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Data Analysis and Visualization of Road Accident Using Power BI

Omer Abdullah[1], Mohd Yousuf [2]
[1]*CSE, Lords Institute of Engineering and Technology, Hyderabad, India*
[2]*CSE, ISL Engineering College, Hyderabad, India*

Abstract: ***Power BI has taken the world of business intelligence, data visualization and analytics by storm. Power BI is an online service that enables searching data, transforming it, visualizing it, and sharing the developed reports and dashboards with other users in the same or different department/organizations or even with the general public. As of February 2017, more than 200,000 organizations across 205 countries are using Power BI. Power BI is having a free option that has adequate features and functionality , it has become a serious contender for use as a business intelligence platform in small and medium organizations. One of the innovative features of Power BI is its Quick Insights feature (Michael Hart, 2017) that is built on a growing set of advanced analytical algorithms. After uploading a dataset to Power BI, a click of a button can be used to invoke this feature that automatically builds many reports based on its analysis of the data, without any human intervention being required. This also helps reduce human errors, in calculations and statistical techniques, which lead to un-verifiable research. Accepting even Excel spreadsheets as input, Power BI is easy to use and ripe for adoption as a platform for Research Data Analysis. In this paper, an attempt has been made to show how easily a dataset of research data can be transformed by Power BI into a set of analytical reports and dashboards, and which can be shared with ease.***
Keywords: Research Data Analysis, Power BI, Dash Board , Visualization , Road Accident .

I. INTRODUCTION

Road accident is world main problem. Every day we watch the news of road accident on the TV, Internet. The main causes of road accident are human behavior. The major causes of road accident are human carelessness in our country. Under the causes of road accident the carelessness is one of the most important factors in road accident. In road accident cause include breaking the traffic rules, using the mobile phone when driving .the another causes of road accident is inexperience driver and untrained drivers. At night time most of the driver drives the vehicle under the influence of alcohol it is also main factors which contribute in road accident.

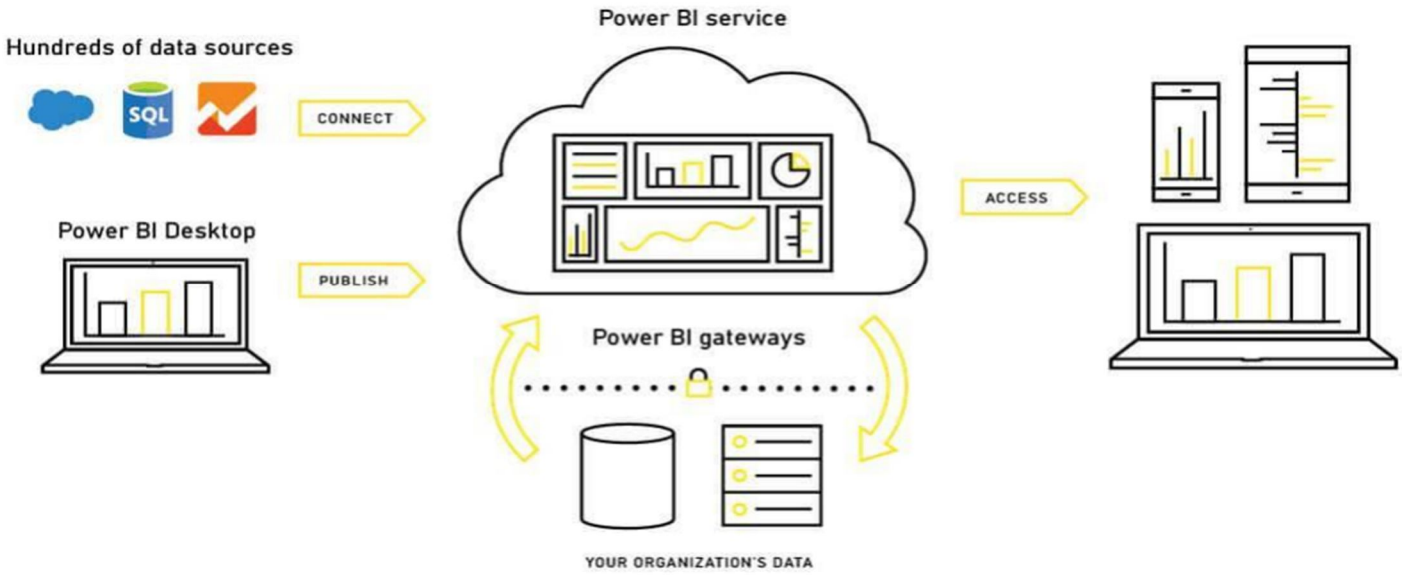
High speed, increasing no of vehicles, carelessness among road user and many other reasons are said to be linked to road accident. The problem of deaths and injuries as a result of accidents is to be a global phenomenon. Traffic safety has been a serious concern since the start of the automobile age, almost one hundred years ago. It has been estimated that over 300,000 persons die and 10 to 15 million persons are injured every year in road accidents throughout the world. Statistics have also shown that mortality in road accidents is very high among young adults that constitute the major part of the work force. In order to overcome this problem there is need of various road safety strategies, methods and counter measures. The survey was conducted on different causes of death due to injury.

II. METHODOLOGY

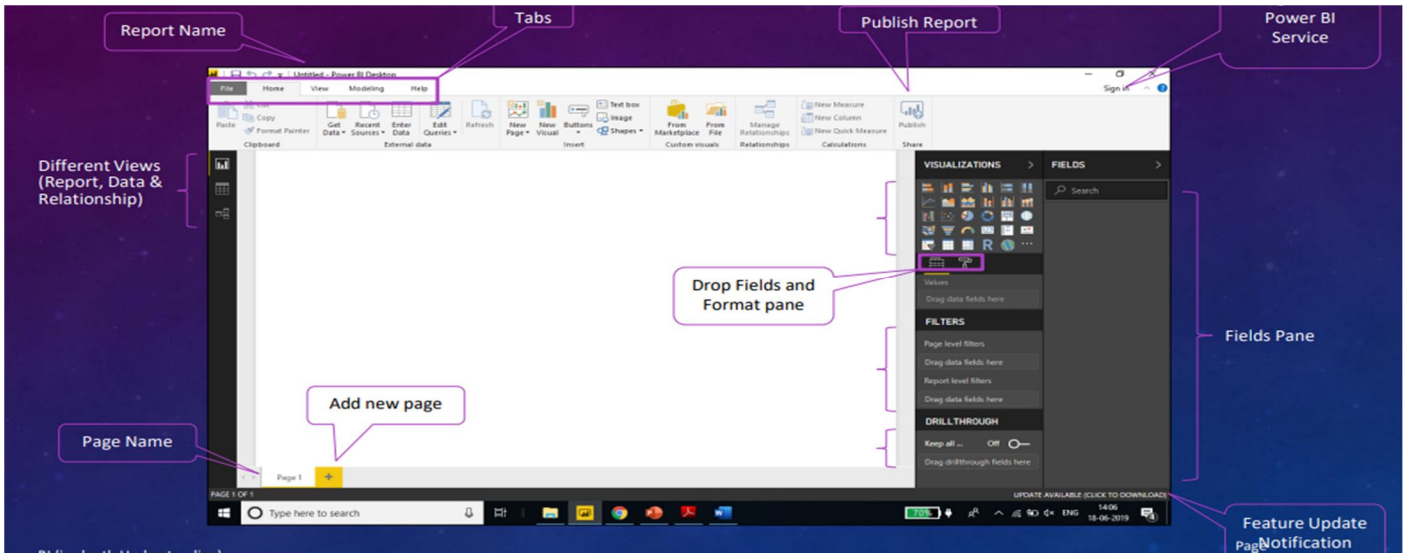
Power BI Apps are the crucial components at user side where viewing and accessing of dashboard through some applications such as Power Apps, Mobile Power BI...etc., Power BI connectors leads crucial role in getting data from the database and other sources using connector application such as database engines, Azure Consumption Insight Connector…etc. The general operations of Microsoft Power BI are as follows: 1) Get the Data from Required Data Source2) Analyse the data by means of connectors and gateways of organization3) Build the Report by means of Different Visuals and Filters4) Publish the Report into web through Power BI Desktop5) Edit the report if any changes are needed and make shareable by means of publishing on to web option for creating embed URL 6)Access the report data from different applications of Microsoft such as Power Apps, Mobile Power BI 7) Refresh the data using different gateways of Organization for updating the dashboard. In this paper, we discussed on process model and Visuals of the Power BI tool and interactive data visualization technique for analysis and design of educational institution data visualization using Microsoft Power BI tool.

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A. Power Bi Architecture



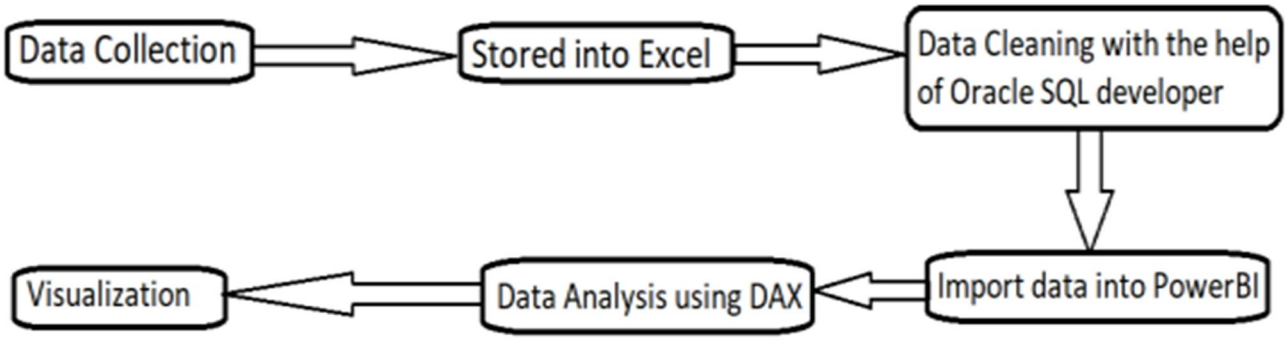
B. Power Bi Desktop Interface



1) *Data Collection:* Data Collection is the process of gathering and measuring information on targeted variables in an established systems, which then enables one to answer relevant questions and evaluate outcomes.
2) *Data Storage:* Power BI uses two primary repositories for storing and managing data: Data that is uploaded from users is sentto excel sheet.
3) *Data Cleaning:* Once the data is stored into power BI it is important to clean and transform data before you build any visualizations or reporting .This is essential step in building quality visualization. Cleaning and transforming data enables to build visualizations from sound and clean data. If it is not done diligently visualization will not behave as we except
4) *Data Analysis:* Data analysis is a process of inspecting, cleaning, transforming and modelling data with the goal of discovering useful information, informing conclusions and supporting decision making We use DAX (Data Analysis Expressions) for Data Manipulation and working on the data.
5) *Visualization:* In this process we convert manually data into visualization is to visually display collected data by using various charts, graphs or other visualization types.

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C. Flow Chart



III. CREATING A REPORT OR A DASHBOARD

A. Requirement

1) KPI= Total casualties and Total Accident values for Current year and YoY growth.--> so Insight is as respect to the last year the current year has been reduced by -11%.

2) KPI= Total casualties by Accident Severity for Current year and YoY growth. --> It is decrease the total accidents have been decreased by 11%

3) KPI= Total casualties with respect to vehicle type for current year --> we can see tht car is one particular vehicle type which is creating maximum number of accidents are offered due

4) Area Chart- Monthly Trend showing comparison of causalities for current year and previous year

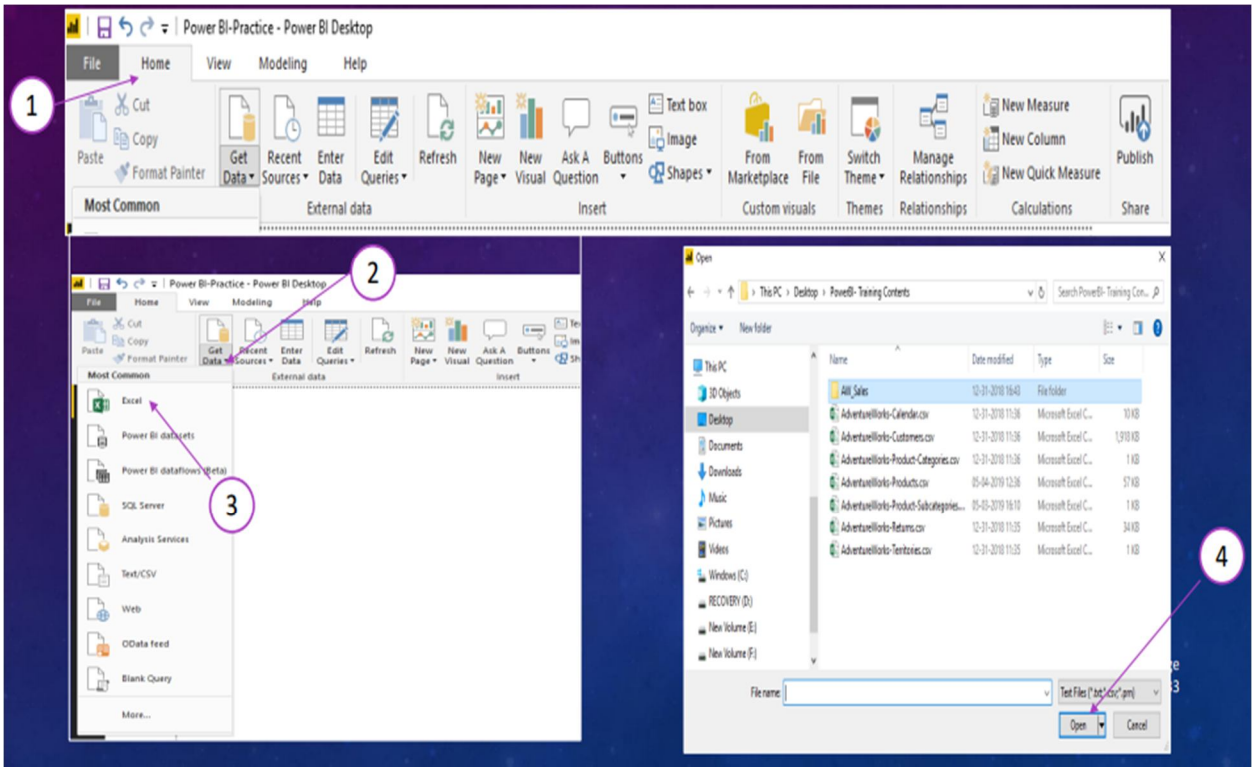
5) Causalities by Road Type for current year-->>> We can say most of the causalities in single carriageway road.

6) Current year Casualties by Area/Location & by Day/Nigh

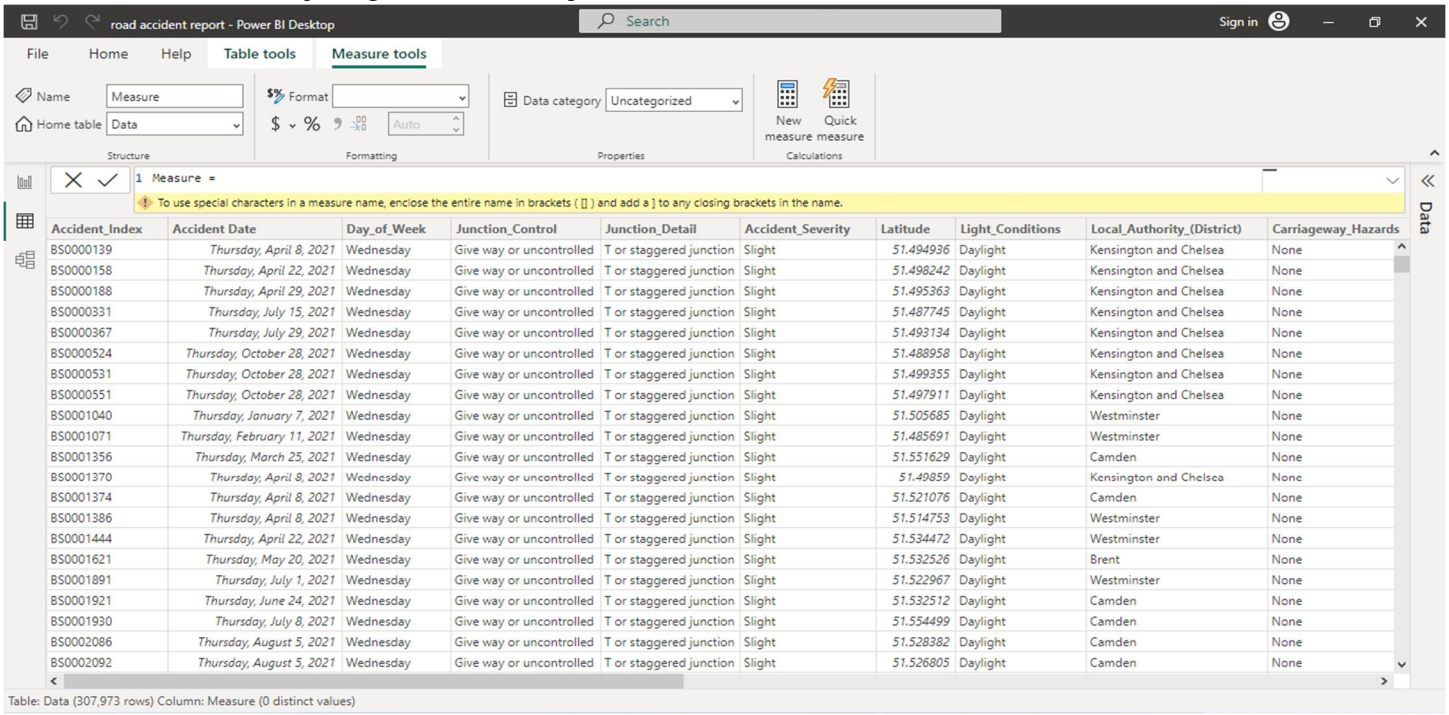
7) Total Casualties and Total Accidents by location.

B. Connection Data with Power BI

Home Tab -> Get Data -> Click on Text/CSV or Excel -> Choose File -> Open



When we click on the open button, a new dialogue box will get open. In which, following delimiter can be selected to extract the data– • Comma • Colon • Equal sign • Semicolon • Space • Tab • Custom • Fixed with

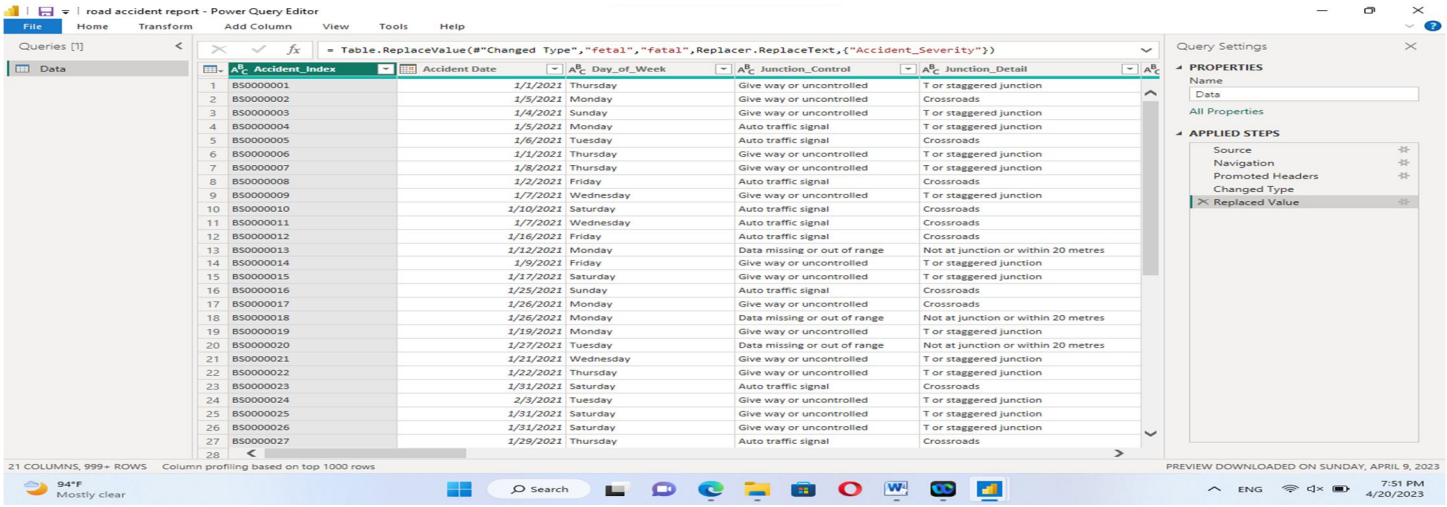


Accident_Index	Accident Date	Day_of_Week	Junction_Control	Junction_Detail	Accident_Severity	Latitude	Light_Conditions	Local_Authority_(District)	Carriageway_Hazards
BS0000139	Thursday, April 8, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.494936	Daylight	Kensington and Chelsea	None
BS0000158	Thursday, April 22, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.498242	Daylight	Kensington and Chelsea	None
BS0000188	Thursday, April 29, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.495363	Daylight	Kensington and Chelsea	None
BS0000331	Thursday, July 15, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.487745	Daylight	Kensington and Chelsea	None
BS0000367	Thursday, July 29, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.493134	Daylight	Kensington and Chelsea	None
BS0000524	Thursday, October 28, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.488958	Daylight	Kensington and Chelsea	None
BS0000531	Thursday, October 28, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.499355	Daylight	Kensington and Chelsea	None
BS0000551	Thursday, October 28, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.497911	Daylight	Kensington and Chelsea	None
BS0001040	Thursday, January 7, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.505685	Daylight	Westminster	None
BS0001071	Thursday, February 11, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.485691	Daylight	Westminster	None
BS0001356	Thursday, March 25, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.551629	Daylight	Camden	None
BS0001370	Thursday, April 8, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.49859	Daylight	Kensington and Chelsea	None
BS0001374	Thursday, April 8, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.521076	Daylight	Camden	None
BS0001386	Thursday, April 8, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.514753	Daylight	Westminster	None
BS0001444	Thursday, April 22, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.534472	Daylight	Westminster	None
BS0001621	Thursday, May 20, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.532526	Daylight	Brent	None
BS0001891	Thursday, July 1, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.522967	Daylight	Westminster	None
BS0001921	Thursday, June 24, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.532512	Daylight	Camden	None
BS0001930	Thursday, July 8, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.554499	Daylight	Camden	None
BS0002086	Thursday, August 5, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.528382	Daylight	Camden	None
BS0002092	Thursday, August 5, 2021	Wednesday	Give way or uncontrolled	T or staggered junction	Slight	51.526805	Daylight	Camden	None

Here we have two options: Edit and Load. 1. Edit will take take us in Power Query editor page. Where we can do necessary formatting, calculation and rearrange data. Then click on close & Apply. Data will be upload into the Power bi desktop 2. Load will directly upload the data into PowerBI Desktop

C. Power Query

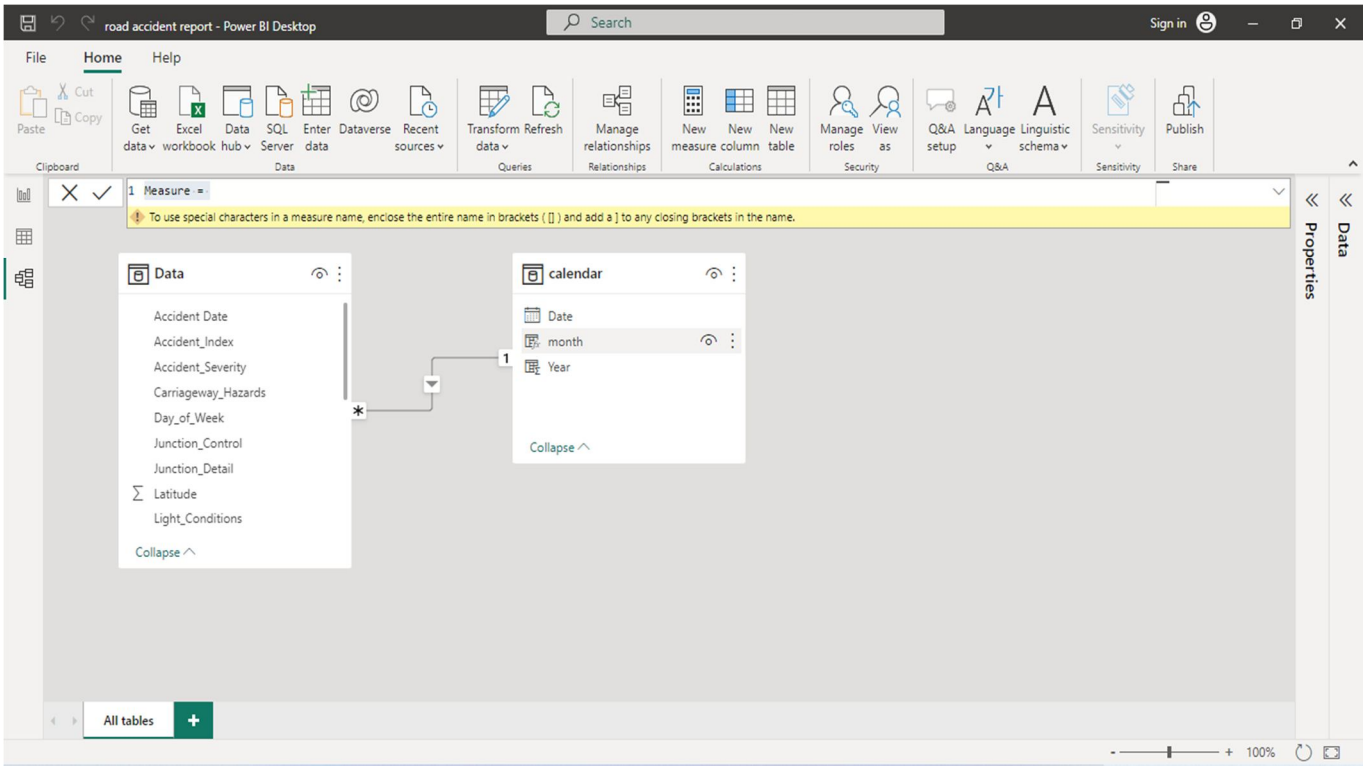
Power Query act as an "ETL" tool for Power BI i.e. it Extracts data from one or multiple sources, Transform that data and finally Load it into Power BI environment. It also facilitates an "Applied Steps" feature, where whatever we do, will get recorded as steps and upon updating the source data, all those steps will get applied to them automatically and this way the creator of the report needs not to repeat the steps. Power query editor is a separate window which can be accessed by either of the following ways: 1. Power BI window Home -> Get Data -> Choose the respective data source -> Browse the file -> "Edit". (Here "Edit" button will open Query editor). 2. Power BI window Home -> "Edit Queries"



	Accident_Index	Accident Date	Day_of_Week	Junction_Control	Junction_Detail
1	BS0000001	1/1/2021	Thursday	Give way or uncontrolled	T or staggered junction
2	BS0000002	1/5/2021	Monday	Give way or uncontrolled	Crossroads
3	BS0000003	1/4/2021	Sunday	Give way or uncontrolled	T or staggered junction
4	BS0000004	1/5/2021	Monday	Auto traffic signal	T or staggered junction
5	BS0000005	1/6/2021	Tuesday	Auto traffic signal	Crossroads
6	BS0000006	1/1/2021	Thursday	Give way or uncontrolled	T or staggered junction
7	BS0000007	1/8/2021	Thursday	Give way or uncontrolled	T or staggered junction
8	BS0000008	1/2/2021	Friday	Auto traffic signal	Crossroads
9	BS0000009	1/7/2021	Wednesday	Give way or uncontrolled	T or staggered junction
10	BS0000010	1/10/2021	Saturday	Auto traffic signal	Crossroads
11	BS0000011	1/7/2021	Wednesday	Auto traffic signal	Crossroads
12	BS0000012	1/16/2021	Friday	Auto traffic signal	Crossroads
13	BS0000013	1/12/2021	Monday	Data missing or out of range	Not at junction or within 20 metres
14	BS0000014	1/9/2021	Friday	Give way or uncontrolled	T or staggered junction
15	BS0000015	1/17/2021	Saturday	Give way or uncontrolled	T or staggered junction
16	BS0000016	1/25/2021	Sunday	Auto traffic signal	Crossroads
17	BS0000017	1/26/2021	Monday	Give way or uncontrolled	Crossroads
18	BS0000018	1/26/2021	Monday	Data missing or out of range	Not at junction or within 20 metres
19	BS0000019	1/19/2021	Monday	Give way or uncontrolled	T or staggered junction
20	BS0000020	1/27/2021	Tuesday	Data missing or out of range	Not at junction or within 20 metres
21	BS0000021	1/21/2021	Wednesday	Give way or uncontrolled	T or staggered junction
22	BS0000022	1/22/2021	Thursday	Give way or uncontrolled	T or staggered junction
23	BS0000023	1/31/2021	Saturday	Auto traffic signal	Crossroads
24	BS0000024	2/3/2021	Tuesday	Give way or uncontrolled	T or staggered junction
25	BS0000025	1/31/2021	Saturday	Give way or uncontrolled	T or staggered junction
26	BS0000026	1/31/2021	Saturday	Give way or uncontrolled	T or staggered junction
27	BS0000027	1/29/2021	Thursday	Auto traffic signal	Crossroads

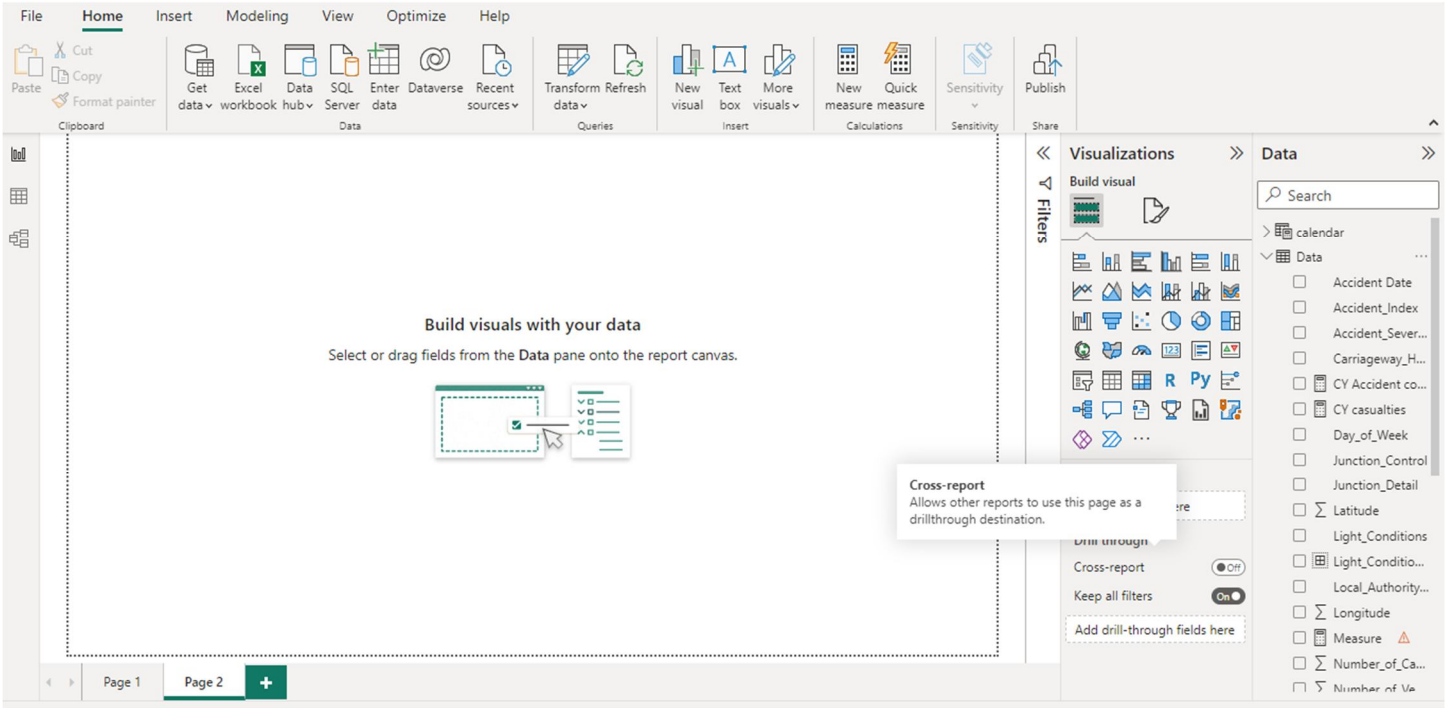
D. Data Modelling

Data modelling is the process of analysing and defining all the different data your business collects and produces, as well as the relationships between those bits of data. Data modelling concepts create visual representations of data as it's used at your business, and the process itself is an exercise in understanding and clarifying your data requirements.



IV. REPORT

A. Report View (Interface)

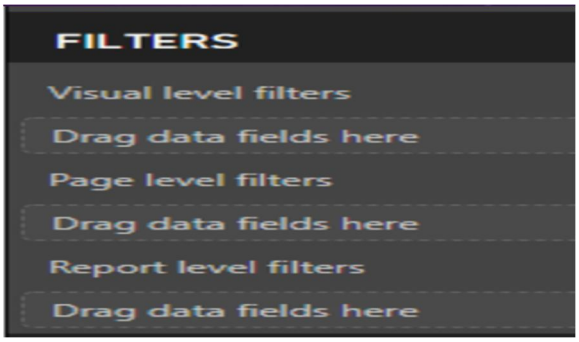


B. Power Bi Desktop Filters

1) Visual Level Filter: This gets applied to only to the active visual.

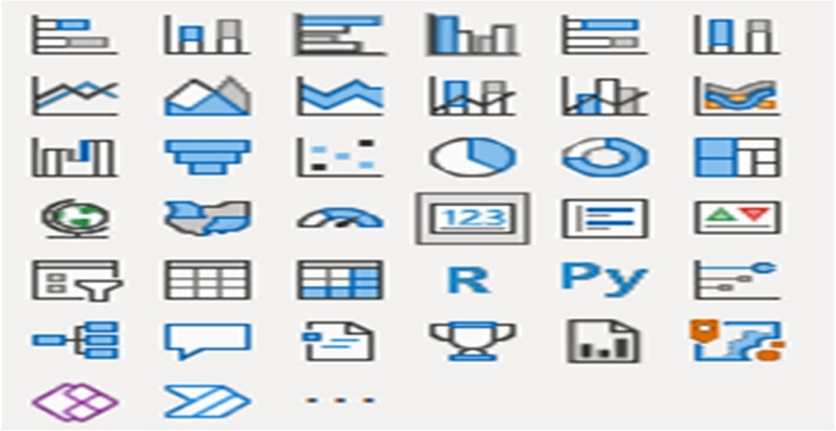
2) Page Level Filter: This gets applied to all the visuals in the existing page.

3) Report Level Filter: This gets applied to all the visuals in all the existing pages in the report.



C. Types Of Visualization In A Power Bi Report

• Area • Stacked Area • Bar/Column • Clustered Bar/Column • 100% Stacked Bar/Column • Combo • Ribbon • Tree map • 3D Map • Filled Map • Card/KPI • Slicer • Table • Matrix • Doughnut • Funnel • Gauge • Line • Pie • Scatter • Waterfall

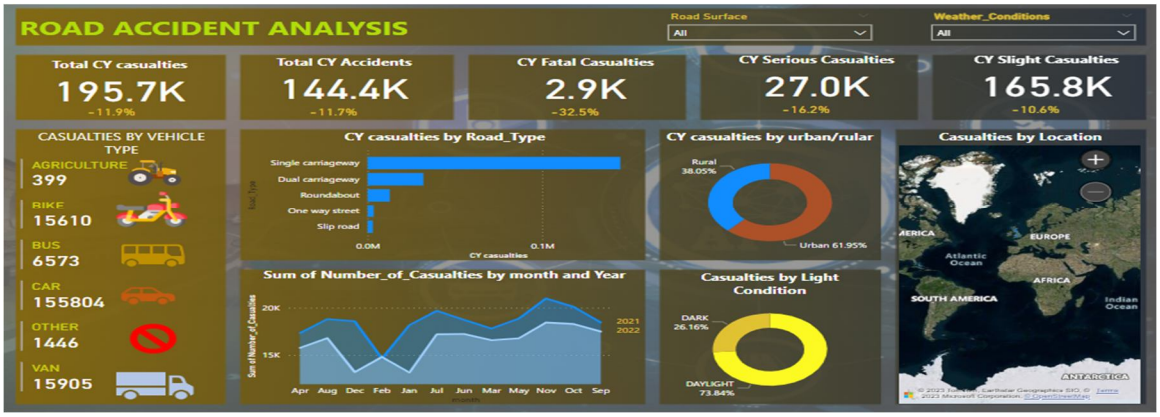


D. Power BI Dashboard

1) This is a single page view of overall story through visualizations. For detailed summary, user can visit the related reports.

2) Dashboard is a feature of Power BI Service. This is unavailable in Power BI Desktop. A pro license if needed to access Power BI Service.

E. Output of Road Accident Analysis



V. RESULTS

Total CY Casualties 182.6k decreases -11.9% Total CY Accident 144.4k decreases -11.7% CY Fatal Casualties 2.9k decreases -32.5% CY Serious Casualties 27.0k decreases -16.2% CY Slight Casualties 165.8k decreases -10.6%

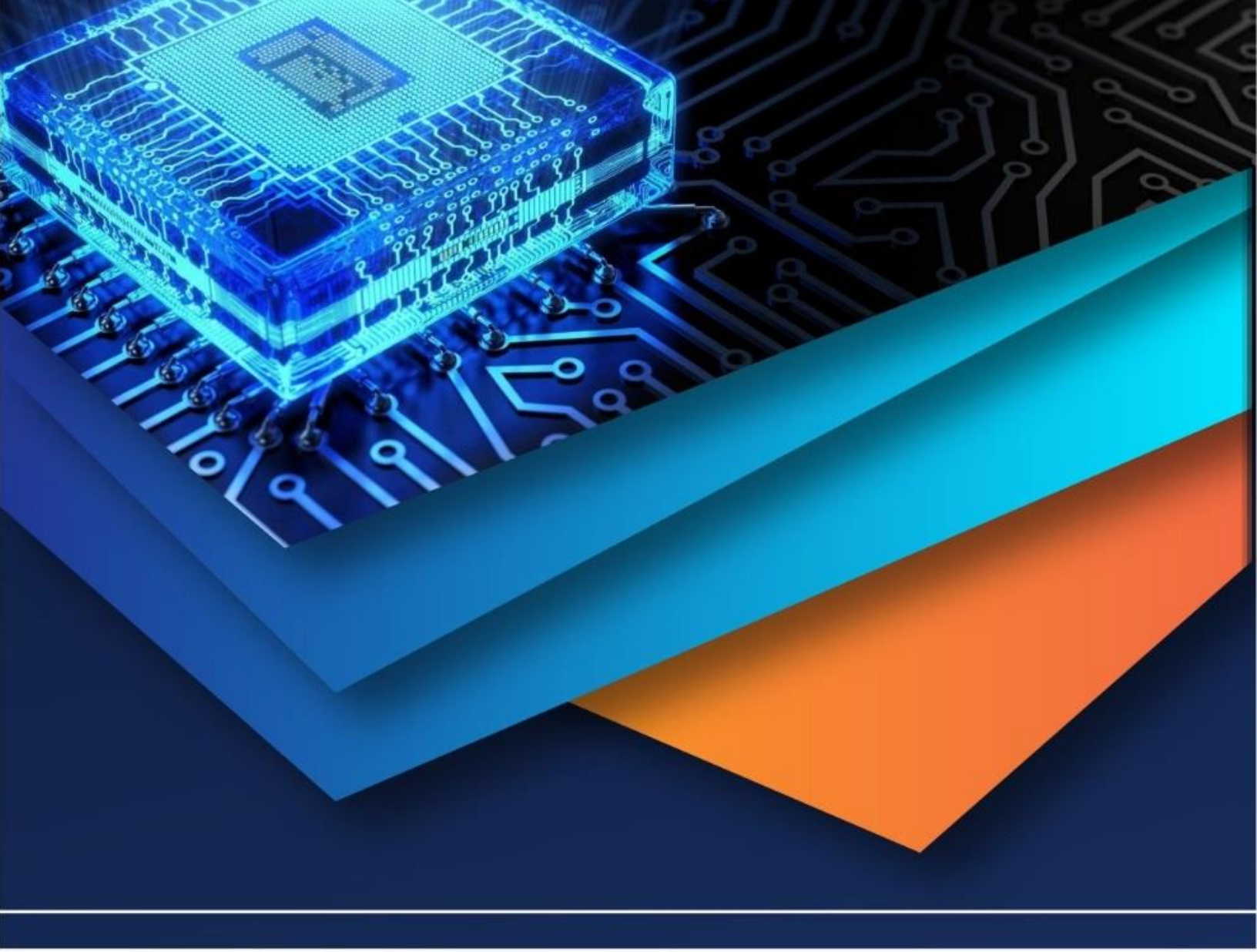
VI. CONCLUSION

Overall, the objectives of this research were met. Through visualization, data analysis aids pupils in comprehending concepts. Various technologies are available to undertake corporate data analysis, however the Power BI visualization technique is the most popular technique for learning the fundamentals of data analysis. With the help of the visualization technique, data interpretation and data representation may be done quickly and easily. This strategy is highly useful for stronger conceptual design.

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