**EXPERIMENT N0 :01**

**INTEGRATING R WITH POWER BI**

**INTRODUCTION**

This experiment demonstrates how to integrate the R programming language with Power BI to enhance data visualization and analytics. It walks through installing R, configuring Power BI to use R, loading data, creating R-based visuals, and publishing reports.

**AIM**

To install and configure R in Power BI, load a dataset, and generate visualizations using R scripts within Power BI.

**FUNCTIONS USED IN R SCRIPTS**

* install.packages() – Installs required R packages.
* data.frame() – Creates data frames.
* ggplot() – Initializes a plot using ggplot2.
* aes() – Sets aesthetic mappings for plots.
* geom\_bar(), geom\_line(), geom\_point(), geom\_smooth() – Adds different layers for visualizations.
* labs() – Adds titles and axis labels.
* theme\_minimal(), theme\_void() – Applies plot themes.
* table() – Summarizes categorical data.
* coord\_polar() – Converts bar chart to pie chart.
* as.data.frame() – Converts table to data frame.

**PACKAGES USED**

* ggplot2 – For creating rich and customizable graphics.
* dplyr – For data manipulation (not directly used in plots but installed).
* tidyverse – A collection of packages for data science including ggplot2, dplyr, etc.
* forecast – For time series analysis (though not used in this specific experiment).
* corrplot – For correlation matrix visualization (also not demonstrated in current visuals).

**OBJECTIVE**

To install and configure R in Power BI, load a dataset, and create a visualization using R.

**Step 1: Install R on Your System**

Power BI requires an external R installation to run scripts. You can choose one of the following:

* Microsoft R Open (MRO): [Download Here](https://mran.microsoft.com/download/)



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* CRAN R (Comprehensive R Archive Network): Download Here

**Instructions:**

1. Download and install Microsoft R Open or CRAN R.

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**Step 2: Install RStudio (Optional)**

RStudio is an Integrated Development Environment (IDE) for writing and testing R scripts before using them in Power BI.

* Download RStudio

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* Install and open RStudio.

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**Step 3: Configure R in Power BI**

1. Open Power BI Desktop.
2. Navigate to File → Options and settings → Options.

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1. Scroll down to R scripting under Global settings.

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1. Under R home directory, select the folder where R is installed.

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Example: C:\Program Files\R\R-4.x.x

1. Click OK to save settings.

**Step 4: Install Required R Packages**

Before using R in Power BI, install the necessary R packages.

Run the following commands in RStudio or R Console:

**Code:**

install.packages("ggplot2") # For visualizations

install.packages("dplyr") # For data manipulation

install.packages("tidyverse") # Collection of R data science packages

install.packages("forecast") # For time series forecasting

install.packages("corrplot") # For correlation matrix visualization

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**Step 5: Load Data Using R in Power BI**

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**Dataset for this experiment:**

Use the following **CSV file** (MT CARS):

**🔹 CSV Data (MTCARS)**

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Date,Category,Sales,Quantity

2024-01-01,Electronics,1500,3

2024-01-02, MILAGE,1200,2

2024-01-03,WEIGHT,800,5

2024-01-04,CC,2200,4

2024-01-05,HP,1350,3

**Save this file in:**  
📂 C:/Users/YourUsername/Documents/sales\_data.csv

**R Script to Load Data in Power BI**

1. **Open Power BI Desktop**.
2. Click **Home → Get Data → More...**.
3. Select **R script** and click **Connect**.
4. In the R script editor, enter the following code:

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R

**data\_bar <- data.frame(**

**Cylinders = factor(c(4, 6, 8)),**

**MPG = c(20, 35, 25)**

**)**

**ggplot(data\_bar, aes(x = Cylinders, y = MPG, fill = Cylinders)) +**

**geom\_bar(stat = "identity") +**

**labs(title = "(Miles per Gallon) grouped by (Number of Cylinders)",**

**x = "Number of Cylinders",**

**y = "Miles Per Gallon (MPG)") +**

**theme\_minimal()**

**Step 6: Create R Visuals in Power BI**

1. Click on **Report View** in Power BI.
2. Select **R Visual** from the visualization pane.

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1. Drag required fields (e.g., Category, Sales) into the **Values** section.
2. Enter the following **R script** in the editor:

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**Code:**

**library(ggplot2)**

**# Fetch data from Power BI dataset (assuming the dataset is already imported)**

**# Power BI automatically passes the dataset to the R script as 'dataset'**

**df <- dataset**

**# Create a bar chart (example: Bar chart of 'cyl' vs 'mpg')**

**ggplot(df, aes(x = factor(cyl), y = mpg, fill = factor(cyl))) +**

**geom\_bar(stat = "identity") +**

**labs(title = "Bar Chart: Cylinders vs MPG",**

**x = "Number of Cylinders",**

**y = "Miles Per Gallon") +**

**theme\_minimal()**

1. Click **Run Script** to generate the bar chart.

A graph with different colored squares

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**LINE GRAPH:**

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**Code:**

**library(ggplot2)**

**# Fetch data from Power BI dataset**

**df <- dataset**

**# Create a line graph (example: tracking horsepower vs mpg)**

**ggplot(df, aes(x = hp, y = mpg, group = 1)) +**

**geom\_line(color = "blue", size = 1) +**

**geom\_point(size = 2, color = "red") +**

**labs(title = "Car Performance: Horsepower vs MPG",**

**x = "Horsepower",**

**y = "Miles Per Gallon") +**

**theme\_minimal()**

A graph with red dots and blue lines

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SCATTER PLOT:

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**Code:**

**library(ggplot2)**

**# Fetch data from Power BI dataset**

**df <- dataset**

**# Create a scatter plot with a regression line**

**ggplot(df, aes(x = wt, y = mpg)) +**

**geom\_point(color = "blue", size = 2) + # Scatter plot points**

**geom\_smooth(method = "lm", color = "red", se = FALSE) + # Regression line**

**labs(title = "Impact of Car Weight on Fuel Efficiency",**

**x = "Car Weight (1000 lbs)",**

**y = "Miles Per Gallon (MPG)") +**

**theme\_minimal()**

A graph with a red line and blue dots

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**PIE CHART:**

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**Code:**

**library(ggplot2)**

**# Fetch data from Power BI dataset**

**df <- dataset**

**# Summarize data for the pie chart**

**transmission\_data <- as.data.frame(table(df$am))**

**colnames(transmission\_data) <- c("Transmission", "Count")**

**transmission\_data$Transmission <- factor(transmission\_data$Transmission,**

**levels = c(0, 1),**

**labels = c("Automatic", "Manual"))**

**# Create a pie chart**

**ggplot(transmission\_data, aes(x = "", y = Count, fill = Transmission)) +**

**geom\_bar(stat = "identity", width = 1) +**

**coord\_polar("y", start = 0) +**

**labs(title = "Transmission Type Distribution") +**

**theme\_void() +**

**theme(legend.position = "right")**

A diagram of transmission types

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**REPORT:**

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**Step 8: Publish to Power BI Service (Optional)**

1. Go to **File → Publish → Power BI Service**.

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**SUMMARY**

The document outlines a full integration pipeline:

1. Install R and optionally RStudio.
2. Configure R within Power BI.
3. Install essential packages.
4. Load and prepare a sample dataset (mtcars or sales\_data.csv).
5. Create multiple R-based visuals in Power BI including:
   * Bar Chart (Cylinders vs MPG)
   * Line Graph (Horsepower vs MPG)
   * Scatter Plot (Weight vs MPG)
   * Pie Chart (Transmission type distribution)
6. Optional step to publish the report to Power BI Service.

**RELATED JOB ROLES**

Skills demonstrated in this file are relevant for the following roles:

* **Data Analyst** – Building reports and dashboards using Power BI and R.
* **Business Intelligence Developer** – Integrating advanced R scripts into BI solutions.
* **Data Scientist** – Creating exploratory visualizations and custom analyses.
* **Power BI Developer** – Enhancing Power BI visual capabilities using R.
* **R Programmer / Statistician** – Working with data visualization and statistical analysis in BI tools.