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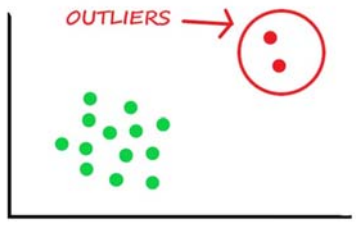
OUTLIERS AND ANOMALY DETECTION USING POWERBI

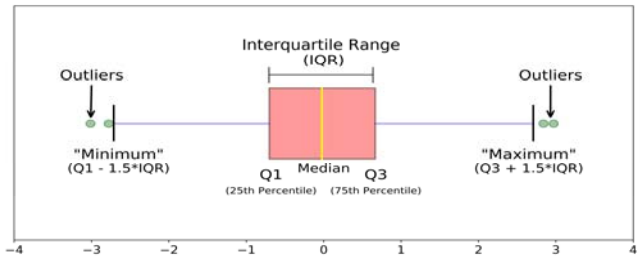
STATISTICAL OUTLIER DETECTION IN POWERBI

Outlier detection or Anomaly detection is the identification of rare items, events or observations which raise suspicions by differing significantly from the majority of the data. Outlier detection is the process of detecting and excluding them from a given set of data. Typical anolomous problems in a real world could be:

- A bank fraud
- Medical problems
- A structural defect
- Errors in a text, measurement, etc

Outliers can be explained as the data point that is more than 1.5 times the Inter Quartile Range (IQR) where Q1 is the median of the lower half of the data, and Q3 is the median of the upper half of the data.





Microsoft PowerBI provides anomaly detection and statistical analysis methods that can be applied to a dataset. The result of the analysis can be translated as a report and a dashboard visual for easy detection. The analysis also provides a deeper insight into the business. A typical data was used to identify the outliers in a dataset using PowerBI and the results are presented below.

Backgroud of the Dataset used:

The dataset contains day wise users index for a newly launched website. The number of users visiting the website are plotted against the day index. A sample of the data used is provided below.

Sample database table: Source: Github, Type: CSV, Columns: 1, Rows: 222

DayIndex Users
01/01/2020 0:00 335
01/02/2020 0:00 1131
01/03/2020 0:00 1094
01/04/2020 0:00 393
01/05/2020 0:00 487
01/06/2020 0:00 1380
01/07/2020 0:00 1607
01/08/2020 0:00 1578
01/09/2020 0:00 1640

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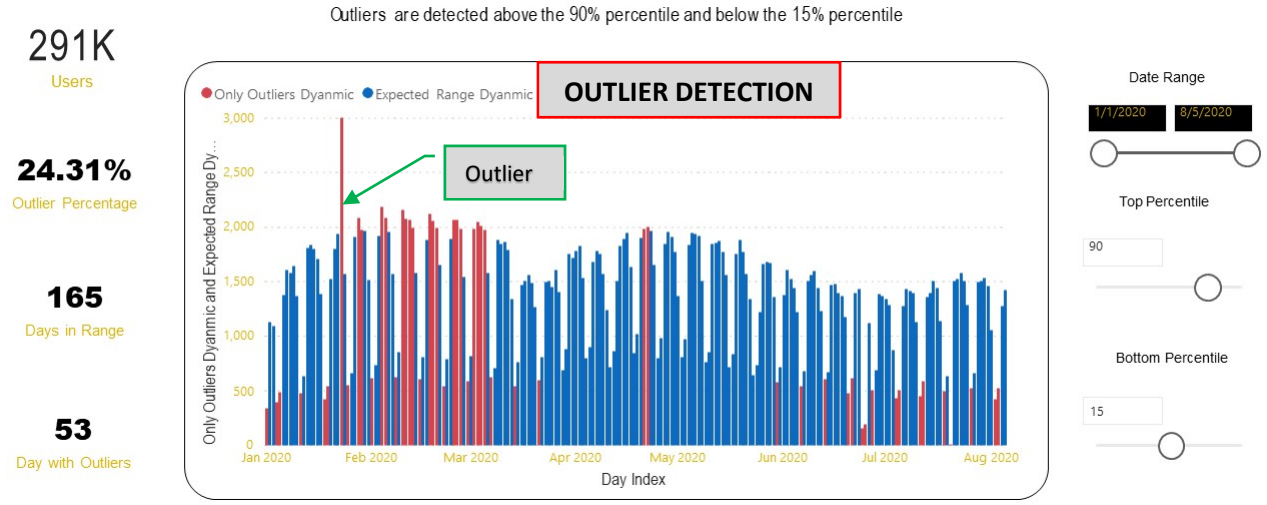
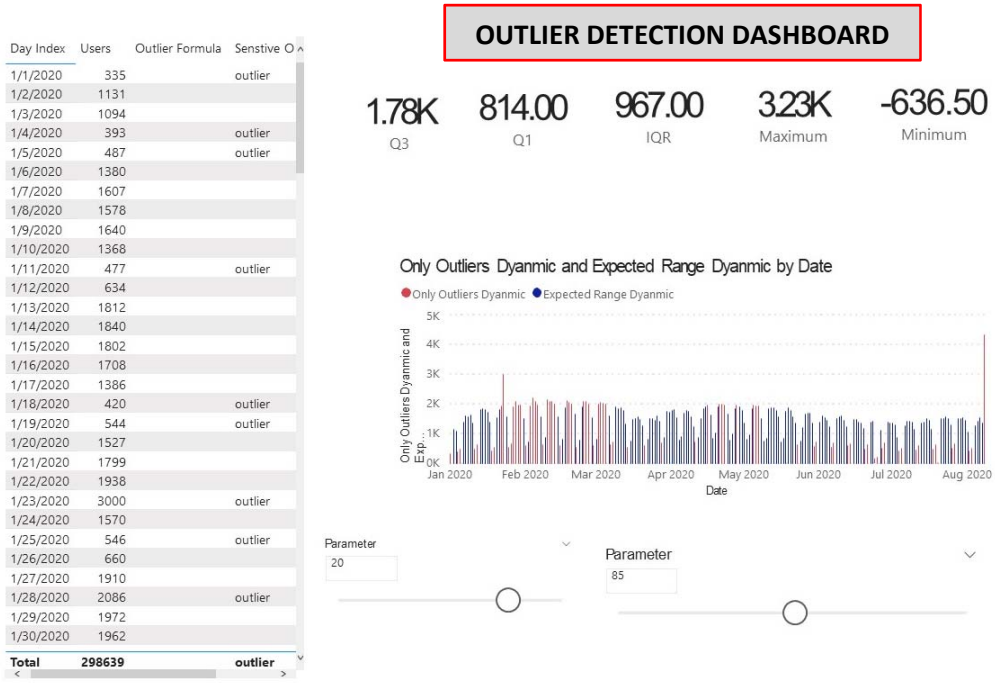


In the above chart, the outliers are calculated in PowerBI from the given dataset and they are represented as red coloured bars.

Dynamic dashboard with table view developed in PowerBI.



Day Index	Users	Outlier Formula	Senstive O
1/1/2020	335		outlier
1/2/2020	1131		
1/3/2020	1094		
1/4/2020	393		outlier
1/5/2020	487		outlier
1/6/2020	1380		
1/7/2020	1607		
1/8/2020	1578		
1/9/2020	1640		
1/10/2020	1368		
1/11/2020	477		outlier
1/12/2020	634		
1/13/2020	1812		
1/14/2020	1840		
1/15/2020	1802		
1/16/2020	1708		
1/17/2020	1386		
1/18/2020	420		outlier
1/19/2020	544		outlier
1/20/2020	1527		
1/21/2020	1799		
1/22/2020	1938		
1/23/2020	3000		outlier
1/24/2020	1570		
1/25/2020	546		outlier
1/26/2020	660		
1/27/2020	1910		
1/28/2020	2086		outlier
1/29/2020	1972		
1/30/2020	1962		
Total	**298639**		**outlier**

Conclusion:

Outlier information is very useful when data is compared with the original data. The above identification of outlliers from the original dataset provides an opportunity to further investigate the causation using PowerBI.

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ANOMALY DETECTION IN SUPERSTORE SALE

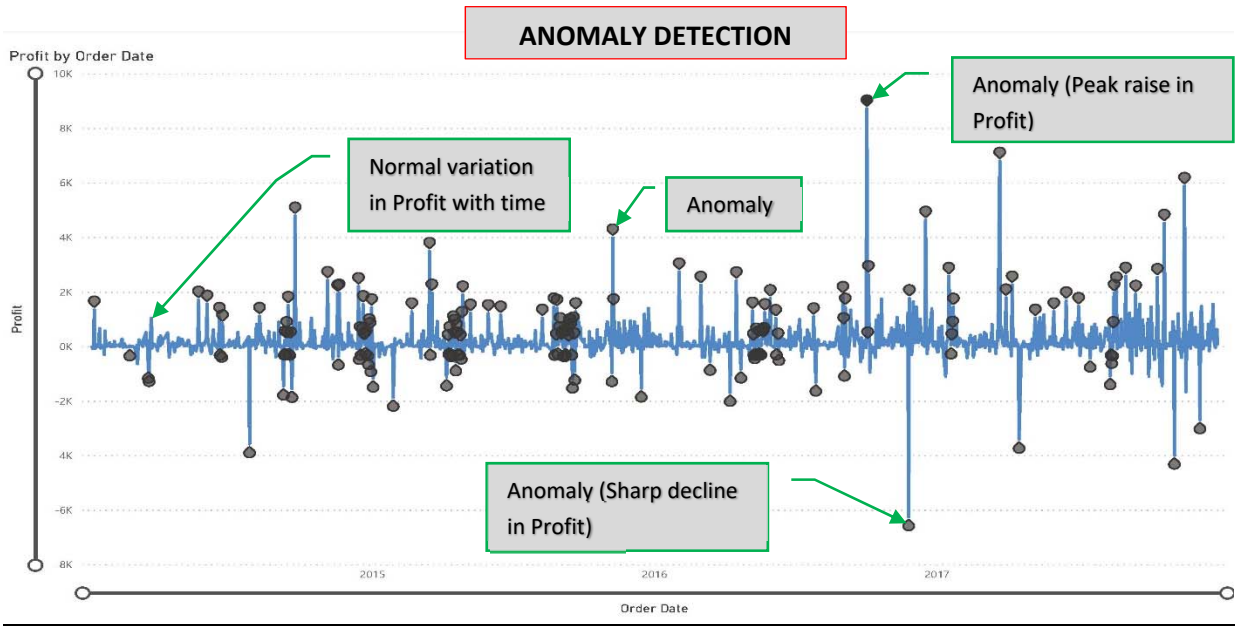
Anomaly detection (or outlier analysis) is referred as something that deviates from what is standard, normal, or expected. Anomalous data can indicate critical incidents, such as a fraudlent transaction, technical glitch, or potential opportunities, or a change in consumer behavior. Identifying outliers and correlating with various influencing factors can deliver insights to business decision makers.

Backgroud of the Dataset used:

The dataset contains the sale of consumer products by a superstore in USA. The Order date and Profits of the superstore was analysed to understand the anomalies in the raise and fall of profits with respect to time of goods purchased. Two peaks in the data points, one for peak increase in profit one for peak decline in profit were selected for further analysis.

Sample database table: Source: Github, Type: Excel, Columns: 21, Rows: 9995, Columns analysed: Order date and Profit

Row ID	Order Date	Ship Date	Postal Code	Region	Category	Sales	Quantity	Discount	Profit
43	Sunday, July 17, 2016	Friday, July 22, 2016	90049	West	Office Supplies	77.88	2	0	3.894
514	Thursday, December 21, 2017	Monday, December 25, 2017	90049	West	Office Supplies	6.63	3	0	1.7901
....	....	....	....	....	....	....	....	....	....



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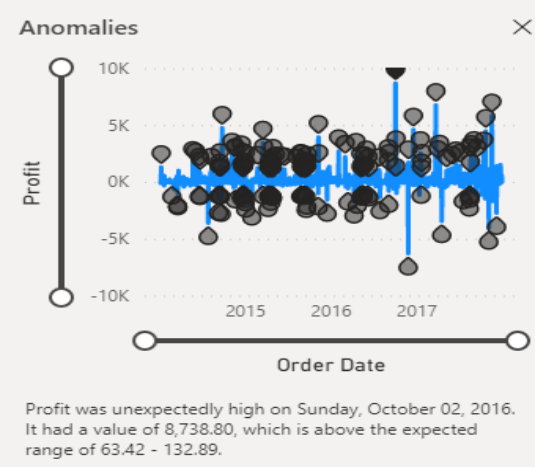
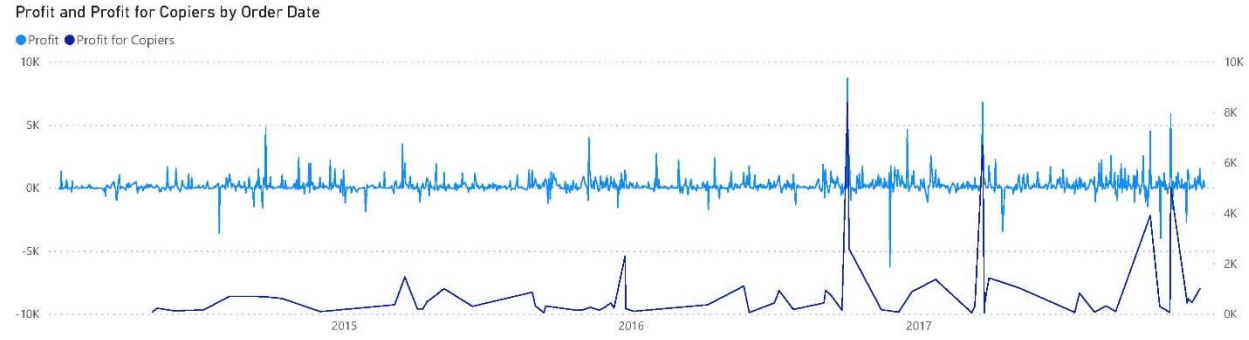
Raise in Profit – A Deeper Analysis using PowerBI

When the data point was selected, the reasons contributing to the anomaly were available for furter investigation. The raise in Profit for the peak identified above was found to be contributed by two major reasons (Central region and Copiers product sub-category). Their contribution is more than 50% for the raise in profit. The detailed graphs as a proof of the findings are provided below.





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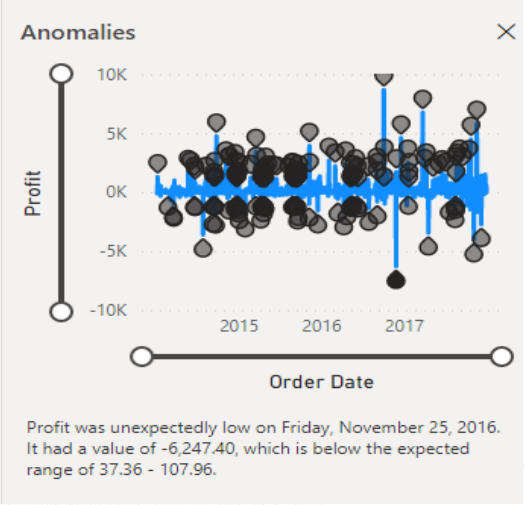
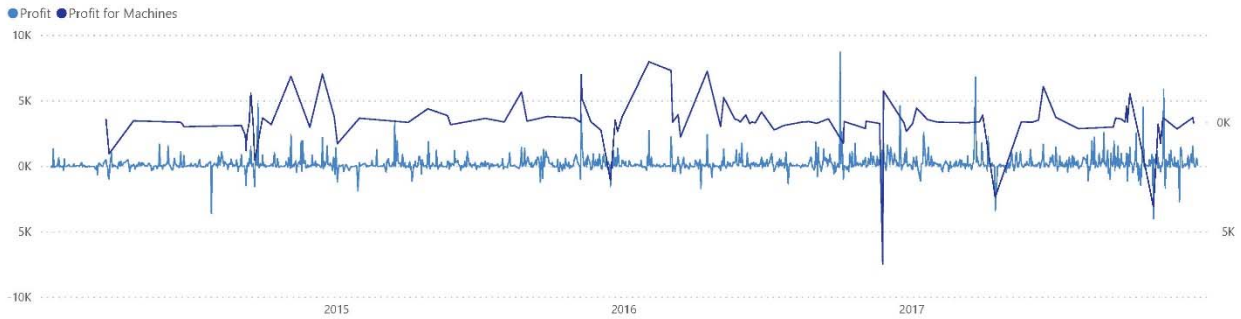
Profit decline by Sub-category and State Comparison:

Similar to the above the reasons contributing to a sharp decline in Profit in 2016 was found to be contributed more than 50% by two reasons. Ohio state and product Machines under the Sub-Category. The detailed graphs as a proof of the findings are provided below.





Conclusion:

With the above charts and analysis, the underlying reasons and their significance to the business can be well correlated. The knowledge gained from this analysis could be further leveraged to promote the business interest.