which tell us the customer traffic in the store #2 as Customer Count and Week Number.

Customer Count	Week Number

b. In category of frozen products, the method of discount (Coupon or price reduction) gives more profit

Type: Report using Report Builder

Report for the category of frozen products will have two columns Sale, B or S, which depicts is the discount type and the average calculated profit.

Sale	Average Calculated Profit

c. To find UPCs had most sale in high, medium and low tier for cookies

Type: Report using SSAS and SSRS

To find the UPCs with most sale amount in the three tiers, we need columns UPC, Category, Calculated Sales amount and Calculated Profit. The page level in SSRS will be tier values '*high', 'medium', and 'low'.*

UPC	Category	Calculated Sales amount	Calculated Profit

d. Trend of candies' sale during Halloween year by year

Type: Report using SSAS

To capture sales of candies during Halloween for each year, columns required are Category=’Candy’, year, Special Event=’Halloween’, Week Number, Calculated Sales amount and Calculated Profit. This data will be the basis for creating a pivot table in Excel.

Category	Year	Special Events	Week Number	Calculated Sales amount	Calculated Profit

e. Relation between bakery sales and bakery coupons redeemed for all stores

Type: Report using Report Builder

To find the sales of bakery and bakery coupons redeemed, columns required in the report are Store ID, Category (Bakery or Bakery Coupon) and the sum of sales amount.

Store ID	Category	Sum Sales Amount

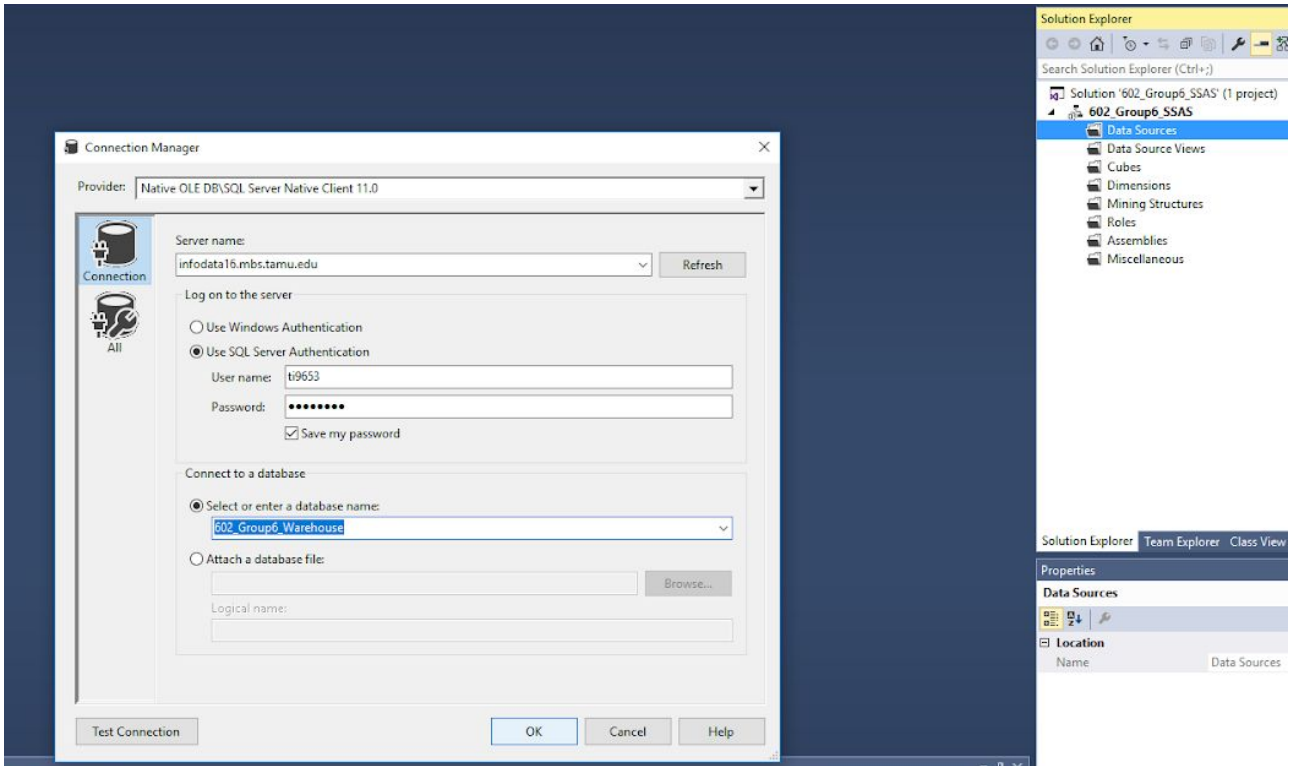
6.1.2 Mapping for report attributes from data warehouse

Data Warehouse Table Name	Data Warehouse Column Name	Report Column Name
_COUNT_FACT	OMER_COUNT	mer Count
WEEK	_KEY	Number
S_MOVE_FACT		
S_MOVE_FACT	ULATED_PROFIT	ge Calculated Profit
PRODUCT		
PRODUCT	GORY	ory
WEEK	T/END	
WEEK	AL_EVENTS	l Events
S_MOVE_FACT	ULATED_SALES_AMOUNT	ated Sales Amount

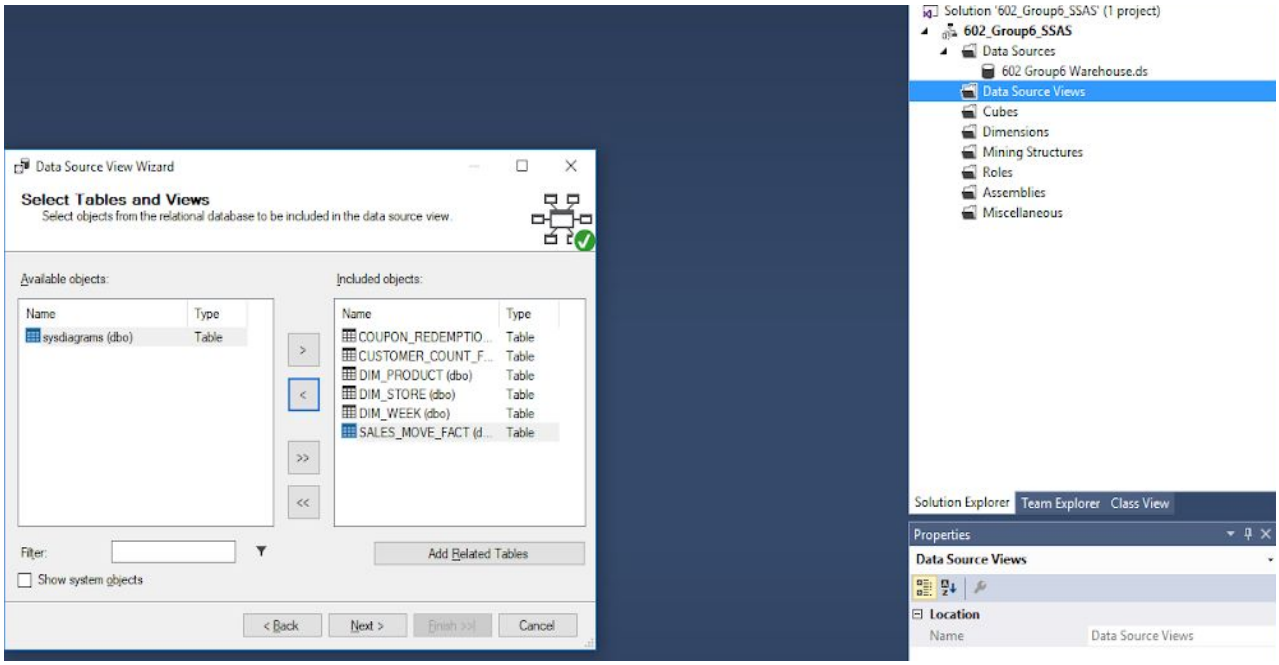
S_MOVE_FACT	ULATED_PROFIT	ated Profit
STORE	E_ID	D
S_MOVE_FACT	ULATED_SALES_AMOUNT	ales Amount
STORE	_TIER	Tier

6.2 Cube generation using SSAS

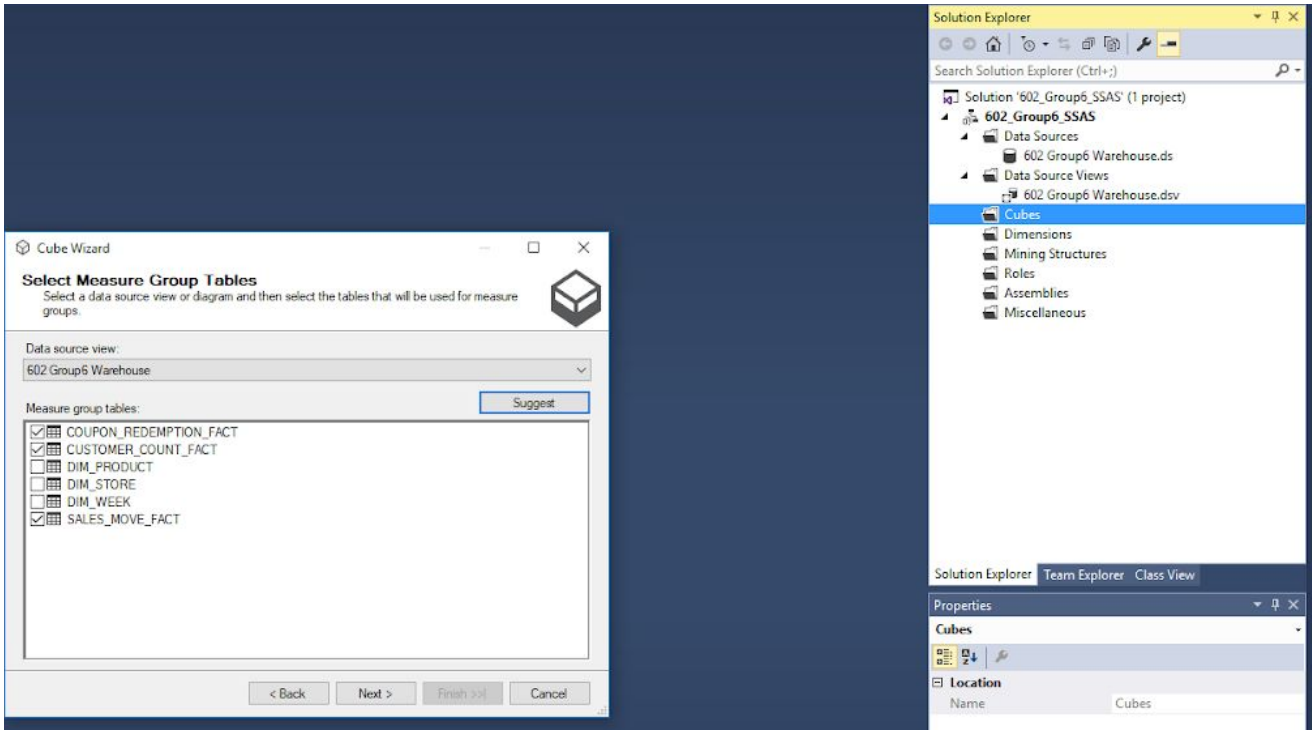
Step 1: Selecting data source



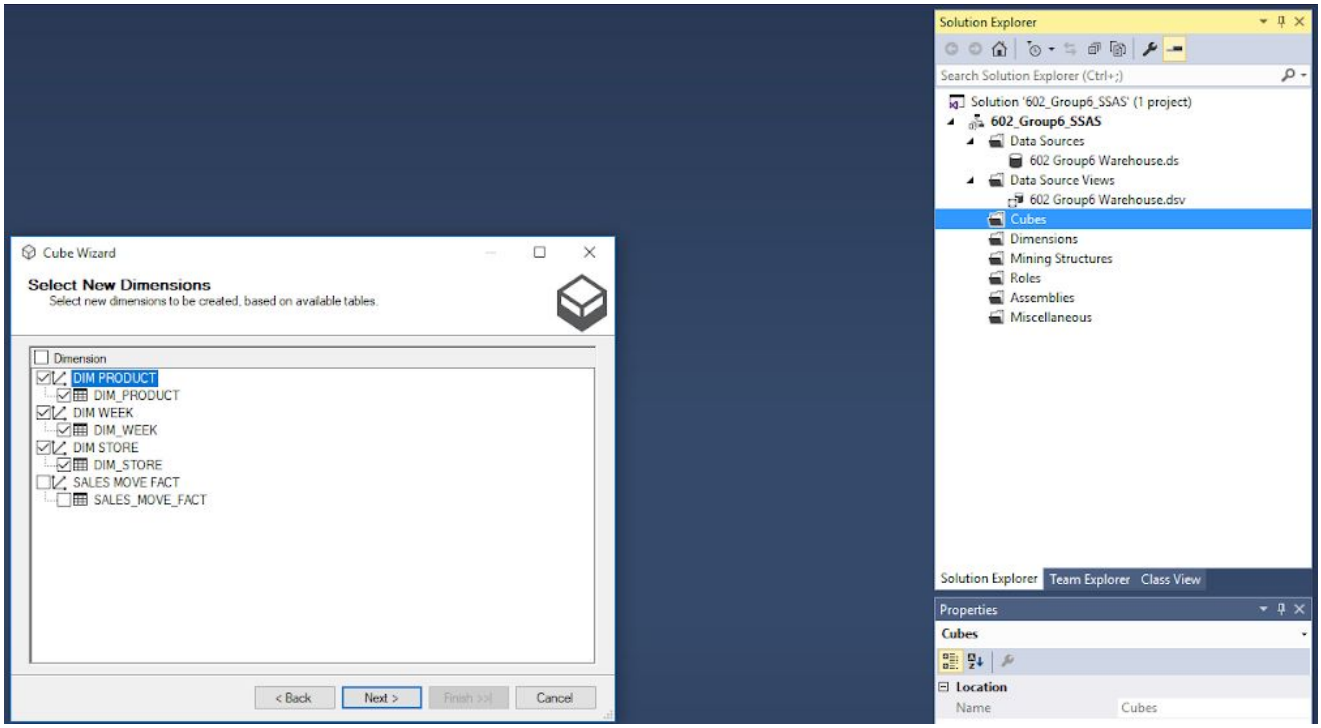
Step 2: Creating Data source view



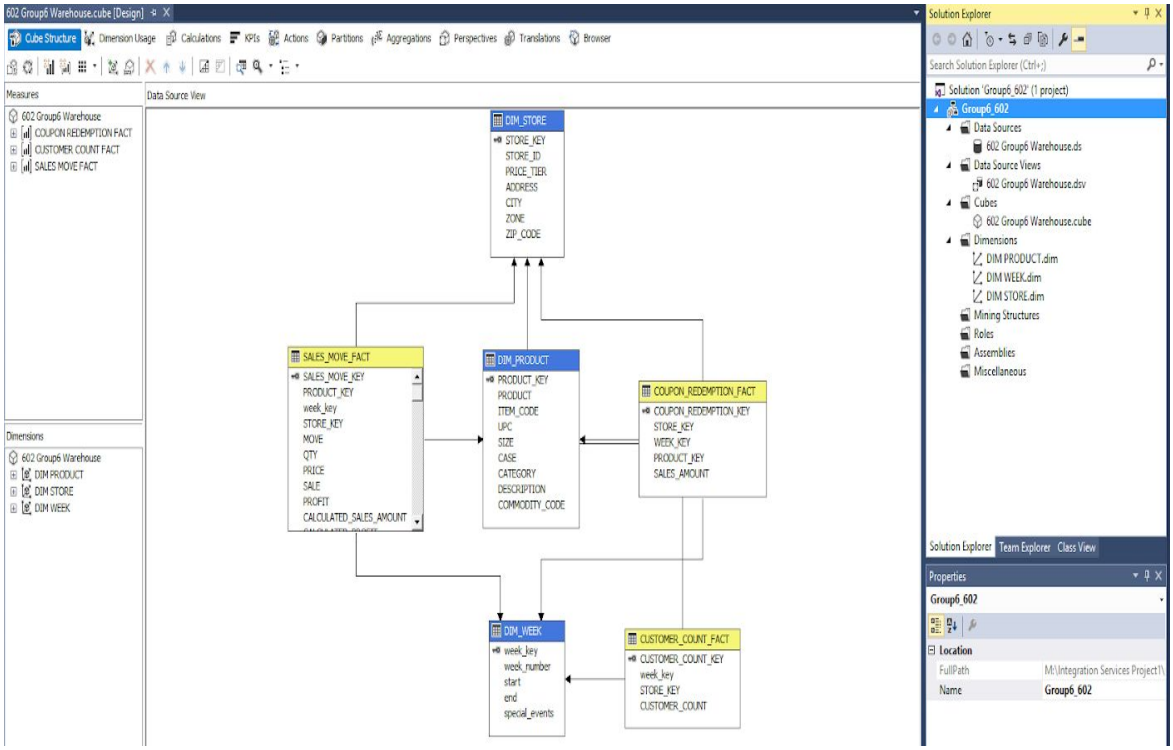
Step 3: Selecting Measures



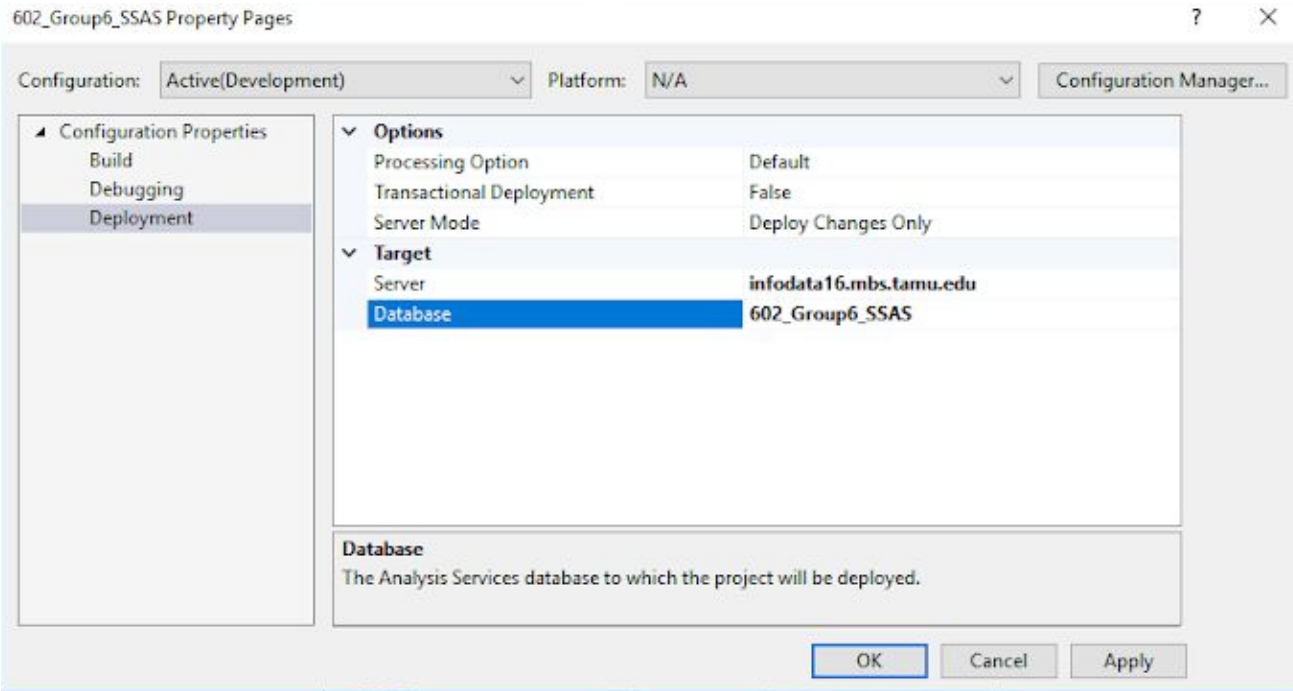
Step 4: Selecting Dimensions



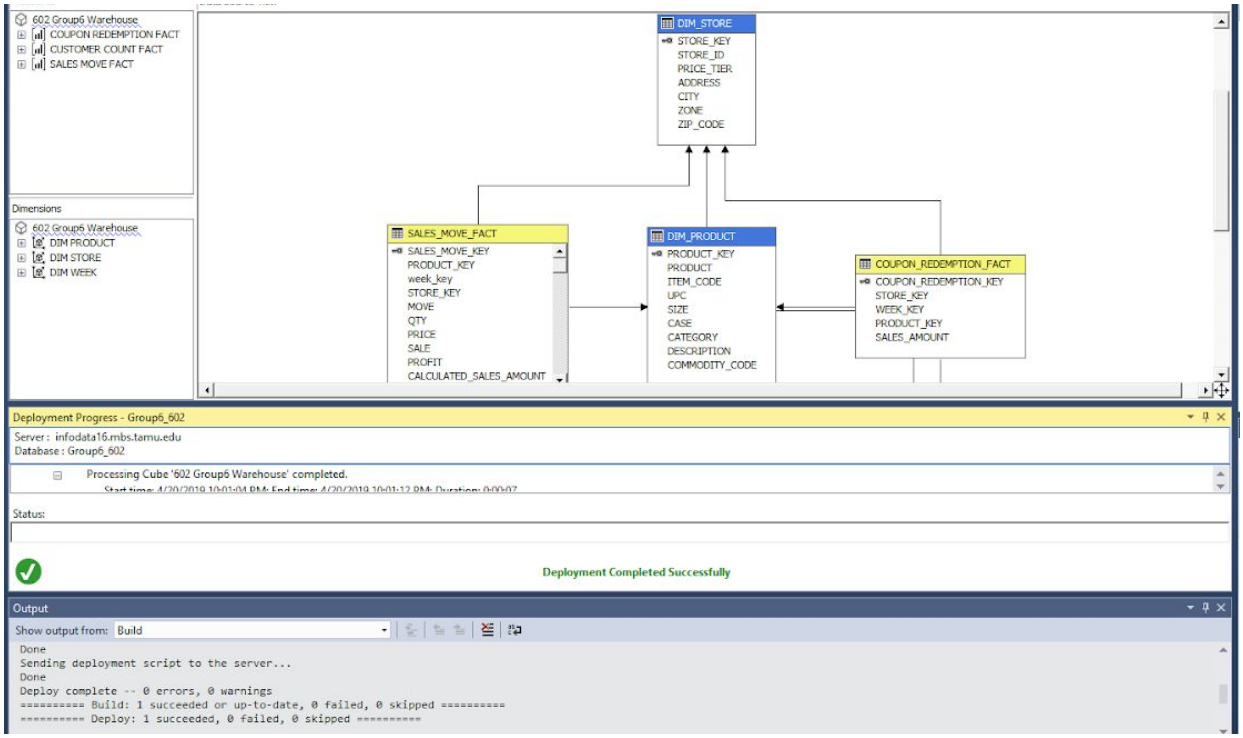
Step 5: Generating Cube

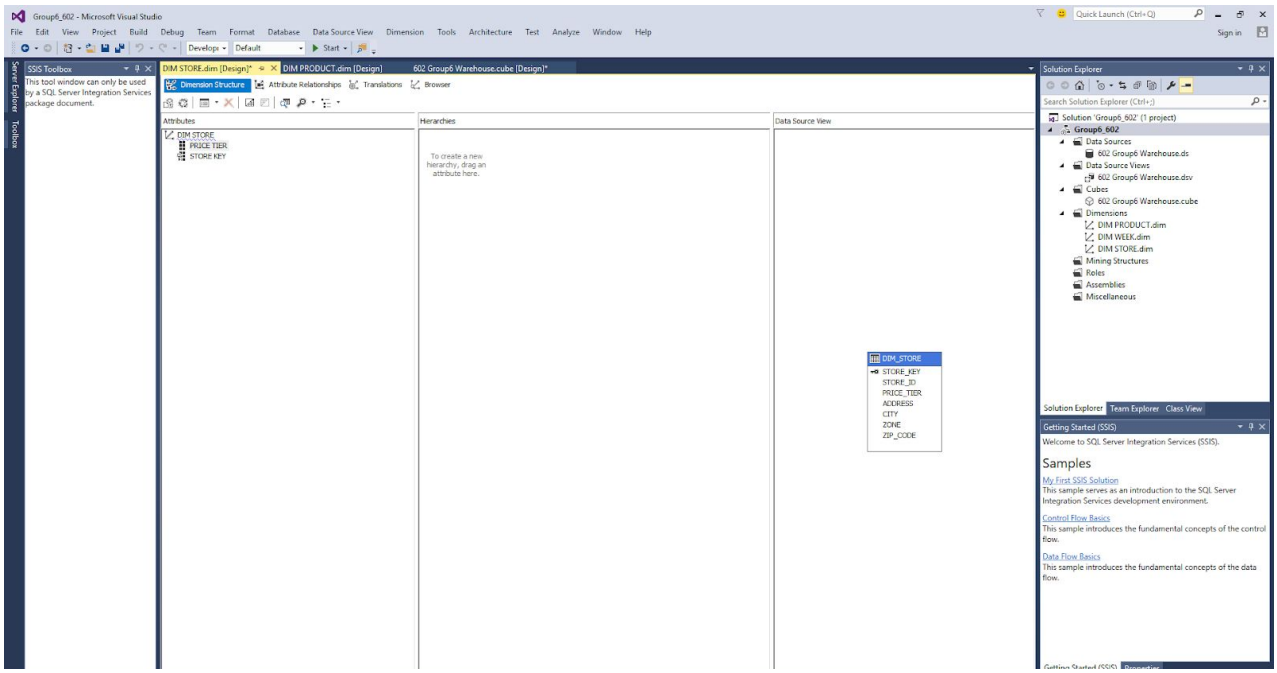


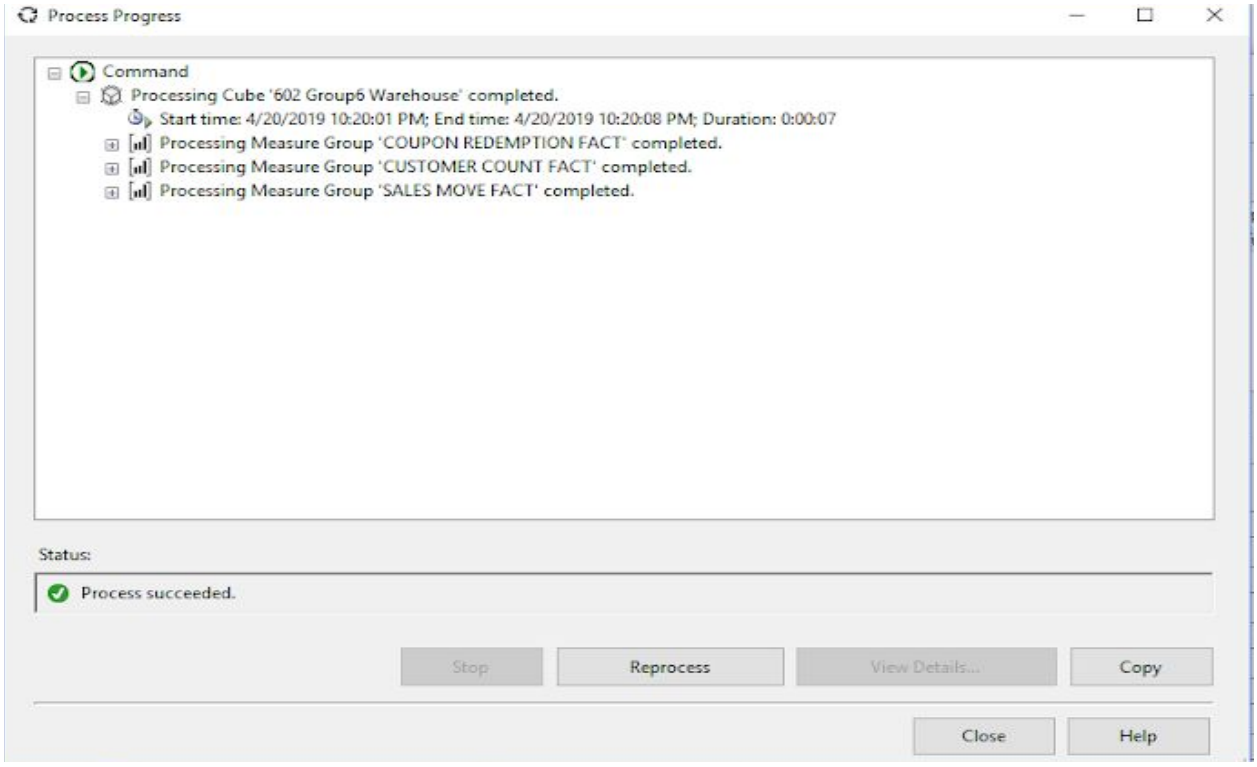
Step 6: Setting up Database connection

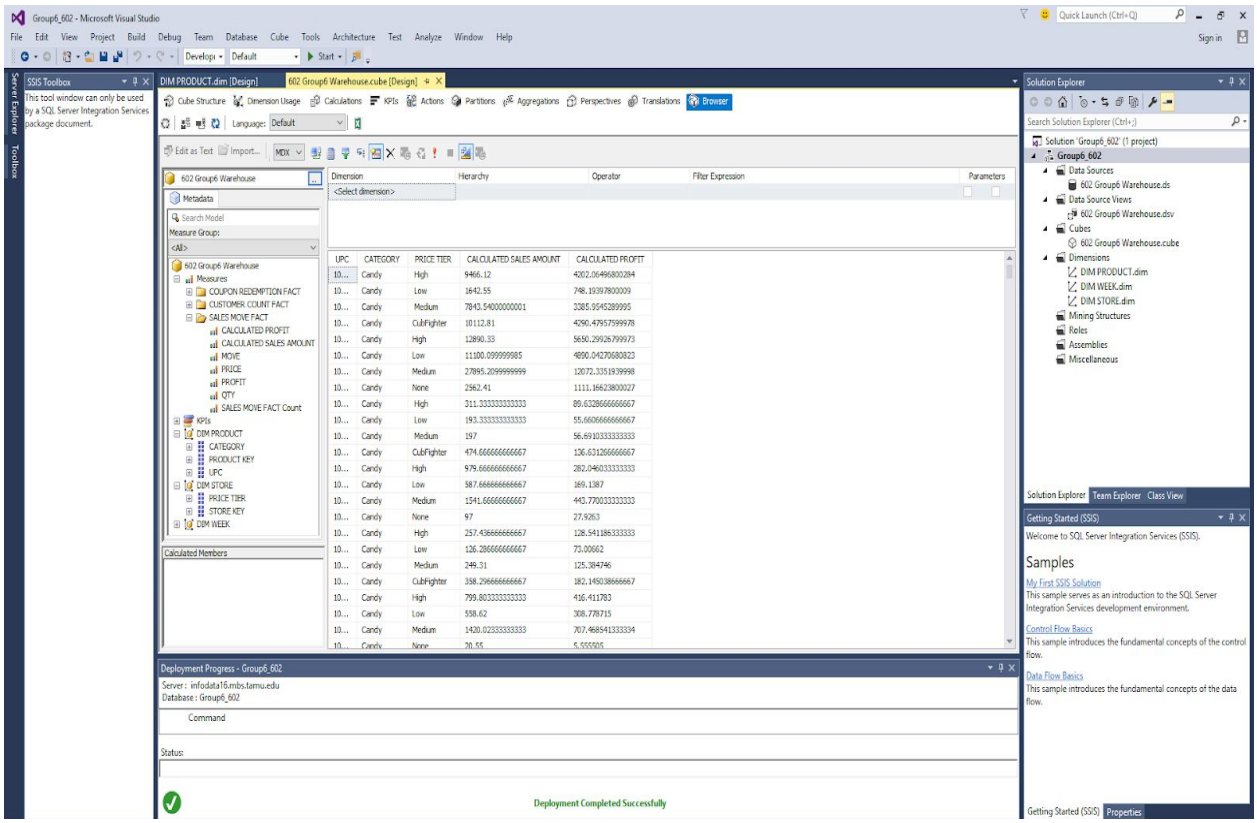


Step 7: Deploying to database

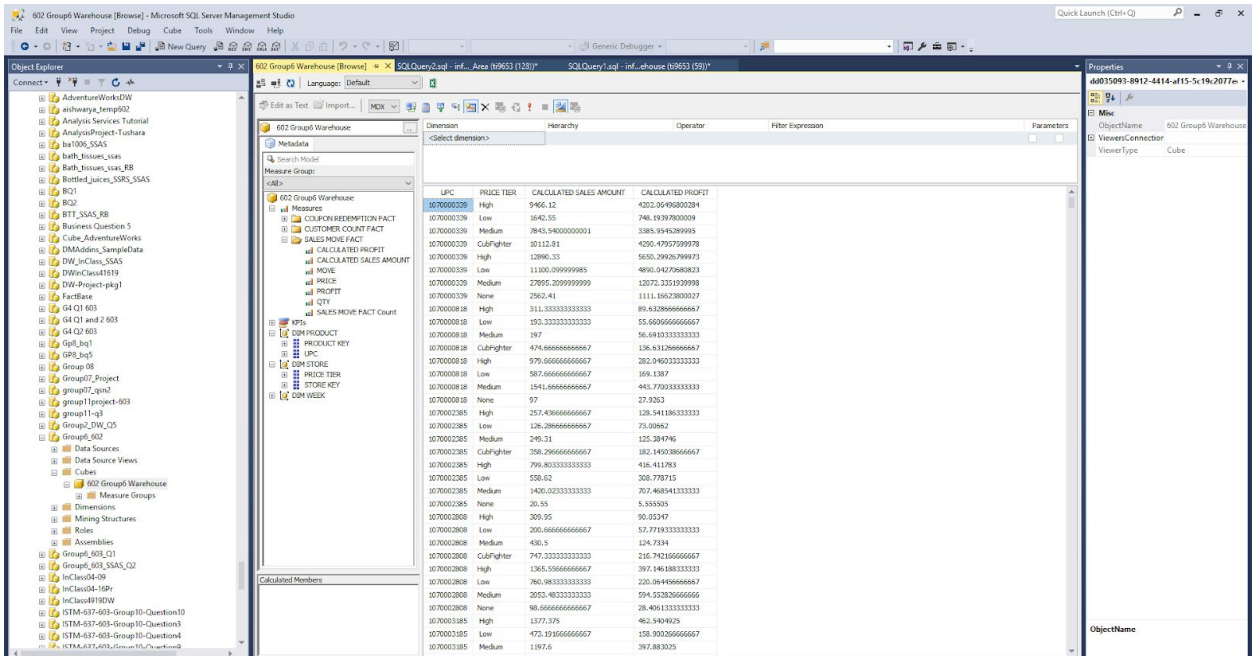

602 Group6 Warehouse
COUPON REDEMPTION FACT
CUSTOMER COUNT FACT
SALES MOVE FACT
Dimensions
602 Group6 Warehouse
DIM PRODUCT
DIM STORE
DIM WEEK
DIM_STORE
STORE_KEY
STORE_ID
PRICE_TIER
ADDRESS
CITY
ZONE
ZIP_CODE
SALES_MOVE_FACT
SALES_MOVE_KEY
PRODUCT_KEY
week_key
STORE_KEY
MOVE
QTY
PRICE
SALE
PROFIT
CALCULATED_SALES_AMOUNT
DIM_PRODUCT
PRODUCT_KEY
PRODUCT
ITEM_CODE
UPC
SIZE
CASE
CATEGORY
DESCRIPTION
COMMODITY_CODE
COUPON_REDEMPTION_FACT
COUPON_REDEMPTION_KEY
STORE_KEY
WEEK_KEY
PRODUCT_KEY
SALES_AMOUNT
Deployment Progress - Group6_602
Server : infodata16.mbs.tamu.edu
Database : Group6_602
Processing Cube '602 Group6 Warehouse' completed.
Status:
Deployment Completed Successfully
Output
Show output from: Build
Done
Sending deployment script to the server...
Done
Deploy complete -- 0 errors, 0 warnings
========== Build: 1 succeeded or up-to-date, 0 failed, 0 skipped ==========
========== Deploy: 1 succeeded, 0 failed, 0 skipped ==========


Group6_602 - Microsoft Visual Studio
SSIS Toolbox
This tool window can only be used by a SQL Server Integration Services package document.
DIM STORE.dim [Design]*
DIM PRODUCT.dim [Design]
602 Group6 Warehouse.cube [Design]*
Dimension Structure
Attribute Relationships
Translations
Browser
Attributes
Hierarchies
Data Source View
DIM STORE
PRICE TIER
STORE KEY
To create a new hierarchy, drag an attribute here.
DIM_STORE
STORE_KEY
STORE_ID
PRICE_TIER
ADDRESS
CITY
ZONE
ZIP_CODE
Solution Explorer
Solution 'Group6_602' (1 project)
Group6_602
Data Sources
602 Group6 Warehouse.ds
Data Source Views
602 Group6 Warehouse.dsv
Cubes
602 Group6 Warehouse.cube
Dimensions
DIM PRODUCT.dim
DIM WEEK.dim
DIM STORE.dim
Mining Structures
Roles
Assemblies
Miscellaneous
Solution Explorer
Team Explorer
Class View
Getting Started (SSIS)
Welcome to SQL Server Integration Services (SSIS).
Samples
My First SSIS Solution
This sample serves as an introduction to the SQL Server Integration Services development environment.
Control Flow Basics
This sample introduces the fundamental concepts of the control flow.
Data Flow Basics
This sample introduces the fundamental concepts of the data flow.



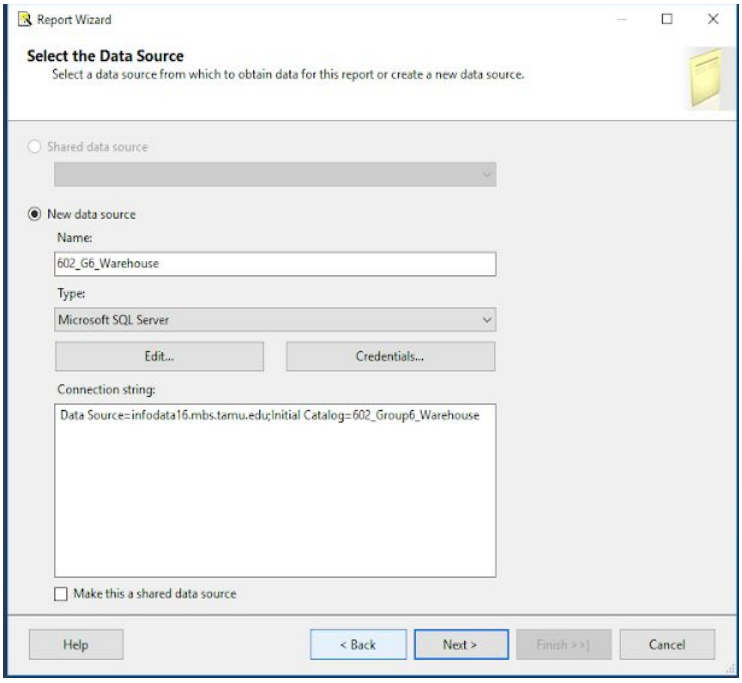


Step 8: Data in SQL server

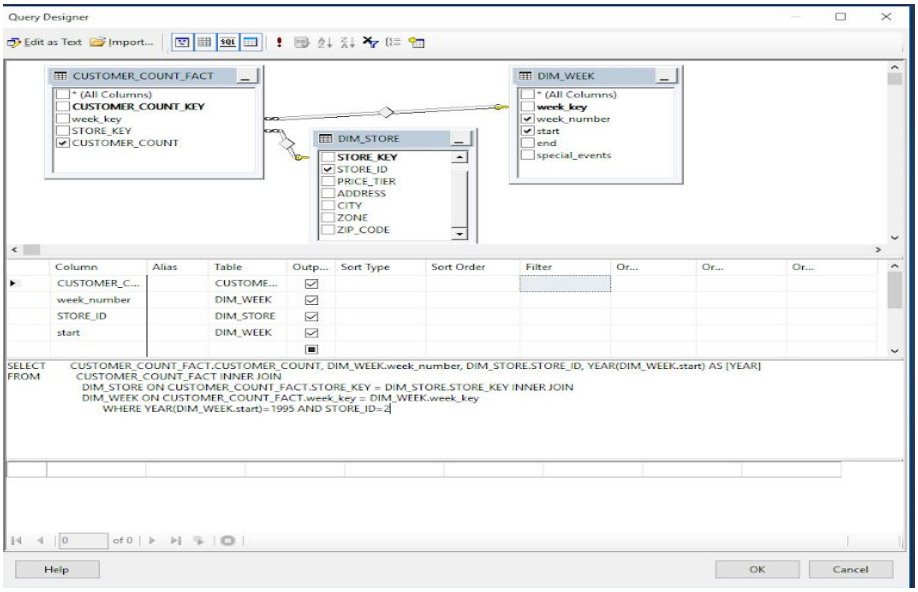


6.3 Report using SSRS **(Business Question #1)**

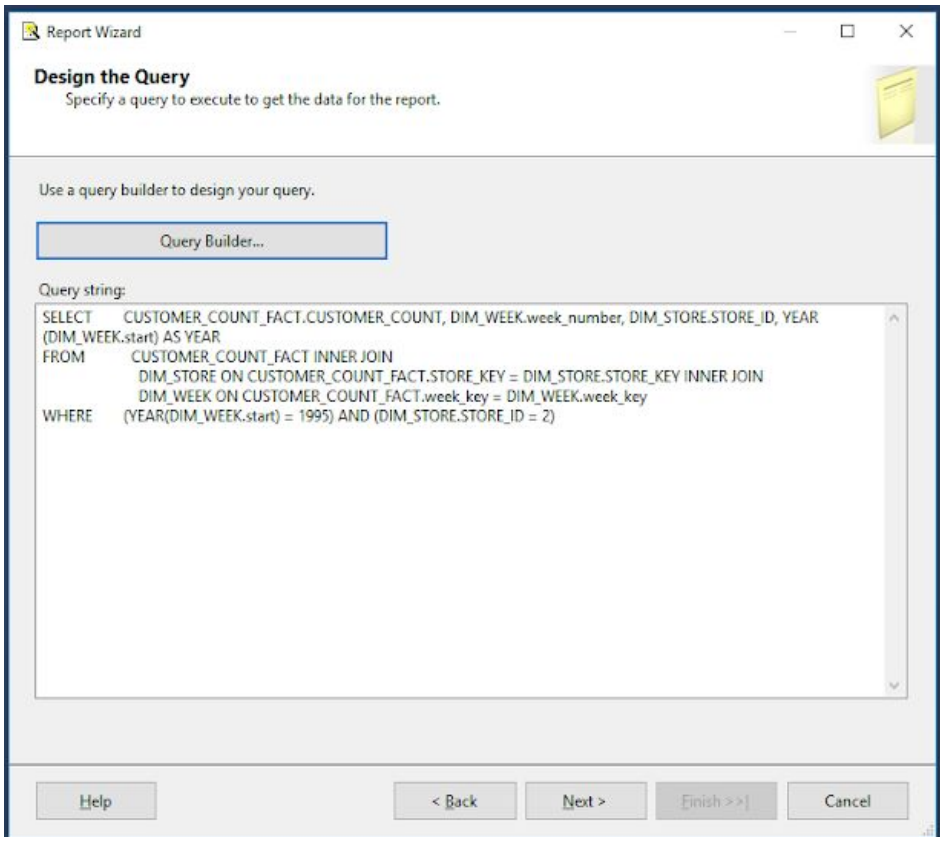
Step 1: Establishing connection to data warehouse



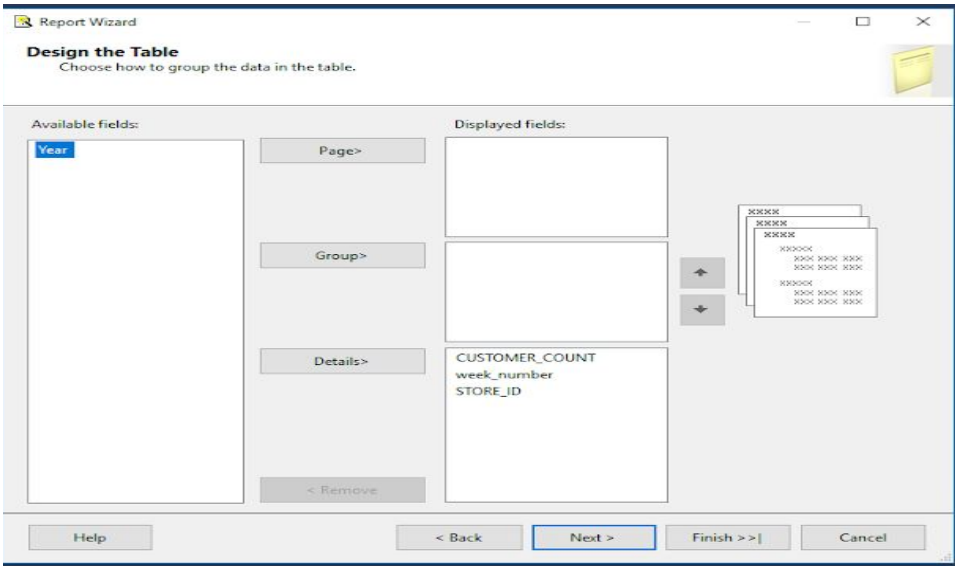
Step 2: Selecting required tables and fields

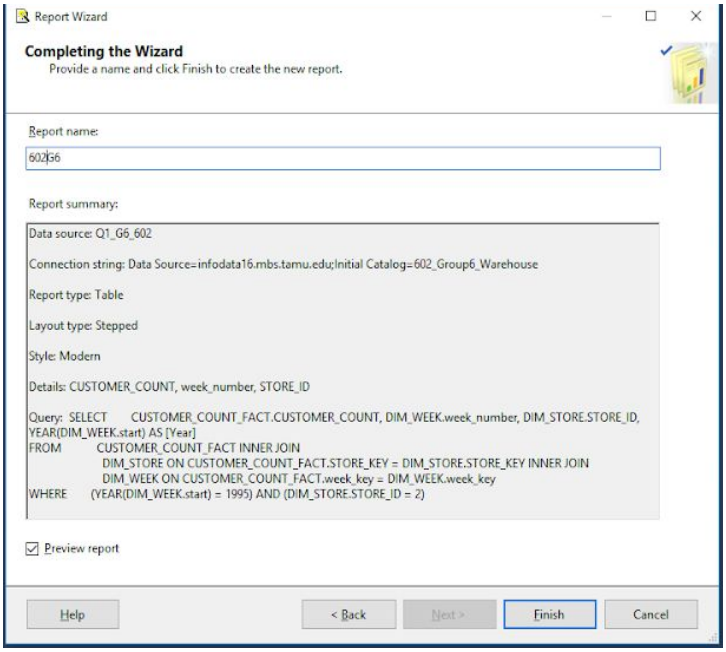


Step 3: Building query for year 1995

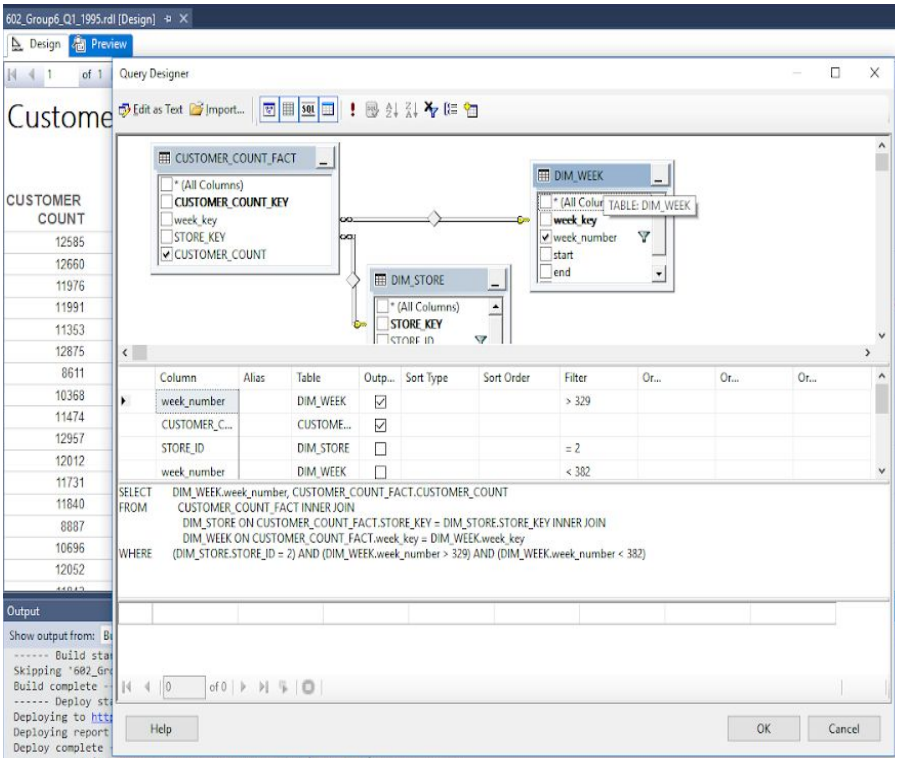


Step 4: Selecting rows and values

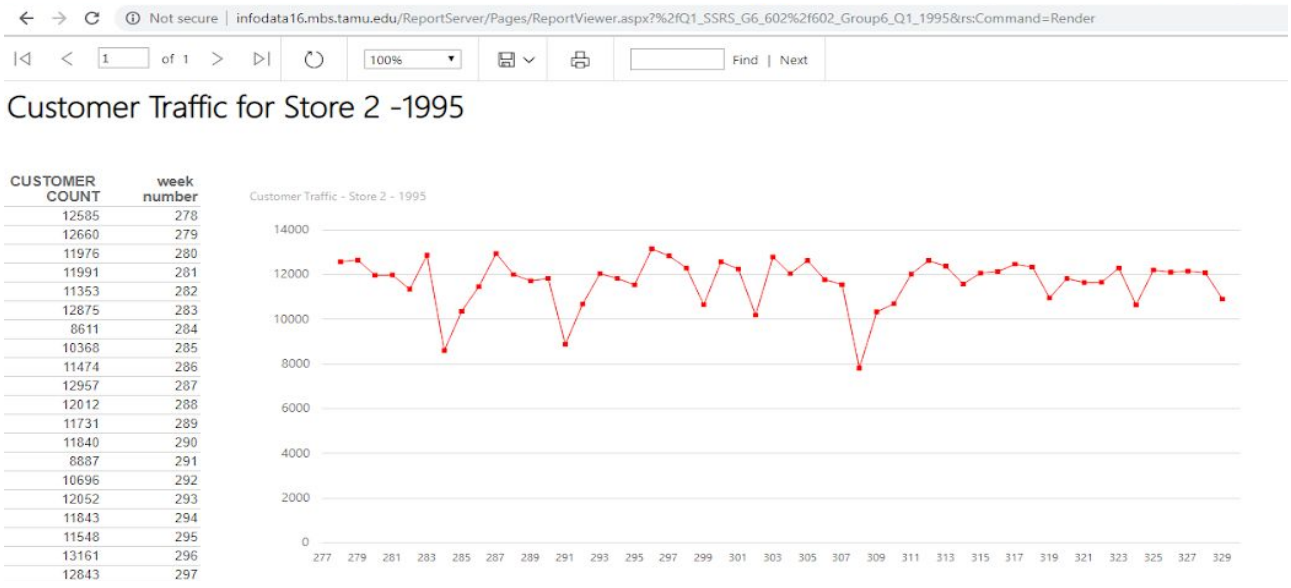




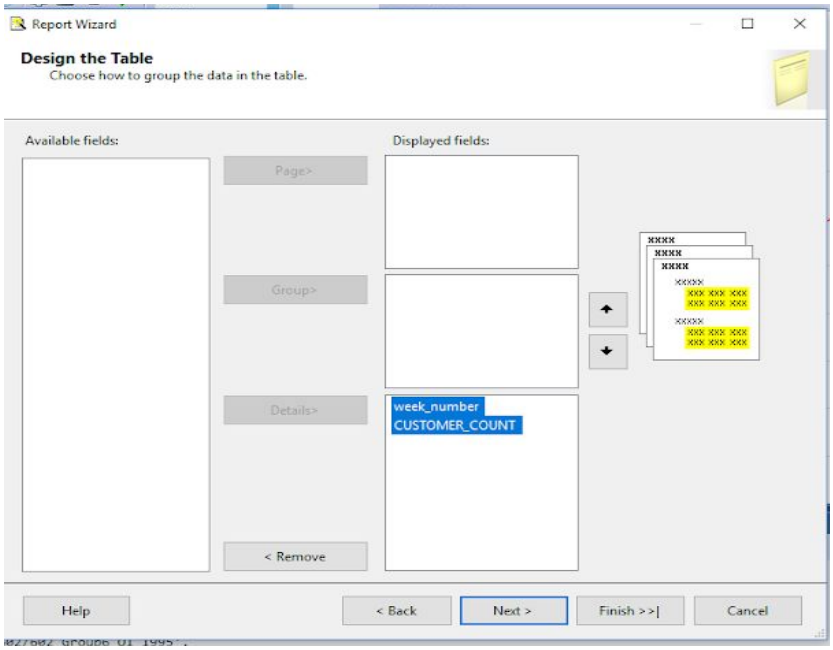
Step 5: Building query for 1995



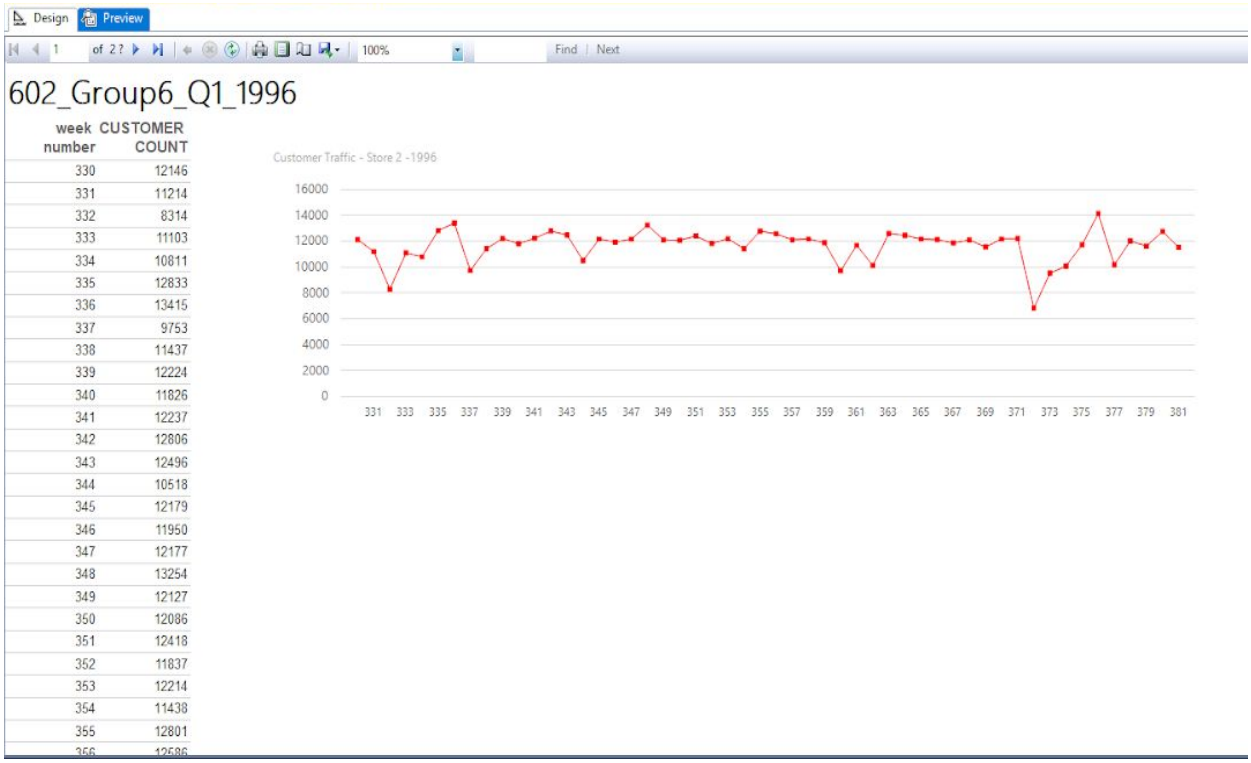
Step 6: Final report for 1995



Step 6: Selecting report columns and values



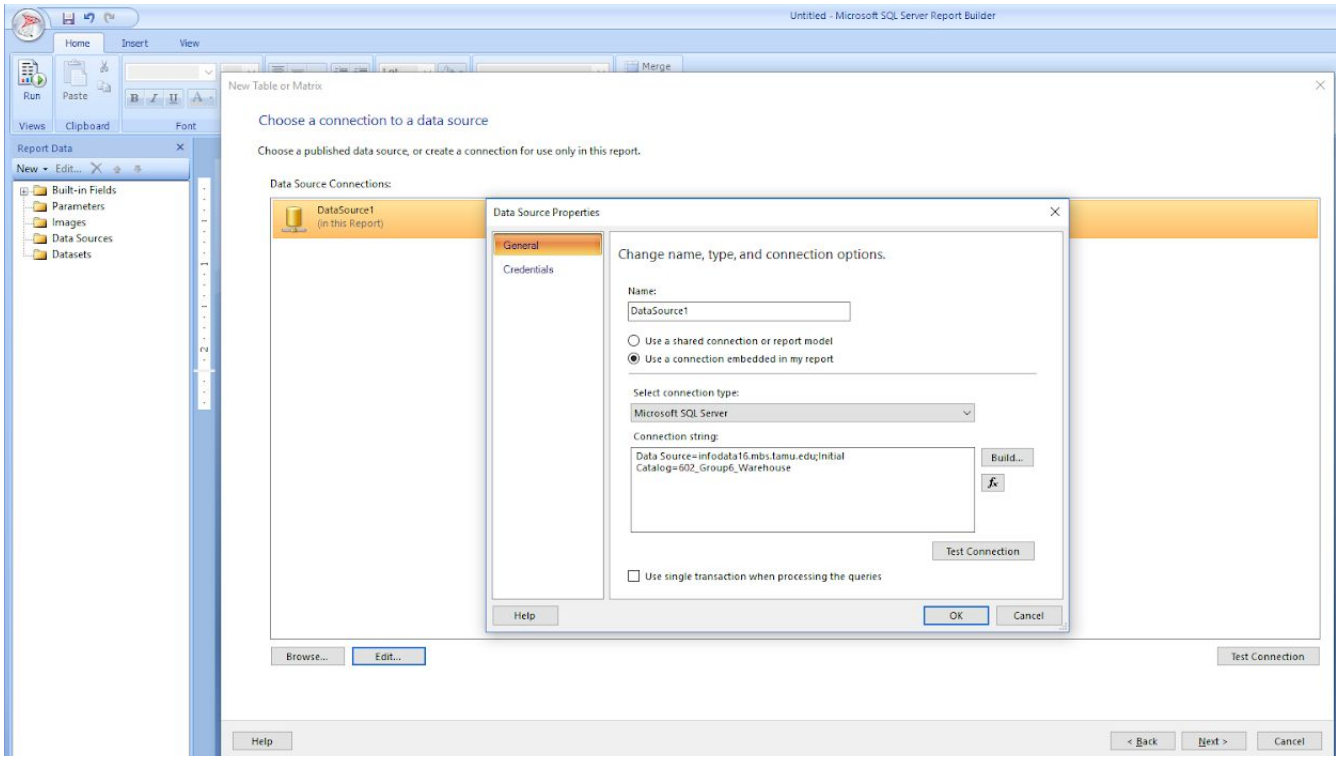
Step 7: Final Report for 1996



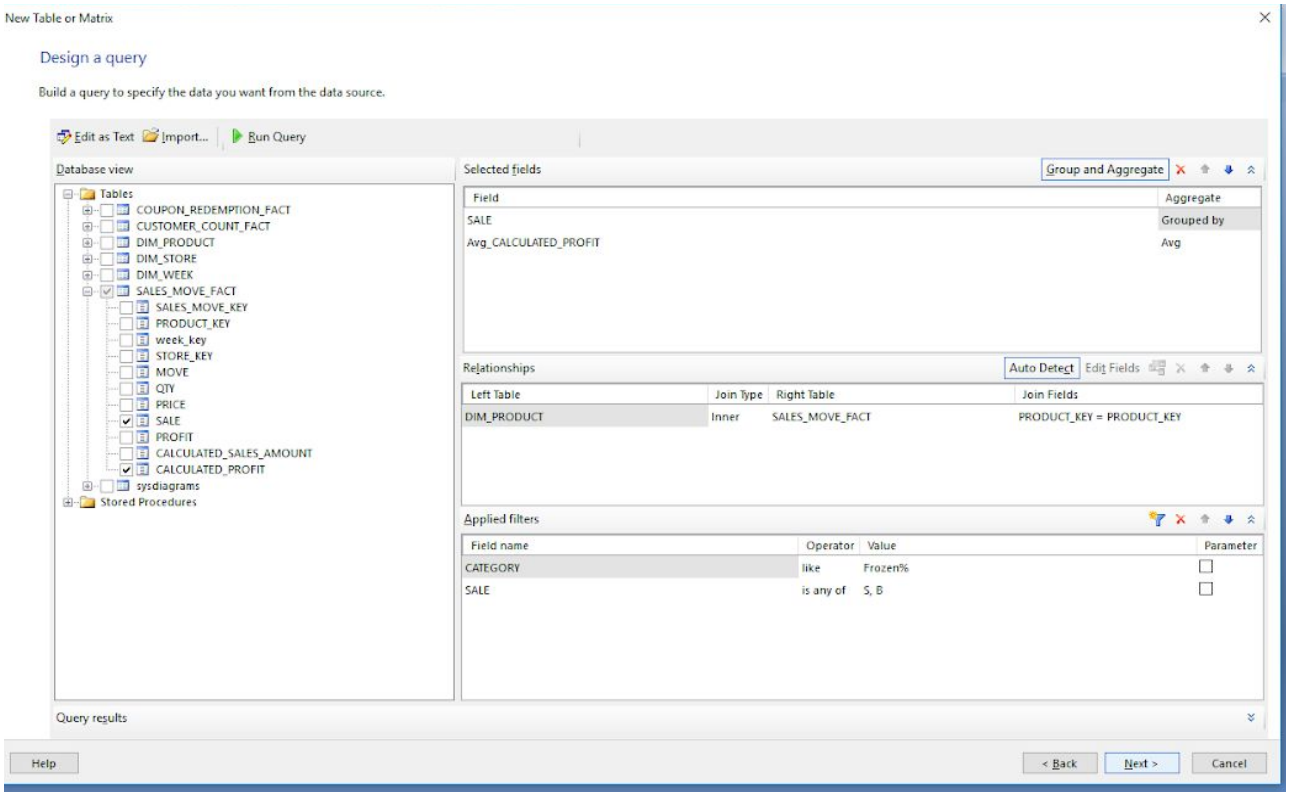
week number	CUSTOMER COUNT
330	12146
331	11214
332	8314
333	11103
334	10811
335	12833
336	13415
337	9753
338	11437
339	12224
340	11826
341	12237
342	12806
343	12496
344	10518
345	12179
346	11950
347	12177
348	13254
349	12127
350	12086
351	12418
352	11837
353	12214
354	11438
355	12801

6.4 Report using Report Builder (**Business question #2**)

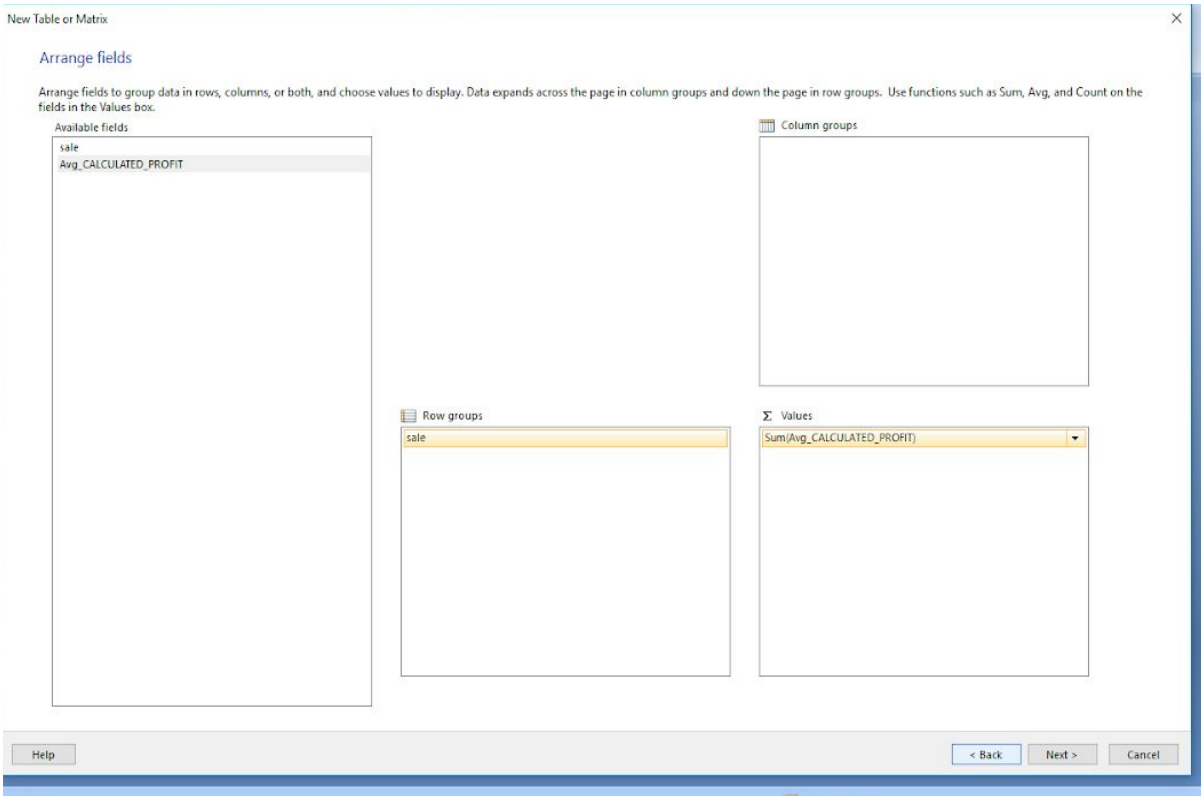
Step 1: Setting the data source



Step 2: Selecting tables and fields

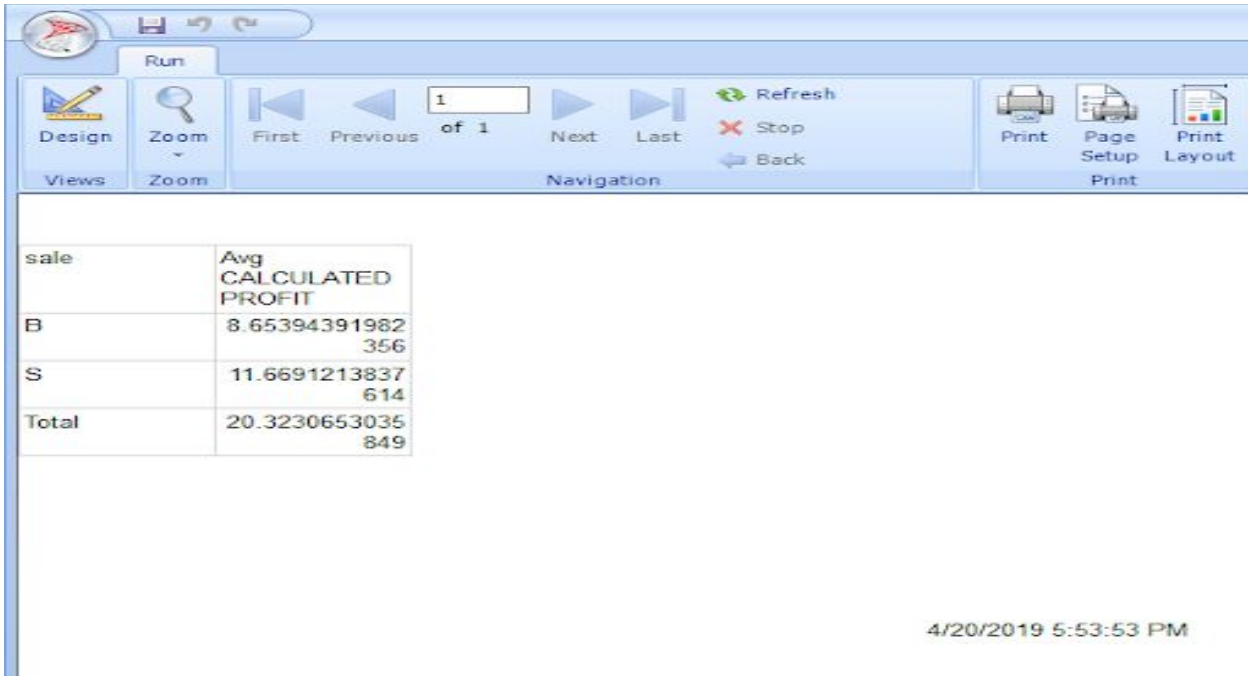


Step 3: Selecting the rows, columns and Values

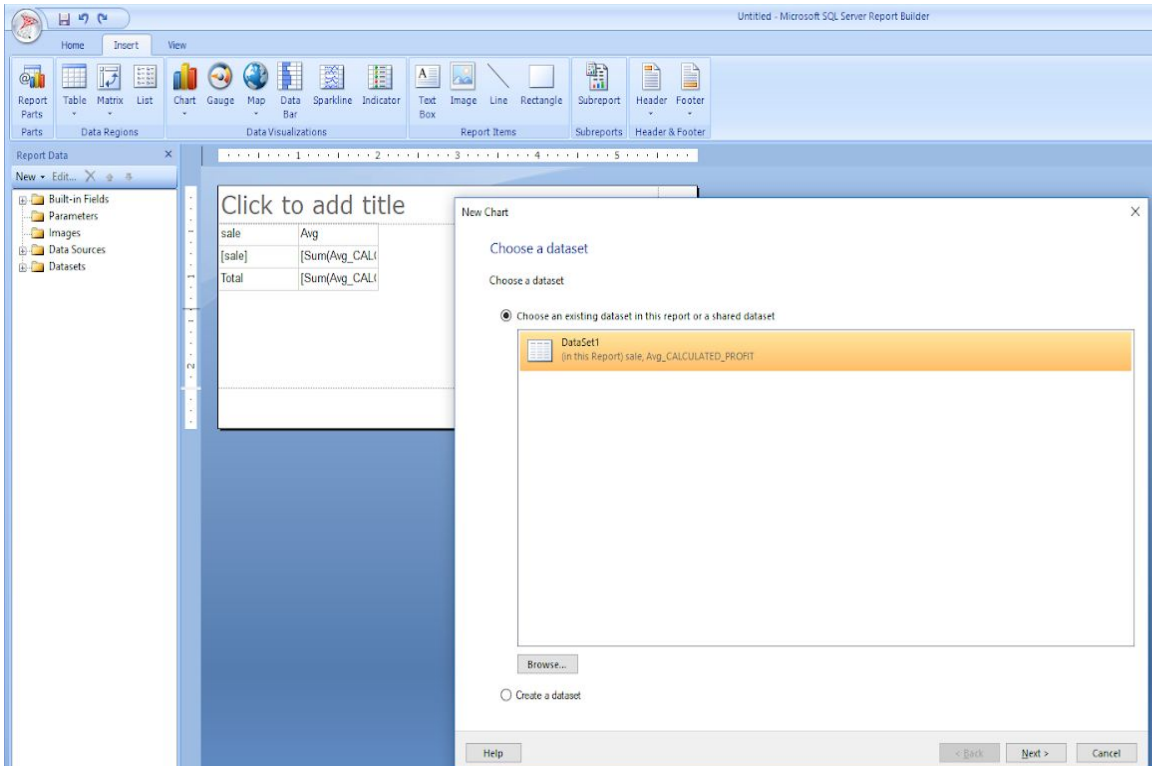


Step 4:

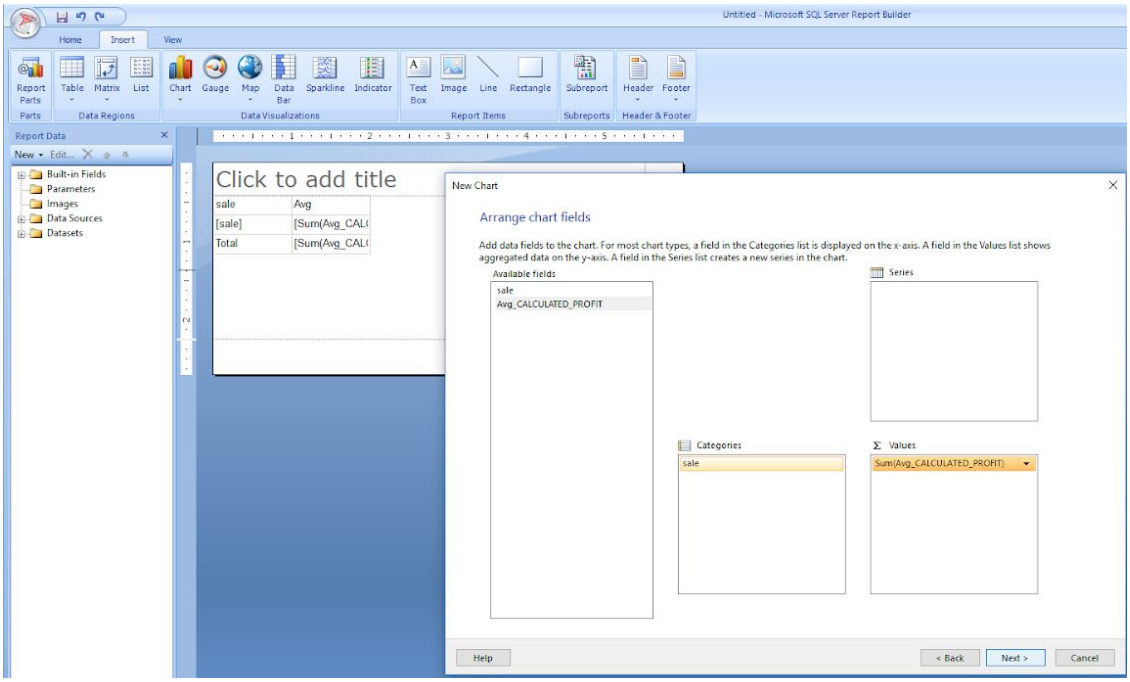
Step 5: Running query for actual data



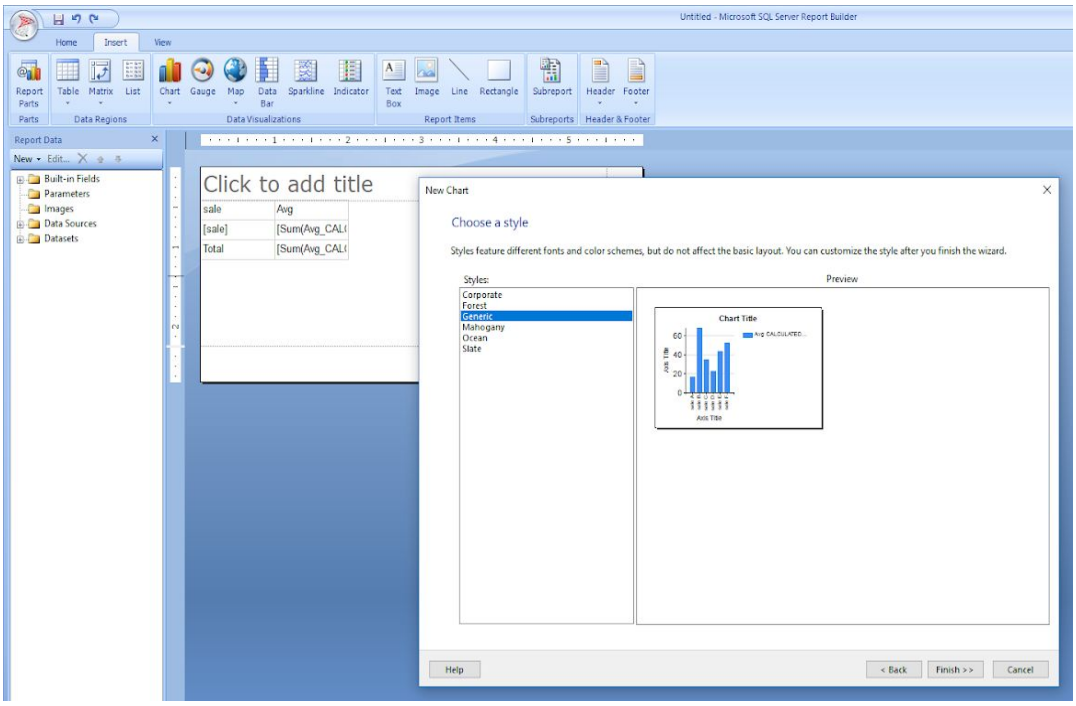
Step 6: Creating chart, selecting data source



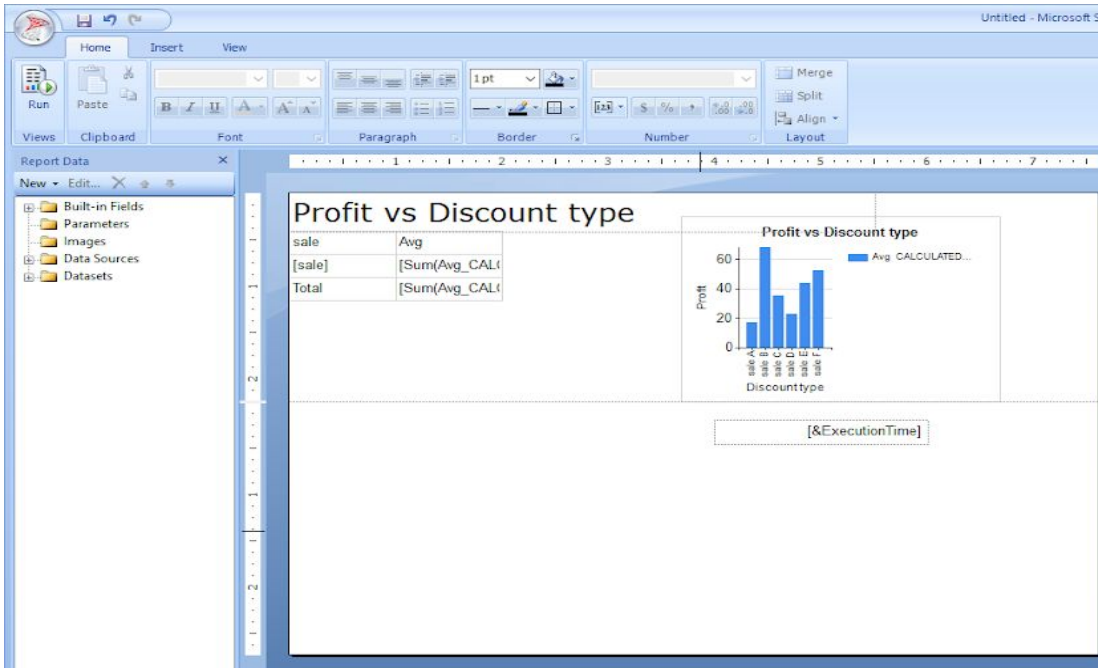
Step 7: Selecting rows, columns and values



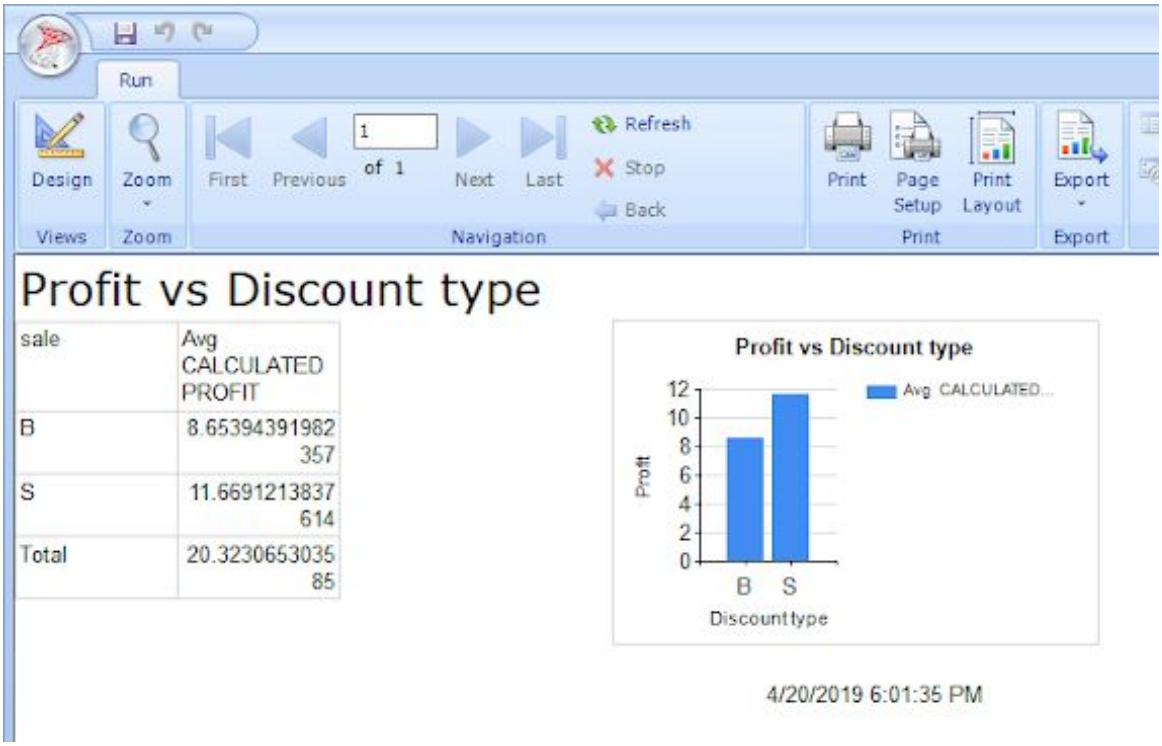
Step 8: Choosing the style



Step 9: Preview

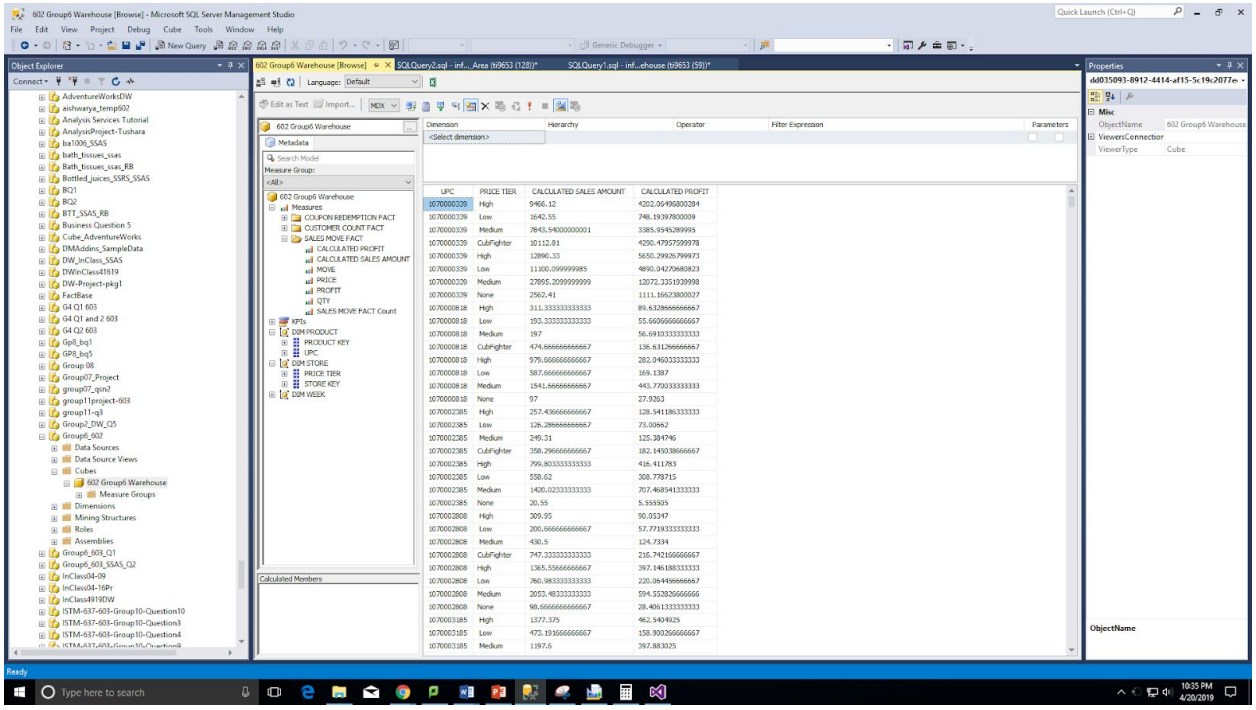


Step 10: Final Chart

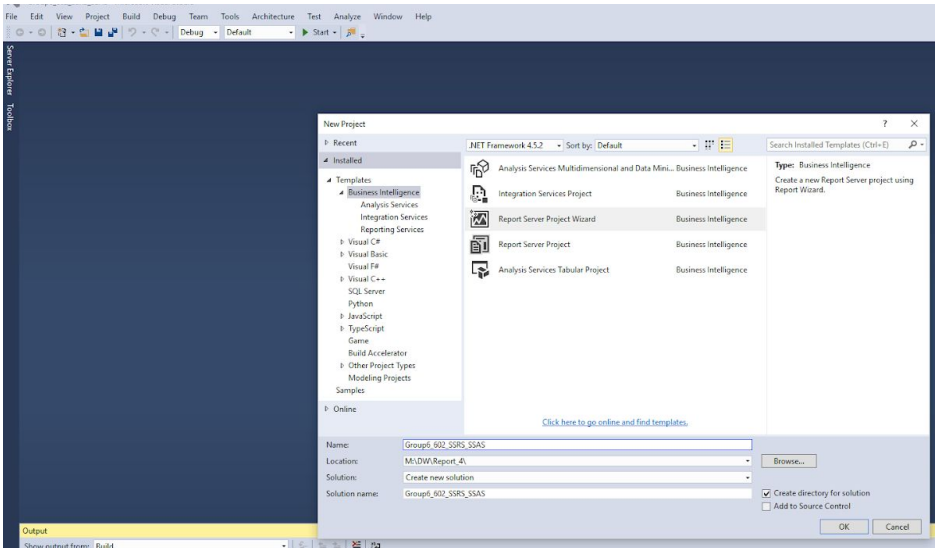


6.5 Report using SSAS and SSRS **(Business question # 3)**

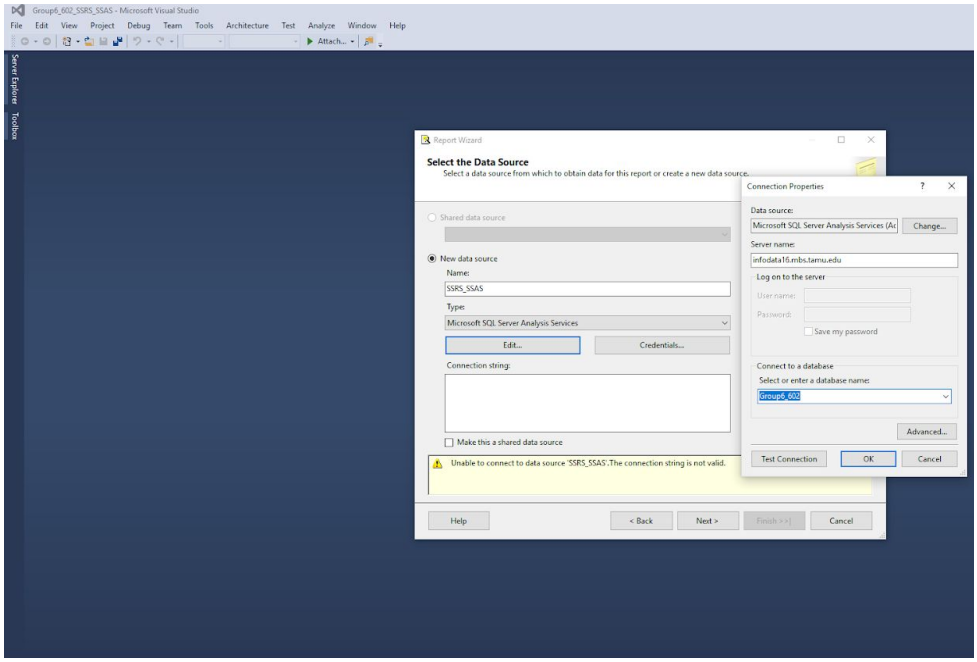
Step 1: Creating Cube & deploying in SQL Server (6.1)



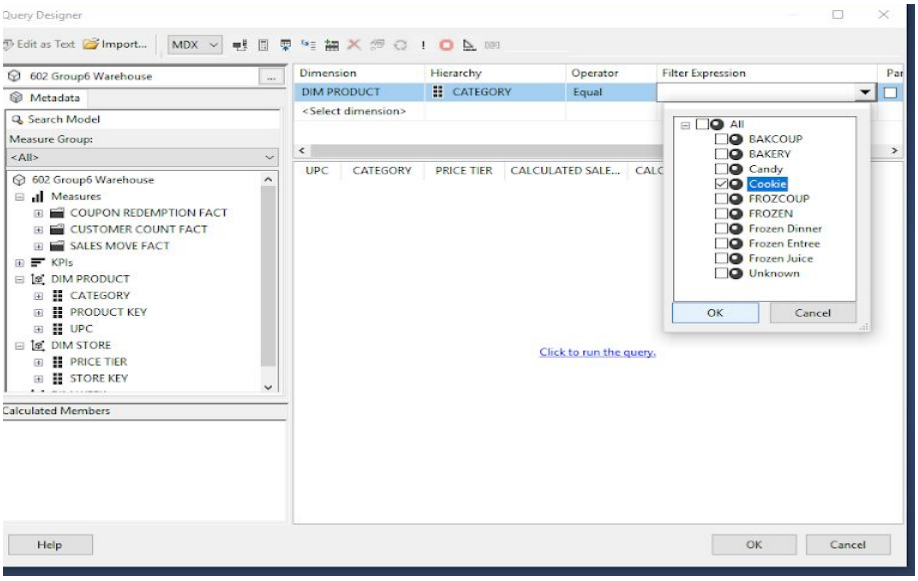
Step 2: Creating a reporting project

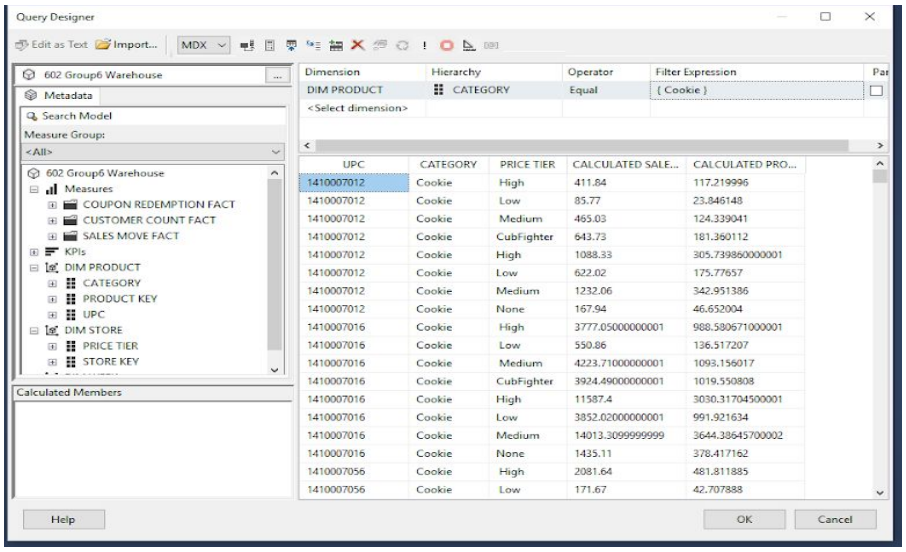


Step 3: Selecting data source

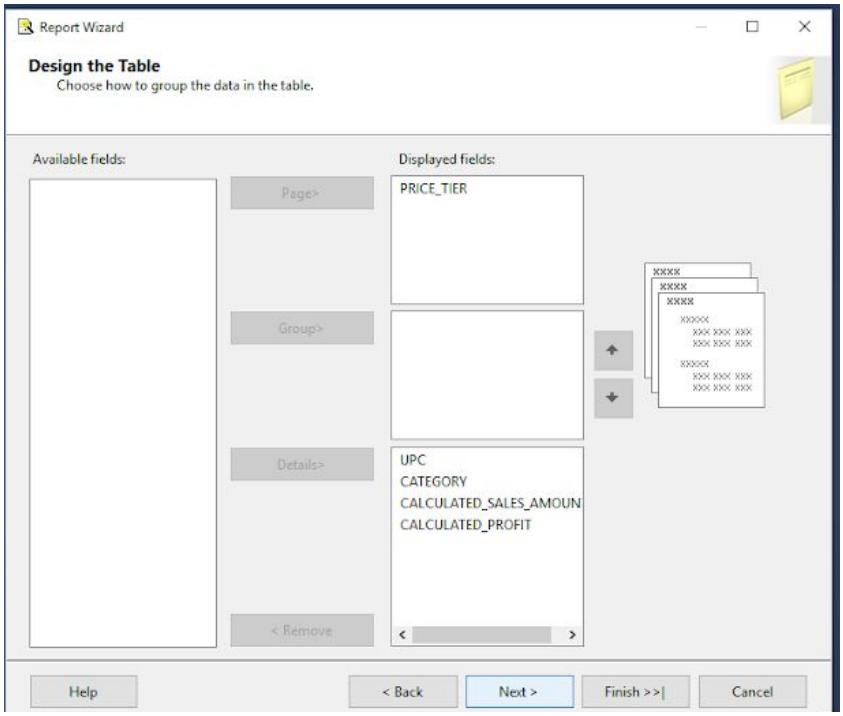


Step 4: Selecting data via query designer

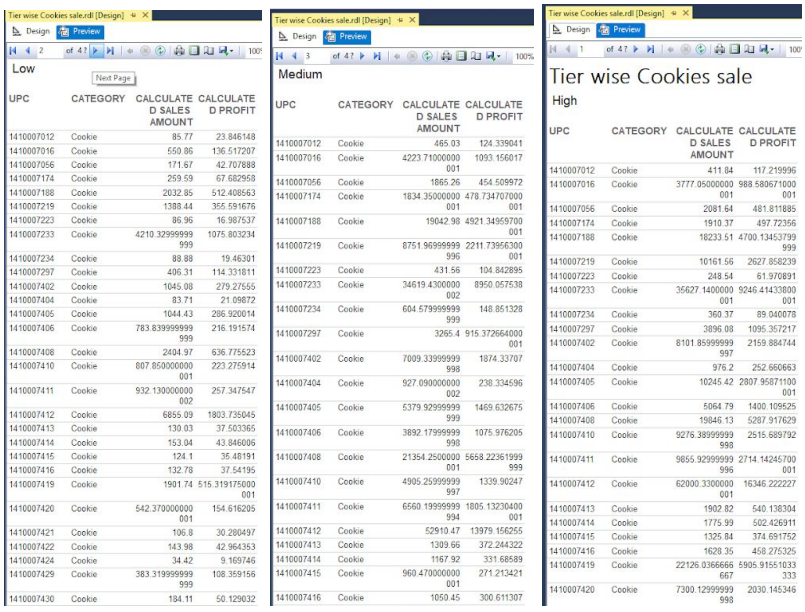




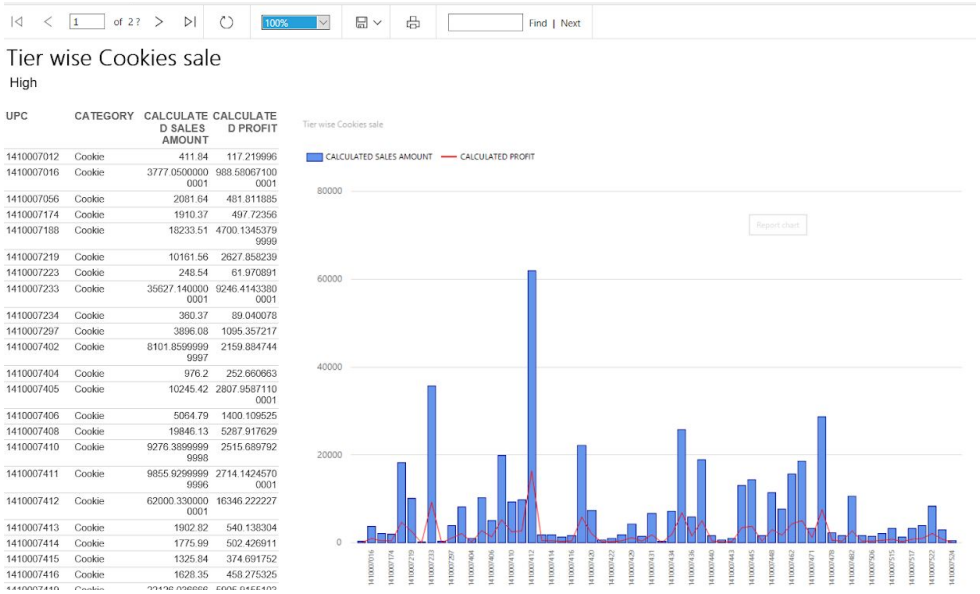
Step 5: Designing tables



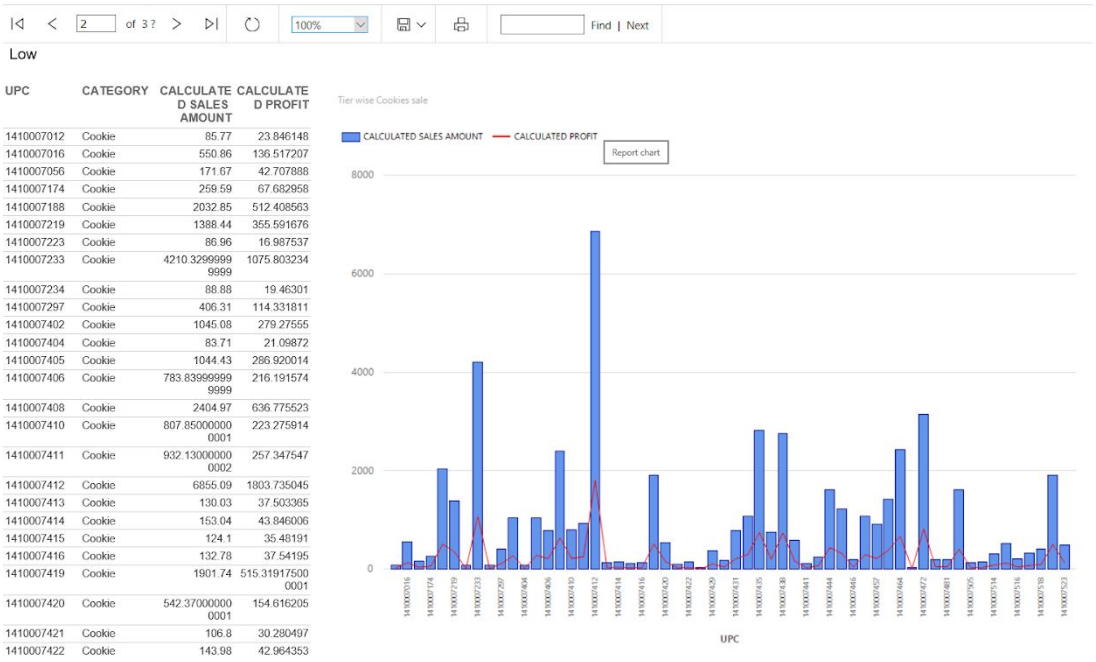
Step 6: Report (for low medium and high tier stores)



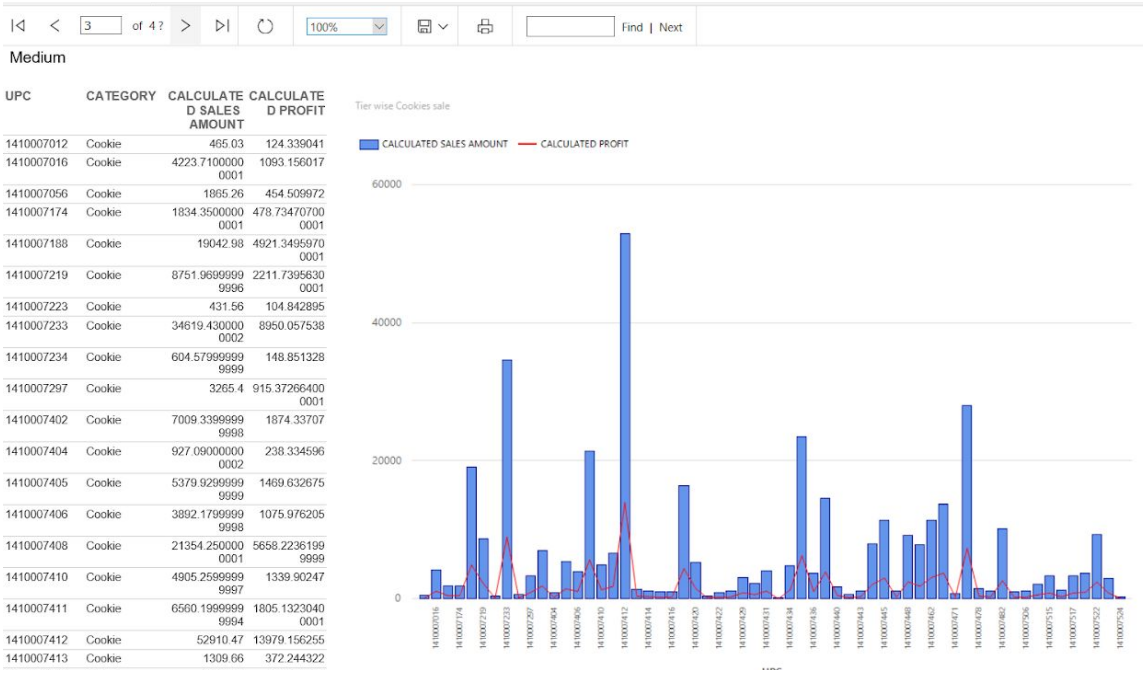
Step 7: Graph for High Tier



Step 8: Generating graph for low tier



Step 9: Generating report for Medium Tier

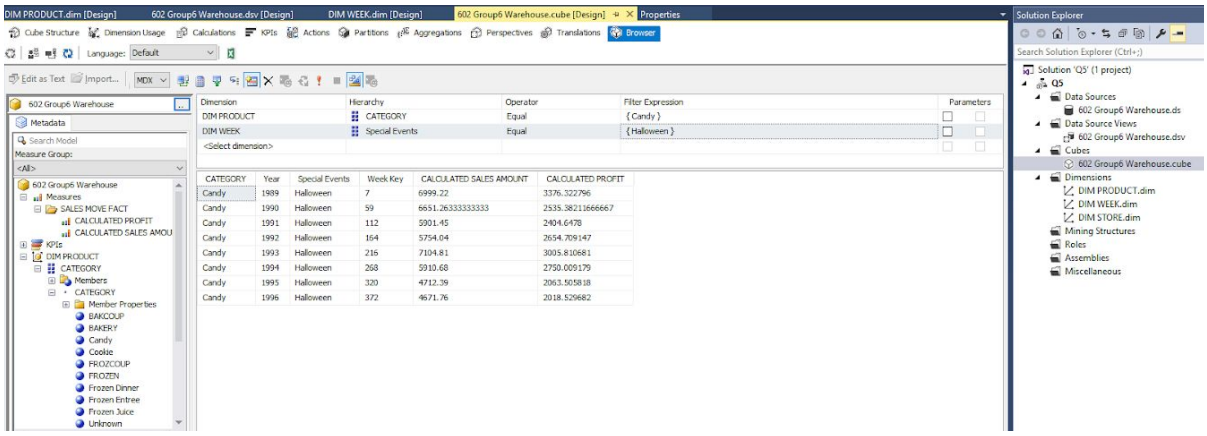


Medium

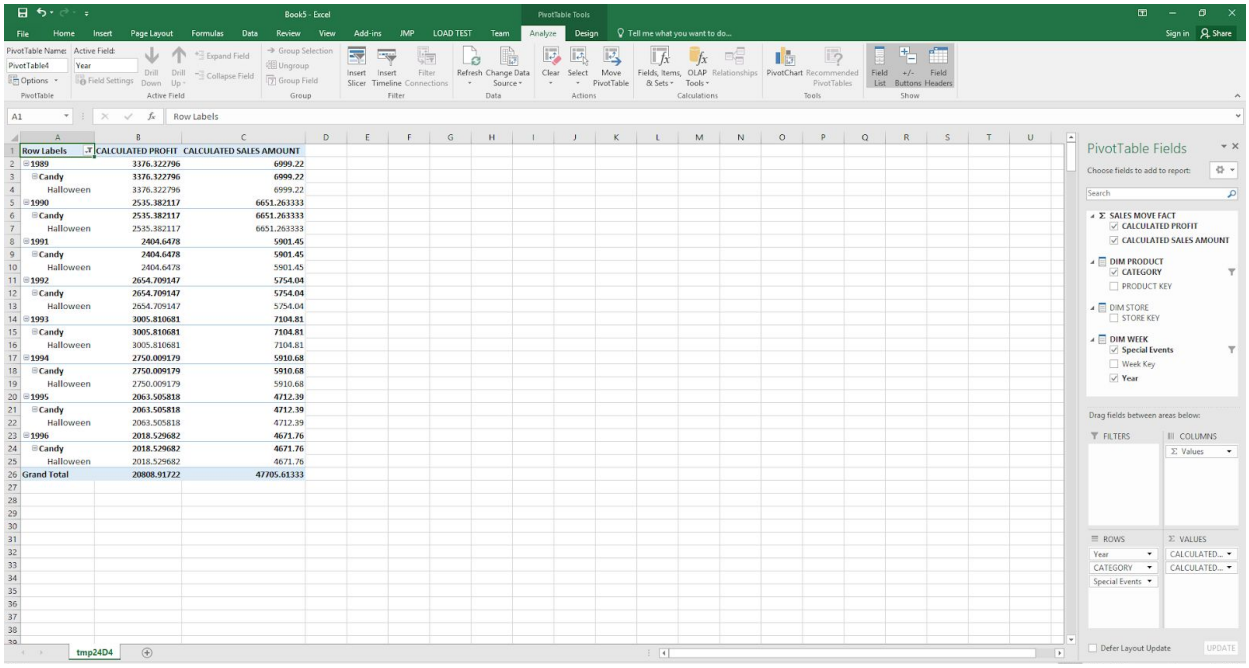
UPC	CATEGORY	CALCULATED SALES AMOUNT	CALCULATED PROFIT
1410007012	Cookie	465.03	124.339041
1410007016	Cookie	4223.71000000001	1093.156017
1410007056	Cookie	1865.26	454.509972
1410007174	Cookie	1834.35000000001	478.734707000001
1410007188	Cookie	19042.98	4921.349597000001
1410007219	Cookie	8751.969999999996	2211.739563000001
1410007223	Cookie	431.56	104.842895
1410007233	Cookie	34619.430000002	8950.057538
1410007234	Cookie	604.579999999999	148.851328
1410007297	Cookie	3265.4	915.372664000001
1410007402	Cookie	7009.339999999998	1874.33707
1410007404	Cookie	927.090000000002	238.334596
1410007405	Cookie	5379.929999999999	1469.632675
1410007406	Cookie	3892.179999999998	1075.976205
1410007408	Cookie	21354.250000001	5658.223619999999
1410007410	Cookie	4905.259999999997	1339.90247
1410007411	Cookie	6560.199999999994	1805.132304000001
1410007412	Cookie	52910.47	13979.156255
1410007413	Cookie	1309.66	372.244322

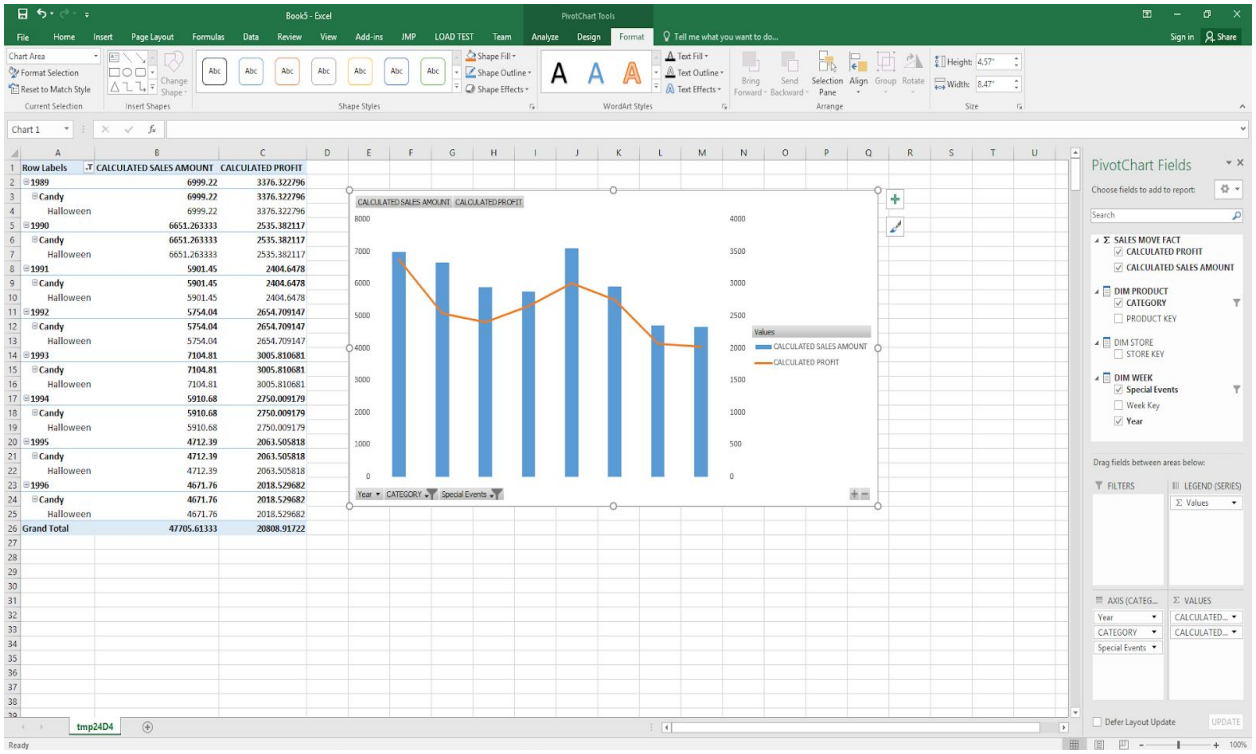
6.6 Report using SSAS (Cube + Excel) (**Business Question #4)**

Step 1: Generating cube (6.1)



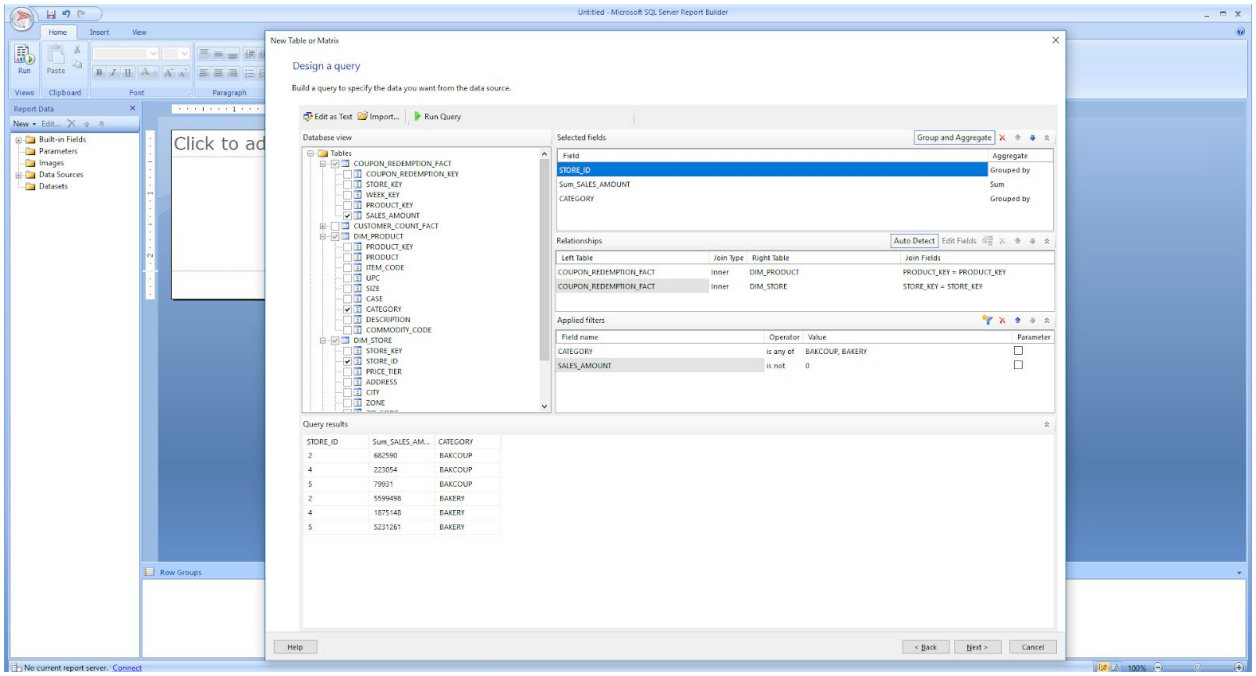
Step 2: Creating pivot



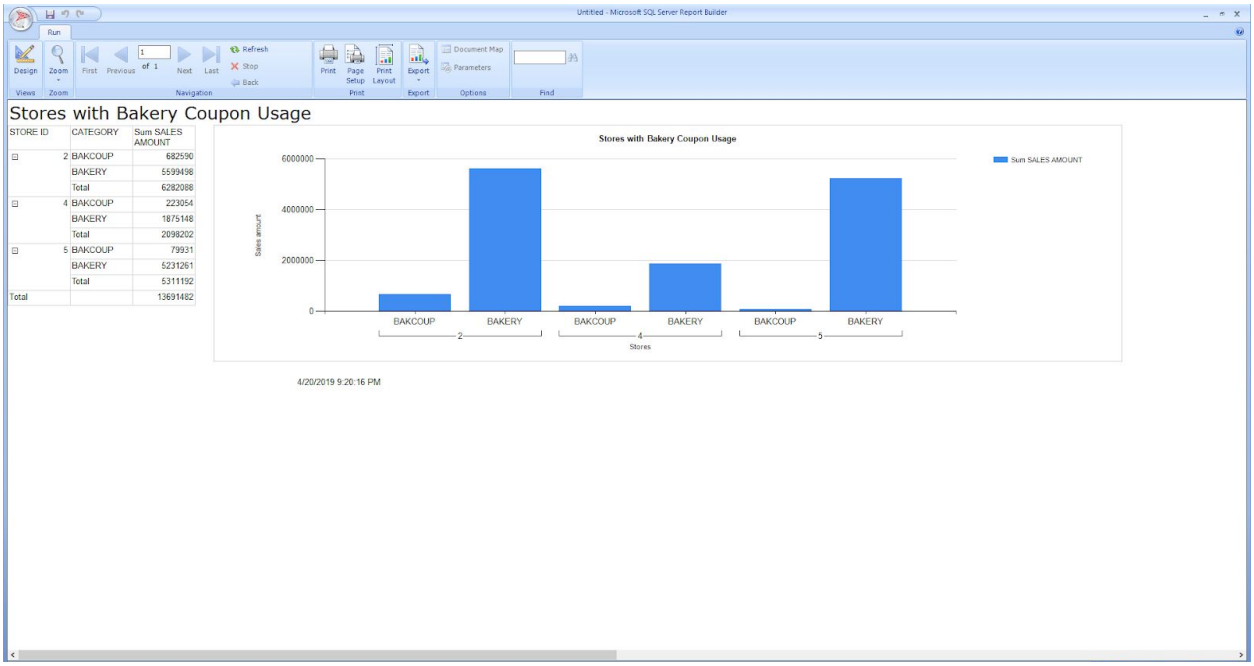


6.5 Report using Report Builder (Business question #5)

Step 1: Filtering required categories



Step 2: Report



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