Business Intelligence and Business Analytics

National College of Ireland

MSc. Data Analytics - Jan 2021

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PROJECT SPECIFICATION

Organization Name: The Toy Company

Background of the Organization:

This writeup focuses on the procedural business of The Toy Company, which is a fortune 100 company with 92nd rank. This company holds the wide global work force with Darius Adamczyk as the chairman and present CEO. Their major footprints are in aerospace, safety and productivity equipment, Building technologies, performance material toys. In fact, they are the pioneers of automation control where they have designed complex system design for better product performance and quality of the toys. Its consistent growth with a firm foundation makes the toy company a conglomerate company.

With regards to the customer service, the toy company performs better than its competitors. Their customers are not the common population but medium and large-scale enterprises and businesses. Each deal with an enterprise will gain the toy company millions of turn over per year. So, customer satisfaction and proper marketing strategies are their primary goals. To be a well-prepared organization the toy company is concentrating more on the Enterprise resource planning, Supply Chain Management and Customer Relationship Management by implementing new sales strategy plans and using CRM tools like Microsoft Dynamics 365 for Customer Relationship Management. Also, more dynamic visualization of supply chain data and sales data with tools like tableau will assist them with more on insights with accurate numbers and patterns. This will make their business processing more realistic and profitable.

STRATEGIES OF IMPLEMENTATION:

We have totally followed three strategies for implementation.

We have analysed and visualized the sales data that indicates on the total revenue made and the number of stocks in each product line that were sold in a yearly quarter.

It was further analysed with the Supply chain dataset, that indicates the raw materials like the Raw quantity of plastic, Steel, Glass, Wheel, Product progress and their demand in market as well.

The third strategy was to track and manage the potential customers and different prospect deals using Dynamics 365 CRM tool.

SCOPE OF THE PROJECT:

The main motivation of this project is to address 3 main issues in a business process management. They are the Customer relationship management, clear understating of the raw material supply and its column in sync with the demand and sales that happened in the same time.

Customer Handling:

Proper customer relationship and steady track of those records are most significant as they are going to be the potential long-term customers and customers with deal size of huge. So, such maintenance of pre sales team with proper proposal activities is needed.

Stock Maintenance:

Once the sales of products from different product line is performed then each product line must be updated on the required stock so as to have the production moving on and ready for the next sales.

Database:

This project aims to achieve the usage of cloud database storage for the dataset files. Initially they are stored in AWS S3 storage and then from there the data is retrieved into AWS RDS MySQL database as a Relational storage area.

PROJECT OBJECTIVES:

The goal of this project is to,

- Improvise the Customer communication and tracking the same using a tool using the customer dataset.
- Retain the Potential clients and attract new customers with best customer service across the country.
- Eschew wastage of raw materials and take suitable actions to overcome this problem.

DATABASE DESIGN:

Database design is important process in which designer determines what type of data should be loaded into database and how different entity are related. Database design is vital to store and retrieve data efficiently.

For our work we have design the database as per our business. Data flow diagram is as follow:

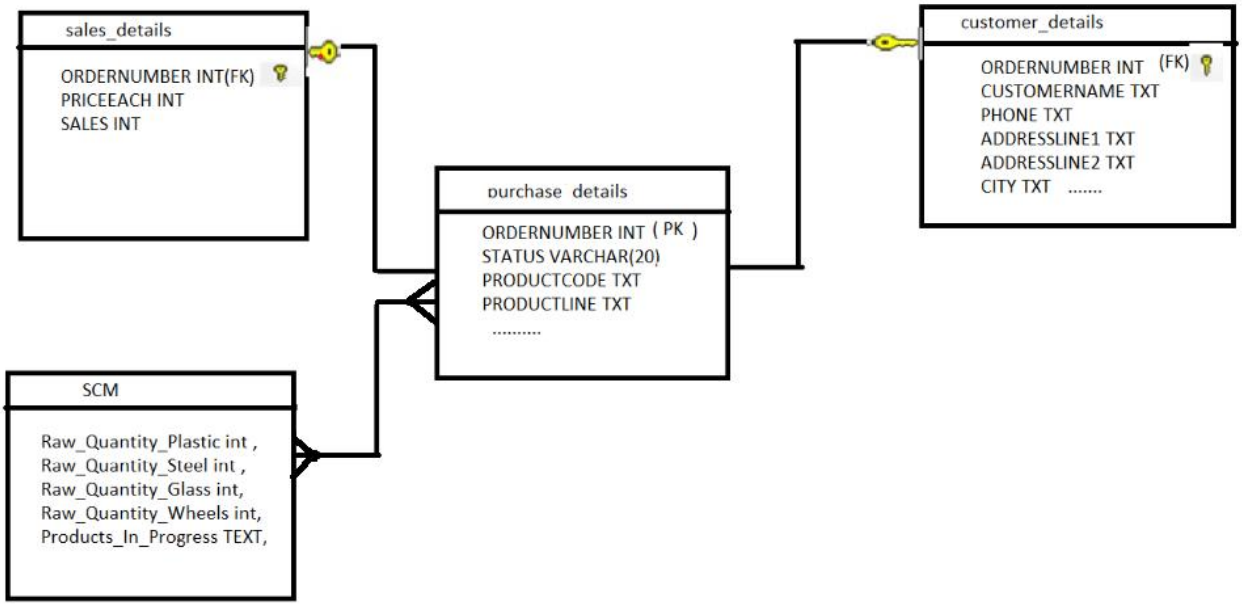


Fig. Database Design

We have created 'BIBA_Project' database on cloud hosted MySQL server. This database holds all the data of organization in different tables. Relationship between tables is established. Organization data is stored in four different tables with common attribute in each of table. Relation between tables is created through this attribute.

Tables details: This table holds all the details regarding customer purchase.

Create query for purchase_details table:

```
'''CREATE TABLE purchase_details(
            ORDERNUMBER INT NOT NULL,
            STATUS VARCHAR(20),
            PRODUCTCODE TEXT,
            PRODUCTLINE TEXT,
            ORDERLINENUMBER INT,
            ORDERDATE TEXT,
            QTR_ID INT,
            MONTH_ID INT,
            YEAR_ID INT,
            MSRP INT,
            QUANTITYORDERED INT,
            PRIMARY KEY (ORDERNUMBER));'''
```

'ORDERNUMBER' will be generated when customer make purchase. This is column contains unique values and no null values. That's why we are using column to uniquely identify the customer. We have 'PRIMARY KEY' constraint on this column.

Create query for customer_details table:

```
'''CREATE TABLE customer_details(
            ORDERNUMBER INT,
            CUSTOMERNAME TXT,
            PHONE TXT,
            ADDRESSLINE1 TXT,
            ADDRESSLINE2 TXT,
            CITY TXT,
            STATE TXT,
            POSTALCODE TXT,
            COUNTRY TXT,
            TERRITORY TXT,
            CONTACTLASTNAME TXT,
            CONTACTFIRSTNAME TXT,
            DEALSIZE TXT,
            Demand TXT,
            email TXT
            FOREIGN KEY (ORDERNUMBER) REFERENCES purchase_details(ORDERNUMBER)
            )'''
```

This table object in database holds information about customer. It has ORDERNUMBER column which is belonging to purchase_details table. It is being used as 'FOREIGN KEY' in this table. Through this column relation is established between customer_details and purchase_details tables.

Create query for sales_info table:

```
'''CREATE TABLE sales_details(
            ORDERNUMBER INT,
            PRICEEACH INT,
            SALES INT
            FOREIGN KEY (ORDERNUMBER) REFERENCES purchase_details(ORDERNUMBER)
            )'''
```

Table object sales_details in the database stores information about the sales. This table has ORDERNUMBER column which is used as FOREIGN KEY referring to purchase_details.

Create query for SCM table:

Data related to supply chain and management is stored in the SCM table. It has many to many relations with purchase_details table.

```
'''CREATE TABLE SCM(
            Raw_Quantity_Plastic int ,
            Raw_Quantity_Steel int ,
            Raw_Quantity_Glass int,
            Raw_Quantity_Wheels int,
            Products_In_Progress TEXT,
            Products_In_Inventory int,
            Year int,
            Quareter TEXT,
            ProductLine TEXT,
            Source TEXT,
            Destination TEXT)'''
```

8. DATASET DESCRIPTION:

Totally three datasets have been chosen:

1) SCM dataset (Supply chain dataset) with the following columns

```
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Raw Quantity_Plastic  84 non-null     int64
 1   Raw Quantity_Steel    84 non-null     int64
 2   Raw Quantity_Glass    84 non-null     int64
 3   Raw Quantity_Wheels          84 non-null     int64
 4   Products_In_Progress  84 non-null     object
 5   Products_In_Inventory 84 non-null     int64
 6   Year                  84 non-null     int64
 7   Quareter              84 non-null     object
 8   ProductLine           84 non-null     object
 9   Unnamed: 9            0 non-null      float64
 10  Source                84 non-null     object
 11  destination           84 non-null     object
```

2) CRM dataset (Customer Relationship Management)

```
13  CUSTOMERNAME       5000 non-null   object
14  PHONE              5000 non-null   object
15  ADDRESSLINE1       5000 non-null   object
16  ADDRESSLINE2       2479 non-null   object
17  CITY               5000 non-null   object
18  STATE              2403 non-null   object
19  POSTALCODE         3761 non-null   object
20  COUNTRY            5000 non-null   object
21  TERRITORY          3366 non-null   object
22  CONTACTLASTNAME    5000 non-null   object
23  CONTACTFIRSTNAME   5000 non-null   object
24  DEALSIZE           5000 non-null   object
25  Products_progress  5000 non-null   object
26  Demand             5000 non-null   object
27  email              5000 non-null   object
```

3) Sales Data set

#	Column	Non-Null Count	Dtype
0	ORDERNUMBER	5000 non-null	int64
1	QUANTITYORDERED	5000 non-null	int64
2	PRICEEACH	5000 non-null	float64
3	ORDERLINENUMBER	5000 non-null	int64
4	SALES	5000 non-null	float64
5	ORDERDATE	5000 non-null	object
6	STATUS	5000 non-null	object
7	QTR_ID	5000 non-null	int64
8	MONTH_ID	5000 non-null	int64
9	YEAR_ID	5000 non-null	int64
10	PRODUCTLINE	5000 non-null	object
11	MSRP	5000 non-null	int64
12	PRODUCTCODE	5000 non-null	object

PROJECT IMPLEMENTATIONS

INTRODUCTION:

Now a days there is increased demand in the toys as the population grows and their requirement too increased. So, high end companies like The Toy Company have started investing in many of sales development and customer relationship development. So, as specified in the final proposal report, we have focused on improving the supply chain management, customer relationship management and analysis of Sales data using tableau visualization. This will help the organization to improvise on revenue.

BUSINESS MODEL: B2B Business Model:

The Toy Company follows the Business-to-Business model, where their service is being provided to another business as a customer and not reaching to the end users. The target audience for every B2B is different and once the deal is successful the products will reach small or medium or large-scale retailers and post that, the products will meet the end users. Each B2B has its own architecture of supply chain where every product pass through.

Cloud Technology & Data Flow:

We have used AWS S3 Cloud Storage and AWS RDS MySQL Database server for this project.

First, instead of taking .csv files locally, we have uploaded .csv files into AWS S3 Cloud Storage and wea are using pandas to pull this data into the Data Frames. Now, we are using these Data Frames to push records into AWS RDS MySQL database.

Finally, we are fetching data directly from AWS RDS MySQL database server for our workbook. We have also published our workbooks on Tableau Online.

Tableau Online Links:

ERP: https://dub01.online.tableau.com/#/site/sanketsonu/workbooks/594063/views

SCM: https://dub01.online.tableau.com/#/site/sanketsonu/workbooks/594062/views

Implementation in Tableau:

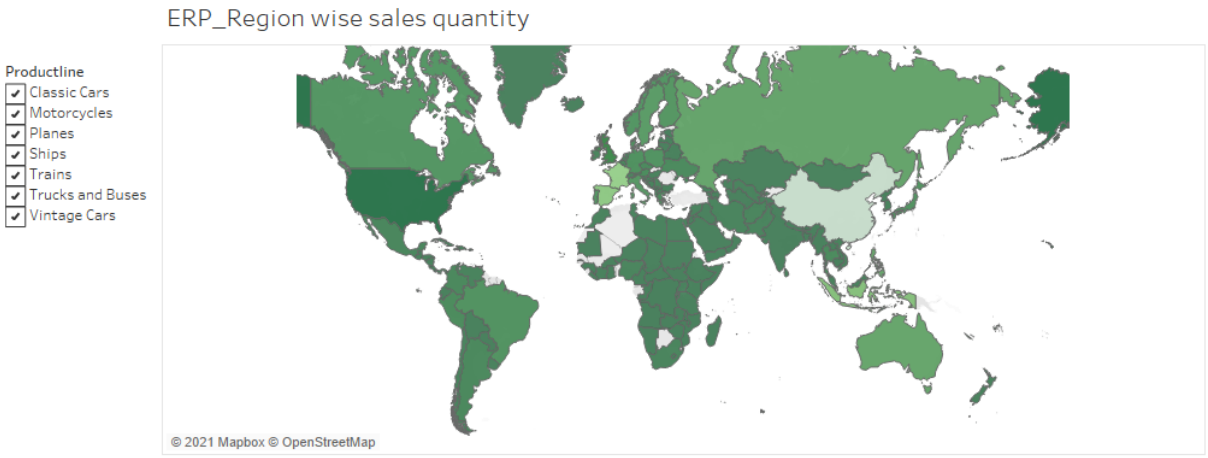
A business has many processes, it is hard to explain a certain aspect of the business without Visualization. Data plays a crucial role and can be explored more for its hidden insights. This hidden insight can visualize in such a way that it will be self-explanatory. In this project, we are using Tableau for visualization. We have analysed and visualized data and created 5 dashboards, as below:

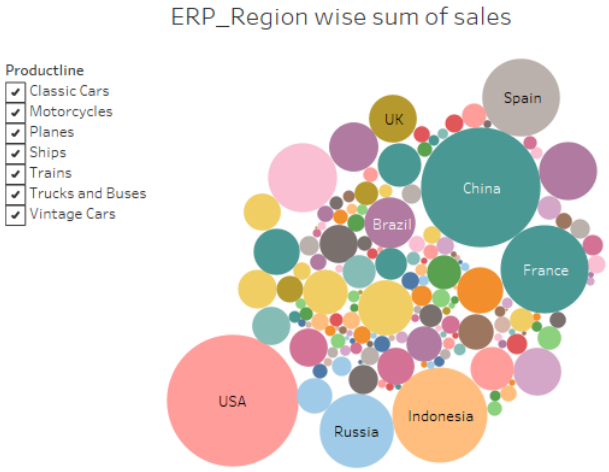
Fig. Implementation using Tableau

- Executive Dashboard
- Manager Dashboard
- Retail Dashboard
- SCM Dashboard 1
- SCM Dashboard 2

1. Executive Dashboard:

The executive dashboard is used to demonstrate insights about the entire business. This dashboard is mainly used by people working at higher hierarchy level like CEO, Stakeholders, Regional Managers, and other members. Executive Dashboard contains information about overall profit, loss, and sales region wise.





Aspects of Executive Dashboard:

- **ERP_Region wise sales quantity:** This chart depicts region-wise Sales in quantity for all the Products like Classic Cars, Motorcycles, Planes, Ships, Trains, Trucks and Buses, and Vintage Cars. It can be used to show Sales in a particular Country. Filters can be used for 'Productline' to checks the Number of Quantity sold for each product across the world.
- **ERP_Region wise Sum of sales:** This chart depicts region-wise total sales in Euro. Fiters can be used for 'Productline' to check total sales for each product across the world.

Business Insights:

- Overall, sales of all products in the USA are higher when compared to any other country. After that China, Indonesia, France, Spain, and Russia are the next 5 top countries with the most sales.
- However, when looking at quantity insights, it can be clearly observed that China is on the top spot for the greatest number of products sold and Russia is next.
- USA is in the top place for total sales, when looking at Classic and Vintage Cars. These 2 car types have maximum Sales among all products. This can be concluded that demand for both Classic and Vintage Cars is more than any other product.
- Trains are the least selling products.

2. Manager Dashboard:

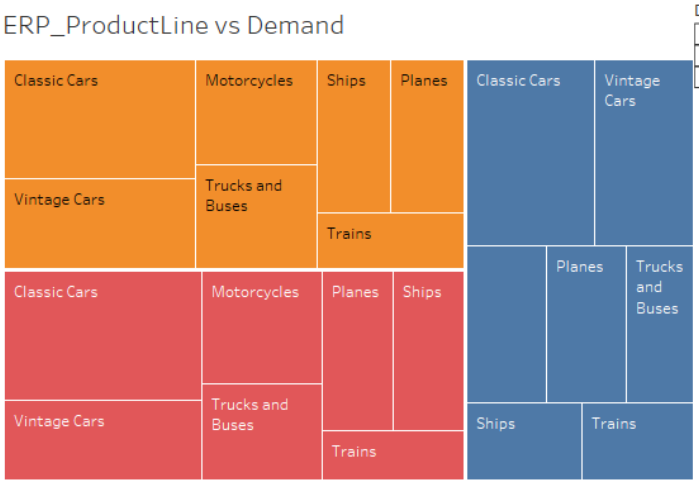
Manager Dashboard is very important to check and keep track of overall insights. It is equipped with various filters and charts for in-depth insights across the entire company. It has various customization, to analyse important key values.

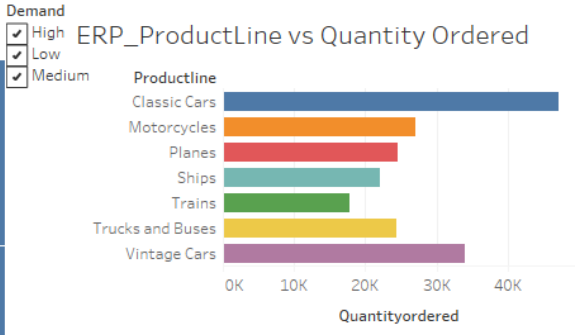
Aspects of Manager Dashboard:

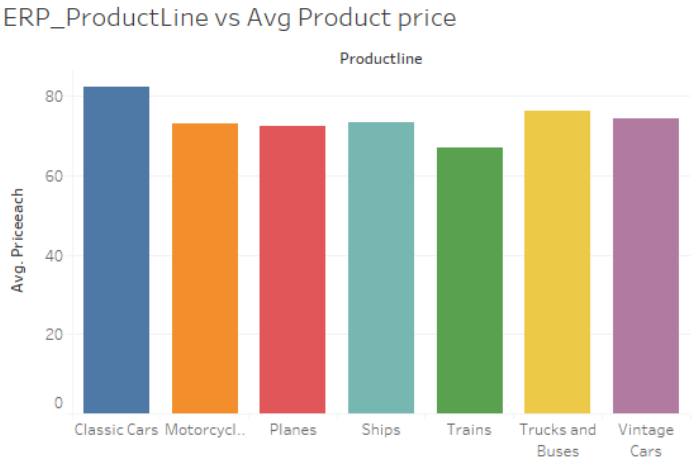
- **ERP_Productline vs Demand:** This chart depicts the demands of each product in High, Medium, and Low demand level. This demonstrates that Classic and Vintage Cars are the most profitable product.
- **ERP_Productline vs Quantity Ordered:** This chart demonstrates the total quantity order for each product. It can be observed that Classic and Vintage Cars have the most ordered, and Train is the least ordered product.
- **ERP_Productline vs Avg Product Price:** This chart demonstrates the average product price for each product. It can be observed that Classic Cars have a maximum average price, and Train is having a minimum average price.
- **ERP_Productline vs Sum Product Price:** This chart demonstrates the total sum of product price. This shows that Classis Cars is dominating the market with total sales and next Vintage Cars are second-most selling product.

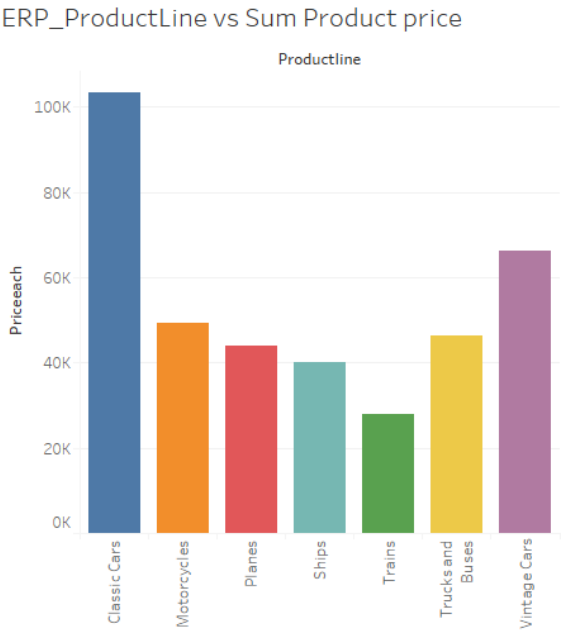
Business Insights:

- Overall, Classic and Vintage Cars are the most sold products among all with maximum profit.
- Train is the least sold product. However, it is also having good sales on average.
- Demand for Classic and Vintage Cars are most in the market, however, the average price of all products are around 70-80 Euros.
- Classic Cars have a maximum average price, i.e., 82.35 Euros and Train is having a minimum average price of 67.01 Euros.
- Overall, Classic Cars have the most total sales i.e., 1,03,271 Euros and Vintage Cars are next with total sales of 66,389 Euros. The train has the least total sales i.e., 27,810 Euros.







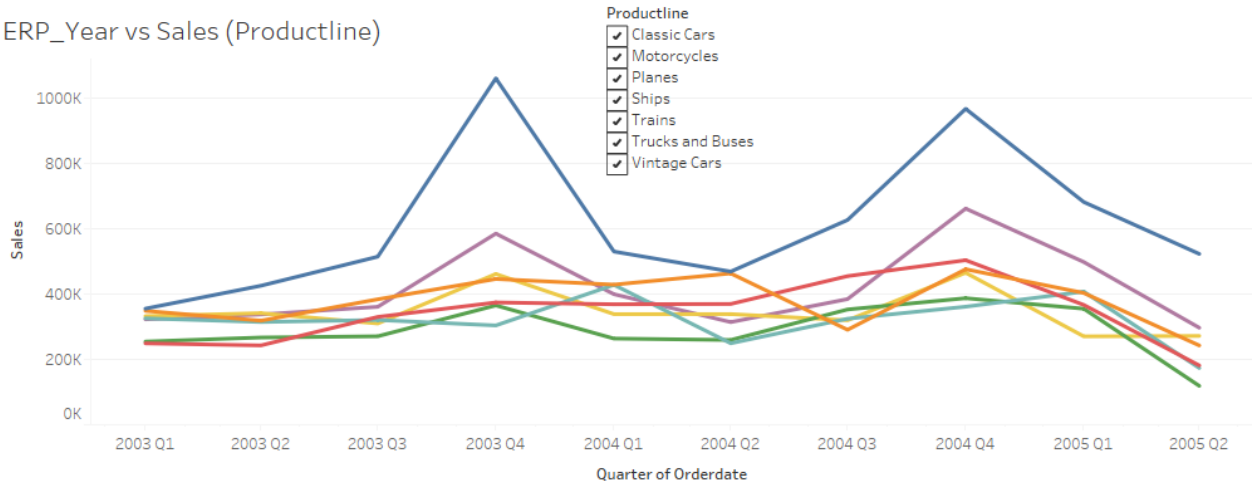


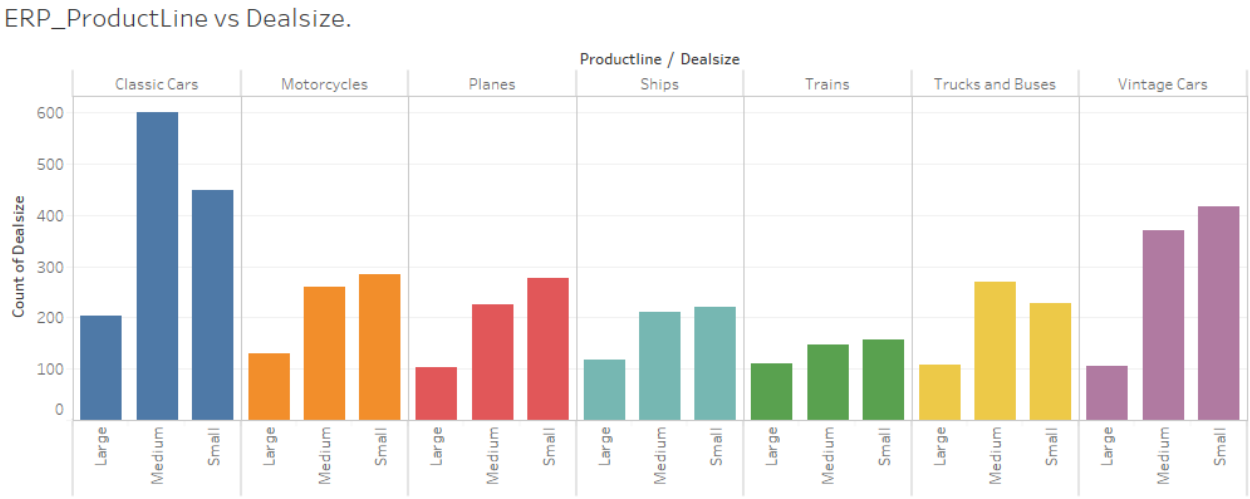
3. Retail Dashboard:

Retail Dashboard demonstrates details about various parameters and insights. This includes Deal Size and Sales pattern based on months. It can be used to keep track of sales for a particular Quarter of the year. Deal Size is split into 3 subs like Small, Medium, and Large.

Aspects of Retail Dashboard:

- **ERP_Year vs Sales:** This chart demonstrates the sales of each product based on the Quarter of years. Filters can be used for 'Productline' to have more clutch on sales insight.
- **ERP_Productline vs Dealsize:** This chart demonstrates the deal size of products in term of Small, Medium, and Large.



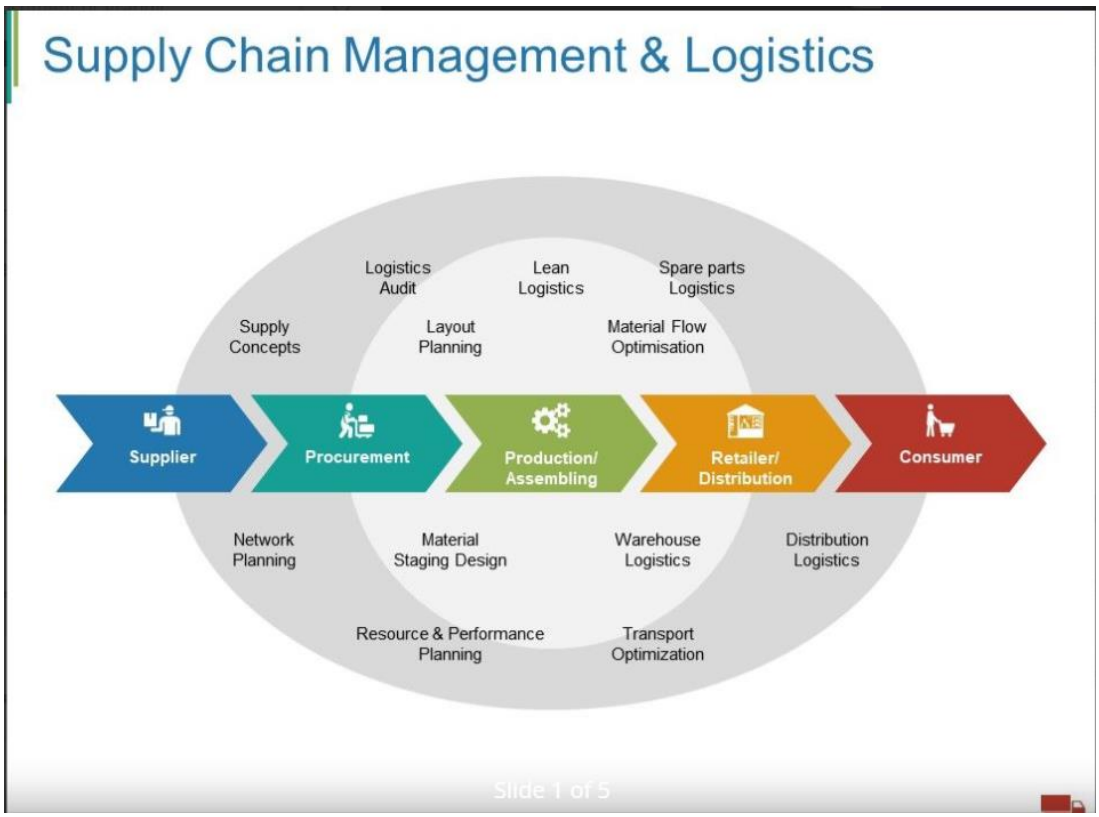


Business Insights:

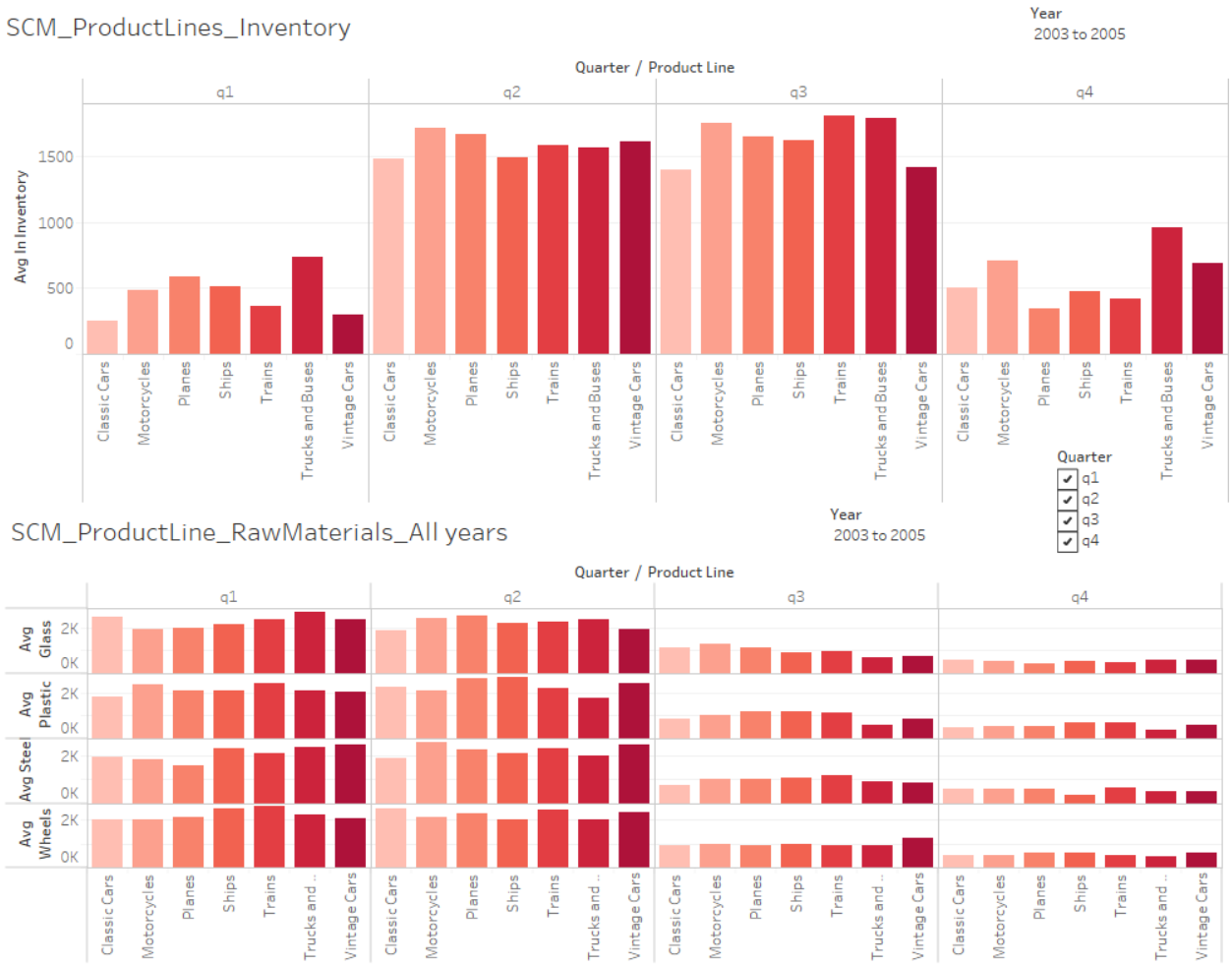
- It is clearly observed that sales are least in Quarter 1 and gradually increased over months and from Quarter 3, sales take sudden rise and start falling again at the end of Quarter 3 and keeps on falling until Quarter 4.
- This also demonstrated that Raw Materials used for production should be more during Production time in Quarter 1 and 2. In Quarter 3 and 4, Raw material is the least required as most of the released products are sold and again from Quarter 1 company focuses on manufacturing new products as per the demand.
- Classic and Vintage Cars are having maximum deal size. Even, smallest deal size of Classic Cars is the 2nd largest deal among all products. The train is having the least deal size for all Small, Medium, and Large Deals.

SUPPLY CHAIN MANAGEMENT:

- Supply chain and management is the centralized system that manages and controls the moment of raw materials from warehouse to till final product is moved to market. Typically, it is process of conversion of raw material into product.
- Through SCM process, organization tries to reduce cost involved in supply of items and its transformation. Ideally, SCM focuses on managing manufacturing, shipping and issuance of product activities, thereby mitigating useless expenses and making final product delivered to customer as soon as possible. To achieve SCM goals, we must observe the inventories closely, distribute product efficiently and log sales details properly. Results of SCM implementation is seen every end product that comes to market.
- We have implemented dashboards for SCM process through Tableau software. Through this we have tracked the inventory details of each raw materials, products in production and end products throughout the year. Then we tried to get the insight of quantity of material, final product available in each quarter. We also tried to analyse the how organization is preparing and planning production to meet the demand thereby helping company in finding faults and improving profit with lower.
- Flow chart of Supply chain management and Logistics:



SCM Dashboard 1:

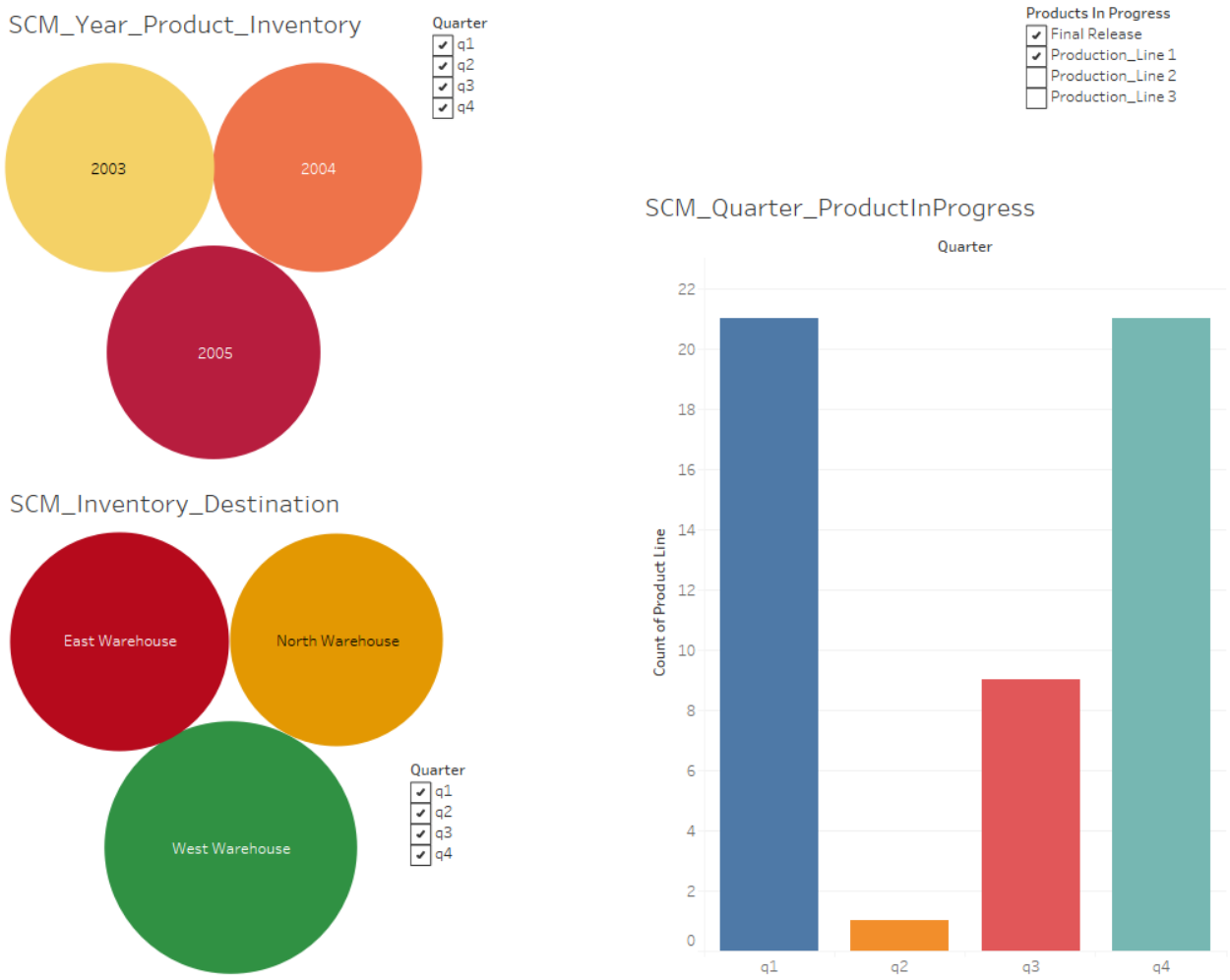


- Above dashboard gives information about the inventory details of each raw material per quarter for each product line. This dashboard can be used by inventory manager and other higher authorities of warehouse of respective product line.

Business Insights:

- As companies' products sales activities will be high during the third quarter of every year, it would be good for company if it keeps production activities high during first two quarter and should have large number of products in the warehouse.
- In SCM_ProductLines_Inventory bar graph we can see that company's activities are in line with plan. It is having high number of end final products in the inventory during end period of second quarter and throughout quarter three.
- From the SCM_Productline_Rawmaterials, we can see the average number of raw materials required for each product line are high during first two quarter of year, thereafter, count of raw material availability decreases. During third and fourth quarter warehouse will be holding less quantity of raw material.
- So, Inventory manager and other authorities of business can leverage this dashboard to track the raw material and final product availability in the warehouse.

SCM Dashboard 2:



- This dashboard can be used by managers to understand count of materials in different production phase as well as year wise final product availability in warehouse.

Business Insights:

- From figure SCM_year_Product_Inventory, we can understand the total final products produced by the company.
- Bar plot SCM_Quarter_ProductInProgress help in getting information about count of different production status like Final release, Production 1, Production 2, Production 3 in each quarter.
- Packed bubbles in the plot SCM_Inventory_destination helps in understanding availability of final products in different warehouses. There are three different warehouses like East, North, West warehouses. All products are stored in Central warehouse and distributed to different warehouses.

IMPLEMENTATION IN DYNAMIC 365 CRM (Customer Relationship Management):

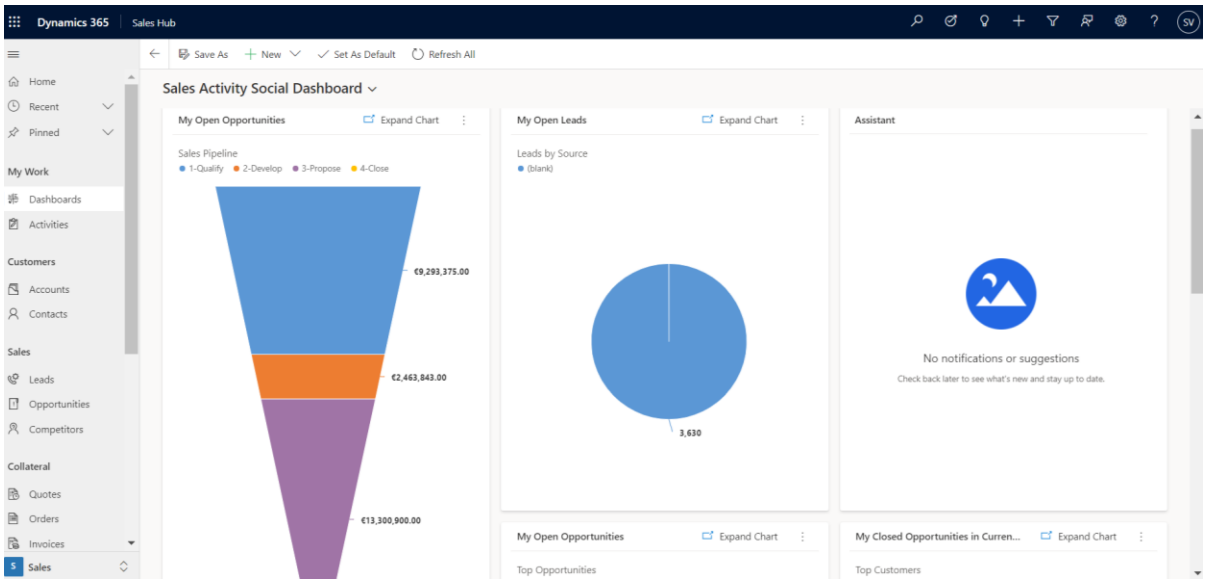
- CRM is a sequence of strategies and tasks that every organization can use to manage their customers and prospects. This in turn helps the business by improving their relationship with customers and increase the chances of making them a loyalty customer. This increases over all business profit.

We have used Microsoft Dynamic 365 as a CRM tool for our project.

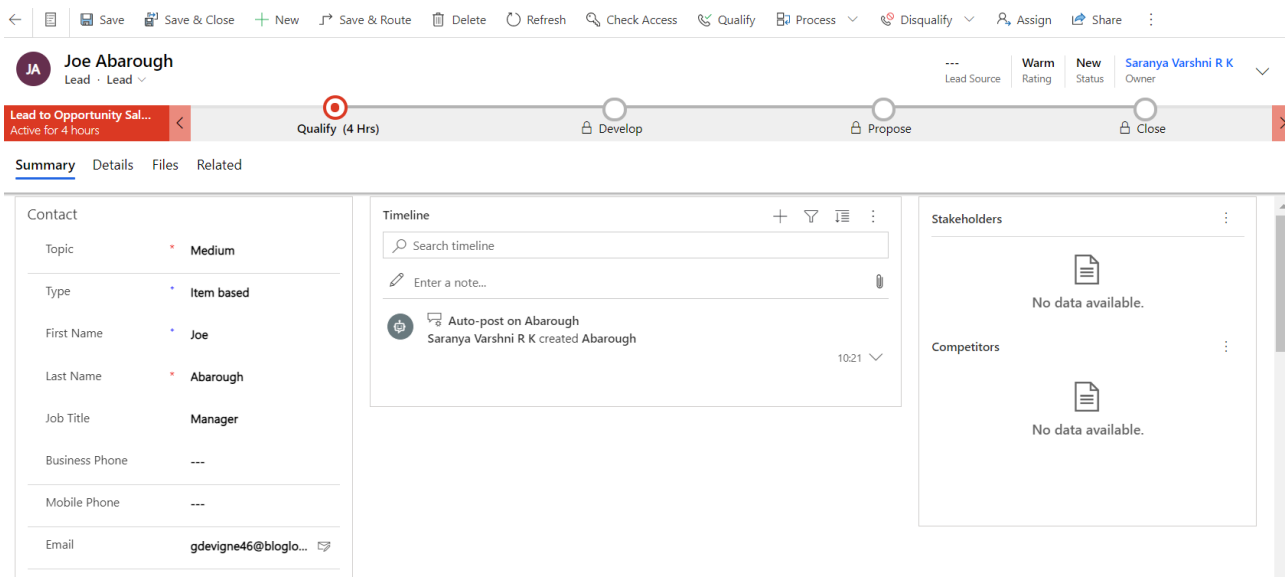
The basic domains in dynamic 365 sales hub are:

- **Lead:** Lead is an individual or a team that is aware of all the products produced in the company.
- **Opportunity:** This is a possible space where there is a way to form a new business process with a new client
- **Account:** An account is created for a customer or a firm that acts as a customer. Usually this is created once an opportunity gets converted to a successful deal.
- **Contact:** It is usually a single point of contact to one customer. And mostly it is only one individual for one account.

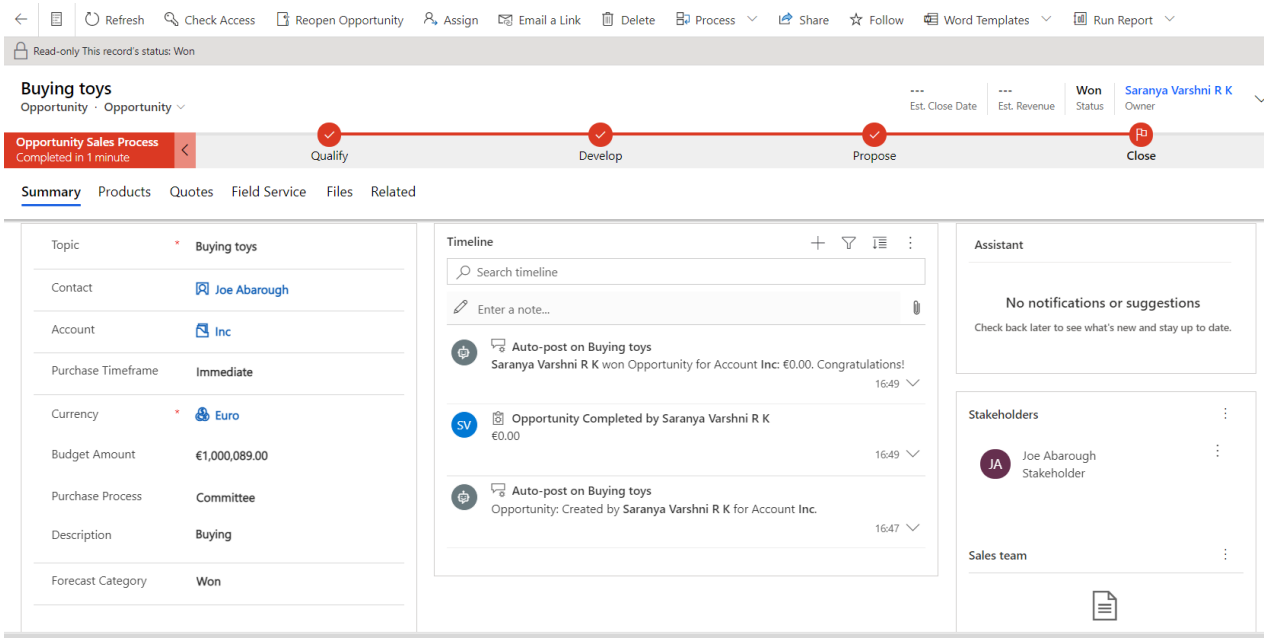
As the project deals predominantly with Product and customer Categories, we have implemented the following steps in Dynamic 365 for the appropriate categories.



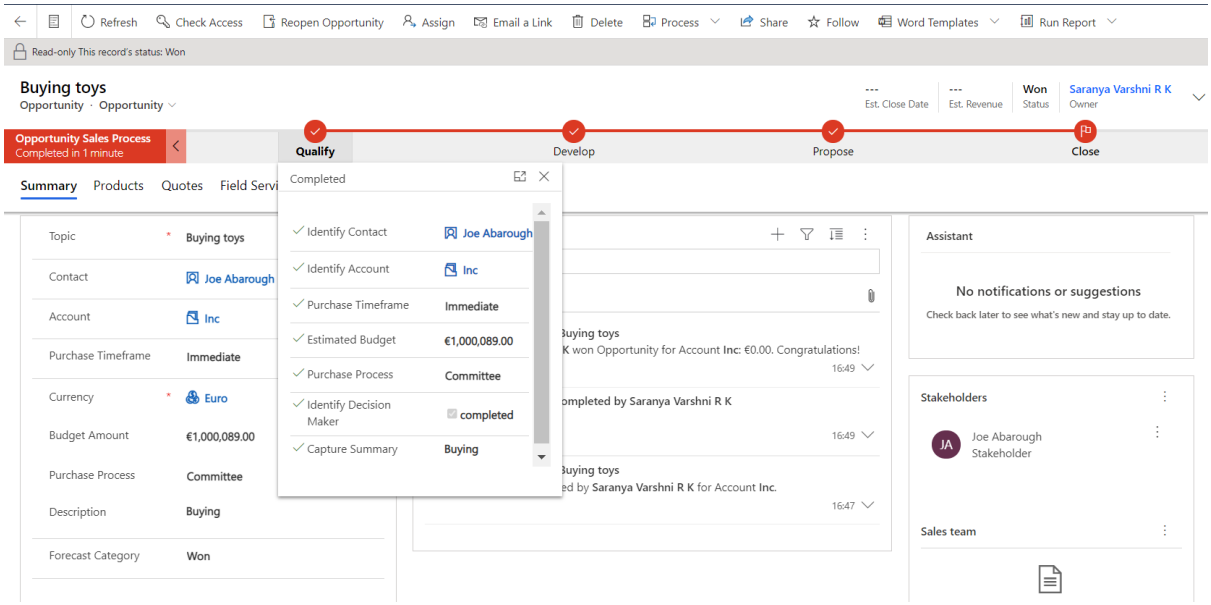
This figure represents the CRM dashboard with the open opportunities listed, open leads, closed opportunities and so on. So, this will be convenient for the executives to have an overall summary.



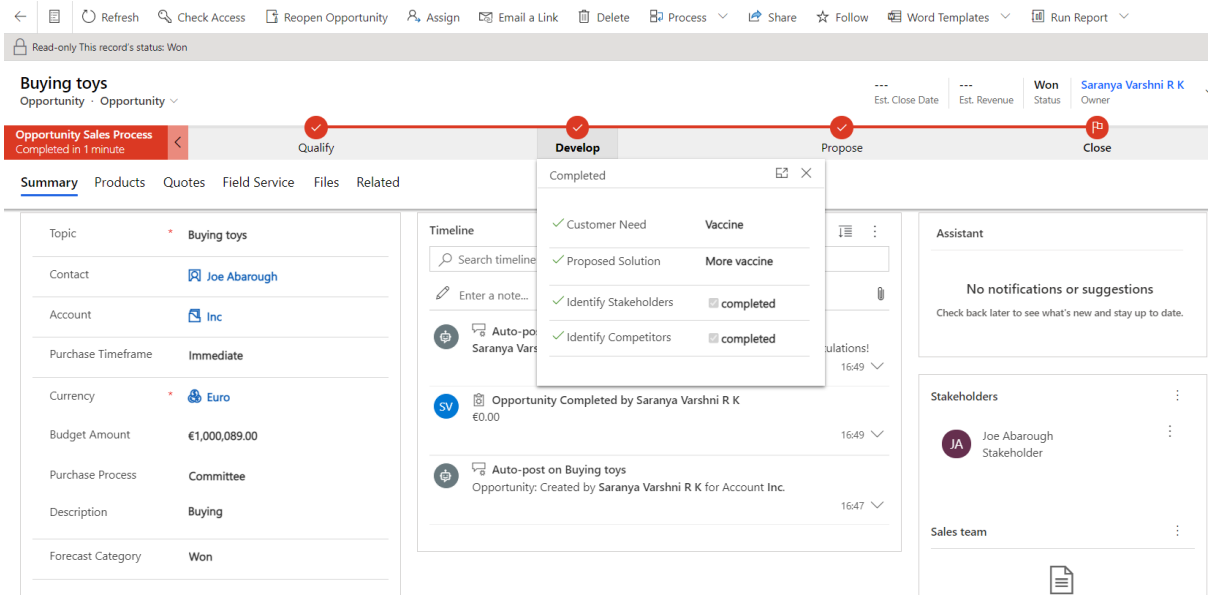
The above image represents the Lead of one opportunity that was created for a potential customer.



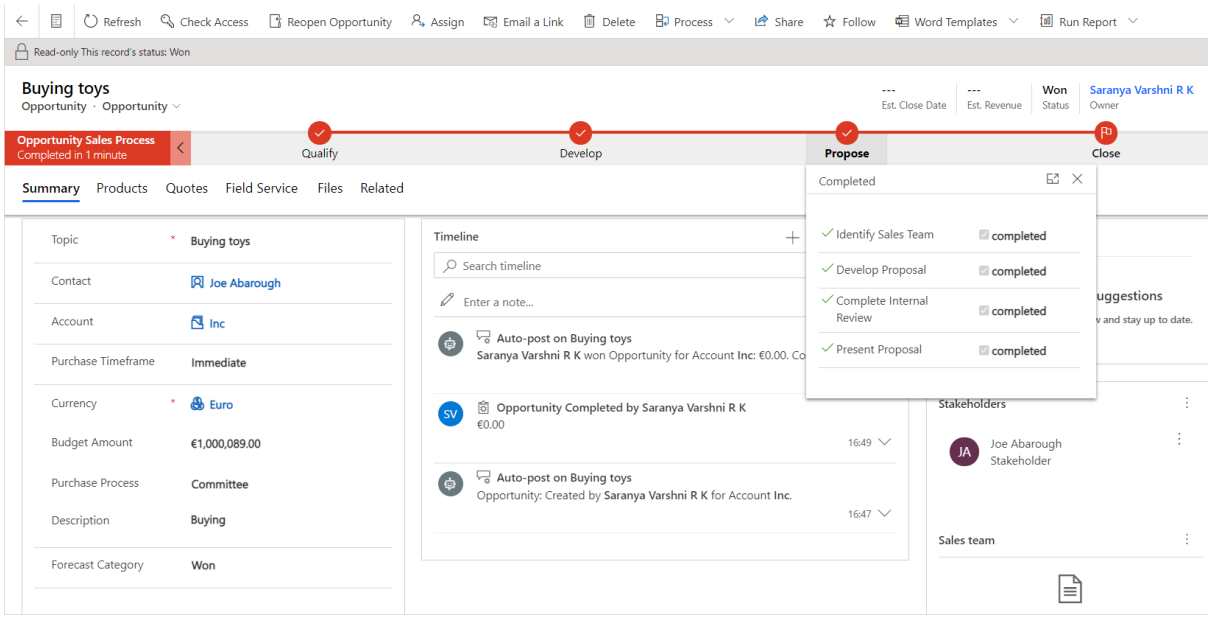
The above image shows the 1st stage in the opportunity where the summary of each potential customer is listed.



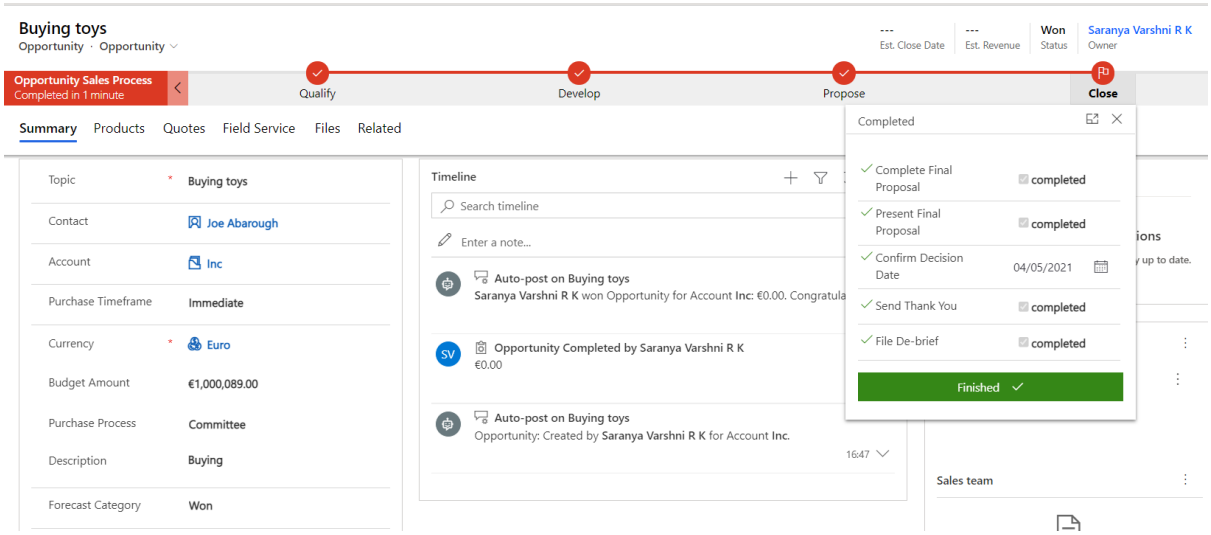
This is the 2nd stage of the process where a customer is checked on the background verification and qualified for the offer.



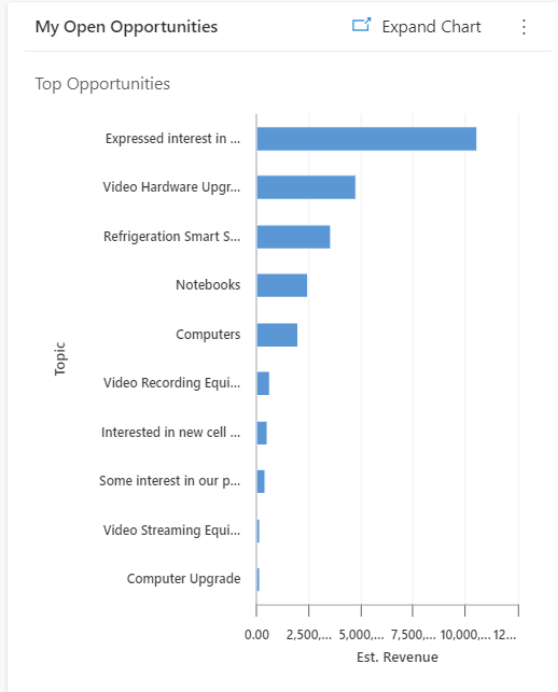
This 3rd stage is the develop stage, where a representative is assigned to each customer for the proposal submission.



Once the develop stage is crossed with requirement submission from the customer, proposal submission from our end is done.



Lastly, post the proposal we can finalise a deal whether the deal is won or failure.



Total my opportunities with estimated revenue is displayed in the dashboard.

CONCLUSION & FUTURE WORK

To conclude, we have implemented all business intelligence process for our organization to get hidden insights by exploring our data gathered from different areas of business. In this work, we demonstrated Business Intelligence process using visualization tools like Tableau, Microsoft dynamics 365. We also designed database to pull the records from multiple areas and integrated them to fetch more insights about business. Products have high market demand during the Quarter 3 & 4 of the year. During Quarter 1 & 2 of the year, manufacturing of products is more, and sales are less. However, during Quarter 3 & 4 sales are more because of high market demand and have less manufacturing rate. It can be depicting from overall business intelligence process that sale and demand of Classic and Vintage Cars are more and on other side train is least in demand with least total sales.

In future, company should start looking into least demanding products. To achieve this goal, company should come up with strategies to improve marketing of least demanding products. Top 5 countries like, USA, China, Russia, France, Spain, and few more vital countries are most demanding and have most total sales, to improve market in these competitive countries company should release toys with new trending features. By deploying good marketing strategies, company should focus more on countries with least revenue.

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