Power BI Intro

East Carolina University

Office for Faculty Excellence

Research and Statistics Workshops, Summer 2024



About the Presenter

- **Greg Harris**, Associate Director of Institutional Research, IPAR
 - Lean Six Sigma Green Belt, 2015
 - MBA, 2013
 - BA, Anthropology & Religious Studies, 2007
- ECU Pirate Since 2002
- Interests: Cooking, Jogging, Horror Films, and All Things Data!



Agenda



Concepts (~50 mins)

Importance of Data Visualization (~30 mins)

- In Business Intelligence
- In Academic Research

Power BI (~15 mins)

- Intro & Key Features
- Power BI Desktop

Break (~10 mins)



Demonstration (~50 mins)

Get Data

Transform & Model Data

Create Visualizations

Publish

Data Visualization in Business Intelligence

- Why is data visualization important <u>in</u> <u>business intelligence?</u>
 - Data visualization plays a crucial role in **unlocking the value of data**, driving informed decision-making, and fostering a data-driven culture within organizations.
 - By harnessing the power of visualizations, organizations can gain deeper insights, communicate more effectively, and achieve better outcomes across various domains.



Data Vis for BI: Segment Overview Exploration and Discovery

- Visualizations encourage exploration and discovery by allowing users to interact with the data dynamically.
- Features such as interactive filters, drill-downs, and tooltips Cost by Order Month and Segment enable users to delve deeper into the data, ask questions, and uncover new insights, fostering a culture of datadriven exploration and learning.



555.98K

Consumer Sales





Largest Sales

1.03M

	Order ID	Order Date	Customer Name	Operating Cost	Sales T
	90831	12/28/2007	Sheryl Alexander	2,789.06	2,43
	2209	9/25/2007	Ronnie Dodson	130.81	2,23
	90916	2/26/2008	Dennis Boykin Townsend	1,970.46	1,82
	91047	11/19/2006	Nina Bowles	-1,259.35	1,82
	90778	5/31/2007	Carlos Johnson	7,865.40	1,78
	90864	6/16/2007	John Merritt	-1,141.23	1,77
	45571	12/18/2007	Ruth McConnell Young	351.49	1,72
	91121	3/12/2008	Neil Hahn	-1,604.93	1,72
	86355	2/15/2008	Keith Fowler	405.54	1,69
	88013	1/28/2008	Don Beard	163.87	1,64

696.07K 560.68

Home Office Sales

Small Business

iod Last Year, Actives YoY % C...

Data Vis for BI: Clarity and Understanding

- Visual representations of data, such as charts, graphs, and maps, make complex information easier to understand immediately.
- By presenting data visually, • patterns, trends, and relationships become more apparent, helping users grasp the insights hidden within the data more quickly and intuitively.

New Hire Count, Active Employee Count BY REGION, ETHNICITY

Bad Hires (<60 Days of Employment)

BY REGION, ETHNICITY





New Hires LAST 6 MONTHS OF 2





Active Employee BY AGE GROUP

30-49

0K



Data Vis for BI: **Spotting Trends &** Patterns

Help

Return Rate

1 414 Recent Transform Refresh New More New Quick Publish data ~ visuals ~ sources visual box measure measure Queries Calculations Share Last Refresh: Jun 30th, 2019 / Chicago, IL, USA Visuali What If... Net Sales (Forecast) Extra Profit 5 \$30,772 \$0 Filters N Profit Increase 100 . Net Sales (Forecast) by Location "What If" Analysis Forecast Predicted Net Sales ●Forecast Park Ridge P + ÷ Q Values Elmwood Park Add data \$10K Oak Park Chicago Drillth Cross-rep \$SK Off O-Keep all fi Off O-Jan 2019 Mar 2019 May 2019 Jul 2019 ak Lawn Date (D)menhors Product is OneN _ Extra Profit Tabular Map Forecast

Returns Tooltip

CathegoryBreackdown

Revinfluencers

©Microsoft Corporation. All rights reserved.

Net Sales Tooltip

Market Basket Analysis

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1

- Visualizations enable users to identify trends, patterns, and anomalies in the data that may not be immediately apparent in raw numbers or text.
- By visualizing data over time or • across different dimensions, users can spot correlations, outliers, and emerging insights, allowing them to make timely adjustments or capitalize on opportunities.

Data Vis for BI: Efficiency and Productivity

- Visualizations streamline the 6.78 process of data analysis by presenting information in a concise and organized manner. Number of Cars.
- Instead of sifting through rows of data or lengthy reports, users can quickly identify key insights and trends, saving time and increasing productivity.





Current Speed WITTERAC.



Current Speed

Cars Earthound

LAST MULTING

20.8K

Care Westbound

34.86

19.56K





12 - 86 Street

C Share Dashbeard

40.36K

Travel Analysis

Data Vis for BI: Communication

- Visualizations facilitate effective communication of data insights to stakeholders across different levels of an organization.
- Whether it's presenting findings in a meeting, sharing reports with colleagues, or communicating with clients, visualizations enhance the clarity and impact of the message, making it easier for others to comprehend and engage with the information.



Variance to Budget \$1.39M Number of Tips





Sales



Per Mile

Budget Remaining

BY TRAVEL MONTH

ports > Segment Overview

Data Vis for BI: Decision-Making



- Well-designed visualizations empower decision-makers to make informed decisions based on data.
- By presenting data in a visually Order Month compelling manner, decision-ting Cost by Order Month and Segment makers can evaluate options, identify opportunities, and mitigate risks more effectively, leading to better outcomes for the organization.



Consumer Sales

1.03M

Corporate Sales

Home Office Sales

696.07K

Small Busines

560.6



Largest Sales

Order ID	Order Date	Customer Name	Operating Cost	Sales ▼
90831	12/28/2007	Sheryl Alexander	2,789.06	2,
2209	9/25/2007	Ronnie Dodson	130.81	2,
90916	2/26/2008	Dennis Boykin Townsend	1,970.46	1,
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88013	1/28/2008	Don Beard	163.87	1,



Data Vis for BI: Storytelling

- Visualizations are powerful tools for storytelling. They help transform data into narratives that engage and captivate audiences, making the data more memorable and impactful.
- By crafting compelling visual stories, data storytellers can inspire action, drive change, and convey the significance of the data in a compelling manner.



Data Visualization in Academic Research

- Why is data visualization important <u>in</u> <u>academic research?</u>
 - Data visualization serves as a powerful tool for academic researchers to **explore, analyze, and communicate** their **findings effectively**, ultimately advancing knowledge and driving innovation in their respective fields of study.



Data Vis for Research: Enhanced Understanding

Subtitle

പി

\$3,388,065







- Academic research often involves analyzing complex datasets and drawing conclusions from the data.
- Data visualization helps researchers gain a deeper understanding of their data by presenting it in a visual format that is easier to comprehend.
- Visualizations can reveal patterns, trends, and relationships within the data that may not be immediately apparent from raw numbers or text.



Data Vis for Research: Exploratory Analysis

- Data visualization facilitates exploratory analysis, allowing researchers to interactively explore their data, test hypotheses, and generate new research questions.
- Visualization tools with interactive features enable researchers to drill down into the data, filter information, and uncover insights in real-time, fostering a data-driven approach to research.



Data Vis for Research: Multi-Dimensional Data Representation

- Many academic research studies involve analyzing data with multiple dimensions or variables.
- Data visualization techniques such as scatter plots, heatmaps, and parallel coordinates allow researchers to visualize multidimensional data in a meaningful and interpretable way, enabling them to explore complex relationships and interactions within the data.



Headcount by Seniority and Gender

42%

Mid-Level

Female Male

59%

40%

Senior





Data Vis for Research: Testing & Validation

- Visualizations play a crucial role in hypothesis testing and validation by providing empirical evidence to support or refute research hypotheses.
- Visual representations of data allow researchers to evaluate the strength of relationships, assess statistical significance, and validate research findings through visual inspection and analysis.

Dashboard | Sales



Data Vis for Research: Comparative Analysis

HIP IN SEATTLE



What kind of genres are being checked out in the King County Library System?

- Visualizations enable researchers to compare different datasets, experimental conditions, or research methodologies more effectively.
- By visualizing data side by side, researchers can identify similarities, differences, and patterns across multiple variables, leading to more robust and comprehensive analyses.



Data Vis for Research: Communication of Findings

- Data visualization enables researchers to effectively communicate their findings to their peers, collaborators, and the broader academic community.
- Visualizations make research findings more accessible and understandable, helping researchers convey complex ideas and results in a clear and concise manner.



Sales vs Target \$55.5M \$44.4M \$88.7M



Acres 4

20.044

10 1104

10 3100

103104

10.20

10.2104

20.2754

10.200

512 Alle

Total Sales by Date

ու ավերական հայտանին, որ հայտանին, որ հայտանին, որ հայտանին, հայտանին, հայտանին, հայտանին, հայտանին, հայտանին,

\$10.70M

511.18M

518.77M

\$33.4714

-3.66%

4.56%

-341%

6.47%

\$17.63M

\$26.57M

535 194

544.374

Mar 2020

21,340

22.341

21,376

22,821

110,402

Apr 2020

May 2020

Data Vis for Research: Publication & Presentation

- Visualizations are often used in academic publications, presentations, and posters to illustrate key findings and support research conclusions.
- Well-designed visualizations enhance the visual appeal of academic materials, making them more engaging and impactful for readers and audiences.



Intro to Power BI

• What is Power BI?

- Power BI is a powerful business analytics tool developed by Microsoft.
- It enables users to visualize and analyze data from various sources to gain insights and make datadriven decisions.



Intro to Power BI, cont.

- What are the key features of Power BI?
 - Data Connectivity
 - Data Modeling and Transformation
 - Visualization
 - Advanced Analytics
 - Sharing and Collaboration
 - Integration with Microsoft Ecosystem



PBI Features: Data Connectivity

 Power BI allows users to connect to a wide range of data sources, including Excel spreadsheets, databases (SQL Server, Oracle, MySQL, etc.), cloud services (Azure, Google Analytics, Salesforce, etc.), and many others. This versatility enables users to bring in data from multiple sources for comprehensive analysis.



Power BI Data Source Connectors (sample)

- Excel
- CSV
- Text
- SQL Server Database
- Other Relational Databases
- Azure Data Services
- Online Services
- Web and API Services

- PDF
- Hadoop File (HDFS)
- JSON (JavaScript Object Notation)
- XML (eXtensible Markup Language)
- SharePoint Lists
- File Folder
- R Scrip
- Python Script

PBI Features: Data Modeling & Transformation



Master's Avg GPA Fall 2023

Combined Standing and Eligibility

Term and Combined Standing and Eligibility

2.96

d Eligible
Warning/Probation or Aid Warning
Suspended or Aid Ineligible

• With Power BI, users can clean, transform, and model data to suit their analysis needs. The built-in Query Editor provides a range of tools for shaping and refining data, such as filtering, merging, and creating calculated columns.



3.68

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Prior Fall: 3.68 (-0.00)

Select a Comparison Group (Line Chart Only ...) ...

Primary Degree Level

Doctoral Avg GPA Fall 2023

Average Cumulative Overall GPA by Term and Deg

Good St

3.86

Prior Fall: 3.85 (+0.01)



Power BI Data Transformations (sample)

- Filtering
- Sorting
- Add Columns
- Remove Columns
- Split Columns
- Merge Columns
- Data Type Conversion
- Grouping
- Aggregation

- Pivot Data
- Unpivot Data
- Conditional Columns
- Custom Functions
- M Language

PBI Features: Visualization

Full-Time Equivalency (FTE) Fall 2023	Full-Time Headcount Fall 2023		Online Only Head	count Fa
23,601.50 Prior Fall: 23,984.50 (-383.0 -1.6%)	19 Prior Fall: 20,249 (-2	,990 259 -1.3%)		Prior Fall:
Group by	Select a Student Characteristic		Select a Metric	
Term 🗸	Primary Career Level	~ ?	Headcount	
y Career Level				

 One of the key strengths of Power BI is its robust visualization capabilities. Users can create interactive and visually appealing reports and dashboards using a variety of chart types, including bar charts, line charts, pie charts, maps, and more. These visualizations can be customized to convey insights effectively.



Power BI Visuals (sample)

- Bar Chart
- Column Chart
- Line Chart
- Area Chart
- Pie Chart
- Donut Chart
- Scatter Chart
- Bubble Chart
- Map

- Gauge
- KPI (Key Performance Indicator)
- Tree Map
- Waterfall Chart
- Funnel Chart
- Ribbon Chart
- Third-Party Visuals

PBI Features: Advanced Analytics

 Power BI offers advanced analytical capabilities through its integration with R and Python. Users can leverage custom scripts and algorithms to perform complex analytics and statistical modeling within their reports.



Power BI Advanced Analytics (sample)

- R Integration
- Python Integration
- Quick Measures
- Key Influencers Visual
- Anomaly Detection
- Al Insights (Premium)

PBI Features: Sharing and Collaboration

 Once reports and dashboards are created, users can easily share them with others within their organization or externally.
 Power BI provides options for sharing via the Power BI Service, embedding in websites or applications, and exporting to formats like PowerPoint or PDF.

5 or More Hours in 3rd Term of New 15 or More Hours in 5th Term of New 15 or More Hour Full-Time Freshmen Entering Fall 2022 Full-Time Freshmen Entering Fall 2021 **Full-Time Freshn** 51.3% 53.3% 44.2% Prior Cohort: 48.2% (+3.1%) Prior Cohort: 43.5% (+0.7%) Select an Entry Term Type... **Display Students in Their Program a** Fall \sim Program in First Term More Hours by Cohort and Term Percent Enrolled in 15 or More Hours in 1st Term by Coll Select a Course Load Benchmark... Select Entry Ter Term 8 Term 4 Term 5 Term 6 Term 7 15 or More Hours in 1st Term All \sim 45.7% 51.0% 51.1% 33.6% College of Education 70.8% (n=3,389) 51.8% 53.0% 52.3% 42.6% 29.8% College of Business 68.8% (n=9,693) 42.0% 53.3% 51.7% 49.3% 28.3% College of Fine Arts and Communication 66.5% (n=5,130) 48.1% 45.7% 37.9% 26.5% College of Health and Human Performance 65.1% (n=9,055) College 42.0% 41.2% 37.0% 26.5% College of Engineering and Technology 62.7% (n=5,836) 37.9% 44.5% 43.0% 26.3% College of Allied Health Sciences 60.3% (n=1,851) 41.8% 43.5% 42.1% 36.2% 27.2% College of Arts and Sciences 59.1% (n=14,470) College of Nursing 59.1% (n=8,922) 44.2% 44.2% 41.4% 28.4% General College (Undecided) 49.1% (n=3,761) 47.2% 39.8% 0% (?)(i) 15 or More Power Bl Sharing Features

- Publish to PowerBI Service
- Share Reports and Dashboards
- Collaborate with Colleagues
- Commenting and Discussion
- Subscribe to Reports
- Embed Reports
- Microsoft Teams Integration

PBI Features: Integration with Microsoft Ecosystem

69% Percent Positvie Responses	2.9 Average Rsponse as a Numeric	
Select a Class Level	Group Responses by	
Freshman 🗸	Response	

8%

0.0%

39%

28%

54%

80.0%

31%

Percent of Responses

60.0%

32%

40.0%

20.0%

uch confidence do you have in your ability to do the following?

Power BI seamlessly integrates bility to do the following? • with other Microsoft products oit •4) Very much and services, such as Excel, SharePoint, and Teams, Address ethical issues you might face in your career 33% allowing users to leverage their existing infrastructure and our knowledge, skills, and experiences to potential employers 36% workflows. nctuality, working productively with others, time and workload m... 36% 46%

with alumni or professionals to make potential career connections

technology (devices, programs, or tools used by those in the field)

backgrounds (economic, racial/ethnic, political, religious, national...

Power Bl Sharing Features

- Excel
- Office 365
- Teams
- Azure
- Dynamics 365
- Power Platform

Intro to Power BI, cont.

• What are the components of Power BI?

- Desktop
- Service
- Mobile
- Report Builder
- Report Server





Power BI Desktop, cont.

- Where can I download PBI Desktop software?
 - You can get the most recent version of Power BI Desktop from the <u>Windows</u> <u>Store</u>, or as a single executable containing all supported languages that you <u>download</u> and install on your computer.
- When is PBI Desktop software updated?
 - Power BI Desktop is updated and released **monthly**, incorporating customer feedback and new features. Only the most recent version of Power BI Desktop is supported by Microsoft.



Break then Demonstration

- Let's take a break for ~10 minutes.
- Then we'll get into the demo and build a dashboard!

About Today's Demonstration

- Credit: Keven Stratvert
- Kevin's YouTube Channel:
 - <u>https://www.youtube.com/@KevinStratvert</u>
- How to use Microsoft Power BI Video Tutorial for Beginners:
 - <u>https://www.youtube.com/watch?v=TmhQCQr_DCA&t=256s</u>