

Advanced Business Analysis Techniques

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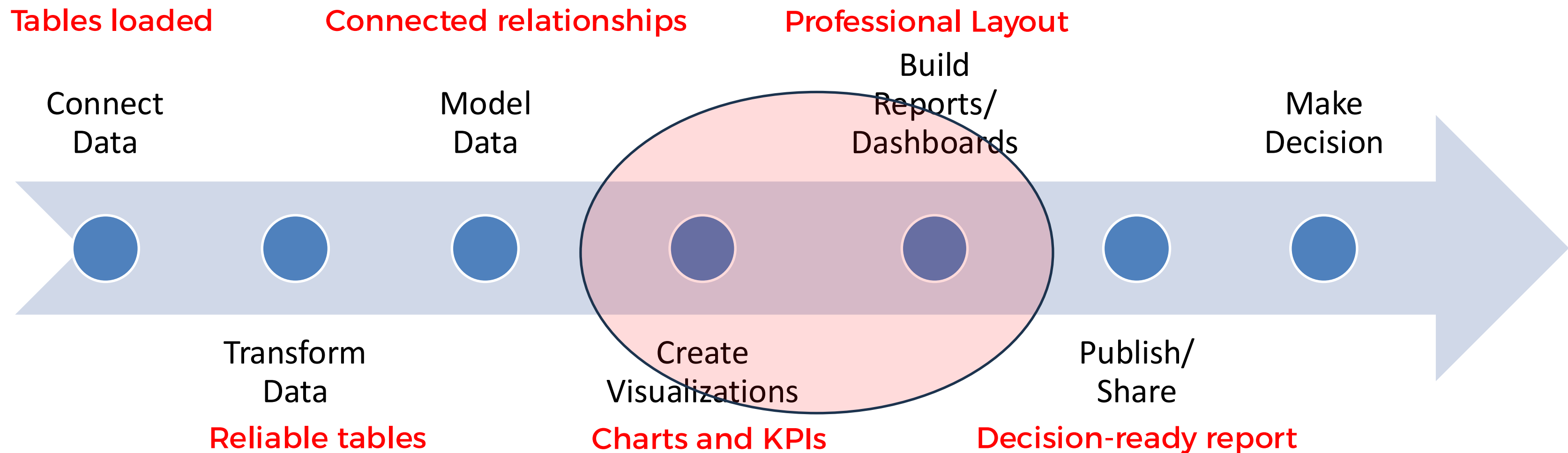
Course: From Data to Decisions using Power BI

Lecture 07



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Power BI Workflow (The Analytics Journey)



Each stage adds value — skip one and the chain breaks

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What we will cover

1. Bringing External Context into Power BI
2. AI-Powered Analytics
3. Advanced Business Analysis

From Reporting to Advanced Analytics



Traditional Reporting

Explores the past: "What Happened?"
Relies on simple historical summaries, operational tallies, static tables, and lagging indicators.
Keeps decision-making reactive.



Advanced Analytics

Unravels: "Why? & What Next?"
Connects external contextual metrics, fires machine learning algorithms, models future pathways, and points to direct actions.

Types of Business Analytics

Type	Core Question	Power BI Implementation	Analytical Value
Descriptive	What happened?	Operational Charts & KPIs	Low Complexity
Diagnostic	Why did it happen?	Decomposition Trees, Key Influencers	High Insight
Predictive	What will happen?	ETS Forecasting Engine	Forward Looking
Prescriptive	What should we do?	What-If Parameters & Scenario Matrix	Highest Strategic Impact

Business Scenario

A global retail company is experiencing sudden, multi-quarter profit margin compression despite consistent high gross sales volume.

Management demands swift answers on:

- 📍 Which specific products or locations are underperforming?
- ❓ Is this shift macroeconomic or operational?
- 🕒 What are the future margin trends if unaddressed?



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1. Bringing External Context into Power BI



Why External Data Matters?

Go beyond Corporate Silos

Analyzing transactions alone introduces a massive blind spot. Operational changes are heavily influenced by the macroeconomic, regulatory, and physical environments.

By correlating external data layers, we unlock true cause-and-effect insights.



FX Rates

Global revenue
translation
normalization.



Inflation indices

Adjust profit numbers to
real GDP metrics.



Weather layers

Map local weather
impact on seasonal
sales.



Demographics

Incorporate regional
purchasing power shifts.

Extracting Web Data: The Workflow

Home → Get Data → Web

Steps:

Provide public webpage address
using "Get Data -> Web".

1. Enter URL

Trim empty rows, fix types,
and promote header rows.

3. Cleanse Data

2. Suggest Tables

Power BI UI auto-identifies
nested HTML structures.

4. Model & Load

Build model relationships
against internal keys.

Working with Web Data: Pro Tips



Overcoming Drift

HTML structures change over time. If the target website changes its layout, your Power Query steps will break.

Rule: Rely only on government or official statistical endpoints with stable pages.



Data Validation

- Verify the refresh cadence (Daily? Monthly?).
- Remove unneeded metadata and empty columns.
- Check that your URLs accept standard gateway refreshes.

Connecting to APIs in Power BI

What is an API?

- An API (Application Programming Interface) allows Power BI to retrieve data directly from online systems and services.
- APIs return structured data, typically in JSON or XML format.
- Data can be refreshed automatically to keep reports up to date



Common API Data Sources

- Exchange rates
- Weather data
- Financial markets
- Government open data
- CRM and ERP systems.

Example API Endpoint (URL):
ExchangeRate.host

`https://api.exchangerate.host/latest
?base=USD&symbols=EUR,GBP,EGP`

REST APIs & Web Feeds

Direct Data Connections

- Web scraping gets the data, but Web APIs give you a direct, stable pipeline.
- API feeds are built specifically for software communication.
- REST Standard: Leverages simple HTTP queries for fast access.
- JSON Payload: Power BI automatically formats JSON files into clean rows.
- Token Security: Easy setup for credential-locked API endpoints.



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2. AI-Powered Analytics



Power BI Built-In AI Engine



Diagnostic AI

Key Influencers and
Decomposition Trees
automatically find root causes
and show exactly what drives
your performance metrics.



Predictive AI

Built-in forecasting and
automatic anomaly detection
algorithms scan your timelines
to spot outliers and project
future values.



Natural Language

Smart Narratives and Q&A
visuals use natural language
processing to translate charts
into clear text bulletins instantly.

Analyze & Key Influencers Visuals

To answer a business question as: "Explain the Sales Decrease"

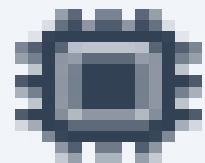
- **Analyze:** Right-click any data point in your bar chart, select Analyze, and Power BI runs an instant automated variance analysis across all dimensions.
- Visualizations pane → Build visual → Key Influencers
- The Key Influencers visual clearly ranks which elements cause metric swings. For example: "If Discount is >20%, profit drop likelihood increases by 3x."



The Decomposition Tree Visual

Algorithmic Root Cause Analysis

- Deconstruct complex high-level KPIs across dynamic hierarchies. Users can slice metrics manually or let Power BI automatically determine the next split.



- High/Low Value AI Splits:
- Power BI automatically scans your dimensions and opens the path showing the highest concentration of variance.

Visualizations pane → Build visual → Decomposition Tree

AI SPLIT LOGIC PREVIEW

Total Loss (\$12M) > Europe (\$8M) > Logistics Surcharges (\$5M)

The system automatically flags the highest loss paths without manual hierarchy setups.

Predictive Forecasting Engine

ETS (Exponential Smoothing)

- Power BI's forecasting tools use built-in exponential smoothing algorithms to find trends and seasonal shifts in historical data.
- Confidence Interval: Standardized error bands (usually set to 95%).
- Seasonality Factor: Manually tune cycles to match your unique business season.



Select a Line Chart → Visualizations → Analytics pane (magnifying glass) → Forecast → Add

Automated Anomaly Detection

Catching Spikes & Drops Instantly

- Power BI scans historic patterns and places diagnostic markers directly on line charts when metrics fall outside normal bands.
- Fraud Detection: Spot sudden, unusual spikes in refund volumes.
- Demand Changes: Identify abrupt shifts in regional purchase activity.



Anomaly Sensitivity Index

Select a Line Chart → Right-click a data point → Analyze → Find anomalies

Clustering: Native Machine Learning



Segmentation

Automatically groups customers by purchase frequency, margin contribution, and average cart size without complex queries.



Product Cohorts

Identifies inventory behaviors and groups products dynamically into velocity tiers for optimized supply chain handling.



Store Clustering

Maps geographic location performances to reveal clusters based on customer base, real estate trends, and local overhead metrics.

Right-click a data point in a Scatter Chart → Automatically find clusters

Smart Narrative & Q&A Visuals



Smart Narratives

Power BI automatically translates your visual dashboards into structured, conversational text summaries.



Dynamically updates when you filter or slice the page.



Conversational Q&A

Let end users build complete visual charts using simple, natural language questions.



Curate custom business synonyms to train the model.



Translates "Sales by Region" into a map or chart.

**Insert → Smart Narrative or Visualizations
pane → Smart Narrative**

Visualizations pane → Q&A



Copilot combines generative AI with Power BI to help users build reports, analyze data, and discover insights faster using natural language, while analysts remain responsible for validating and interpreting the results.

Using Copilot in Power BI

Copilot is Microsoft's AI-powered assistant built into Power BI that helps users analyze data, create reports, generate DAX formulas, and summarize insights using natural language.

What can Copilot do?

- Generate report pages from a text prompt.
- Create and explain DAX measures.
- Summarize key insights from reports.
- Suggest appropriate charts and visualizations.
- Answer questions about your data using natural language.
- Generate written narratives for business reports.

How to Access Copilot?

Power BI Service:

- * Open your report in a Fabric or Premium workspace.
- * Click the Copilot icon in the report toolbar or side panel.

Power BI Desktop (supported versions):

- * Open your report.
- * Select Home → Copilot (available if your organization has enabled Copilot and the required licensing).

Example Prompts

- “Create a dashboard showing monthly sales by region.”
- “Summarize the key sales trends in this report.”
- “Create a DAX measure for Year-to-Date Revenue.”
- “Which products contributed most to profit?”
- “Suggest the best visual to compare sales across regions.”

Note: Copilot requires Microsoft Fabric or a supported Premium capacity, appropriate licensing, and administrator enablement.

Selecting the Right AI Capability

Business Goal	Recommended Tool	Why Choose This?
Find Point Drivers	Analyze Feature	Fast, zero-setup, right-click analysis on single deviations.
Rank Metric Contributors	Key Influencers	Ranks dimensions based on how heavily they affect key KPIs.
Deep Root-Cause Drilling	Decomposition Tree	Visualizes hierarchical paths using automatic AI splits.
Time-Series Predictions	Forecasting Engine	Provides statistical confidence bands based on seasonal history.
Outlier Alerts	Anomaly Detection	Sets up automated alerts for values outside normal parameters.

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3. Advanced Business Analysis



Trend Analysis

Isolating Structural Trajectories

Trend analysis helps businesses look past short-term daily spikes to identify long-term market directions.



Secular Trends: Long-term structural market shifts.



Seasonal Patterns: Recurring annual or calendar events.



Irregular Events: Unique, non-repeating data anomalies.

Analyst Best Practice

Aggregate transaction times into uniform monthly, quarterly, or yearly blocks. Avoid daily detail charts, which often add visual noise and make macro trends harder to read.

Create a Line Chart (Visualizations pane); optionally add a Trend line or Moving Average from the Analytics pane (supported visuals)

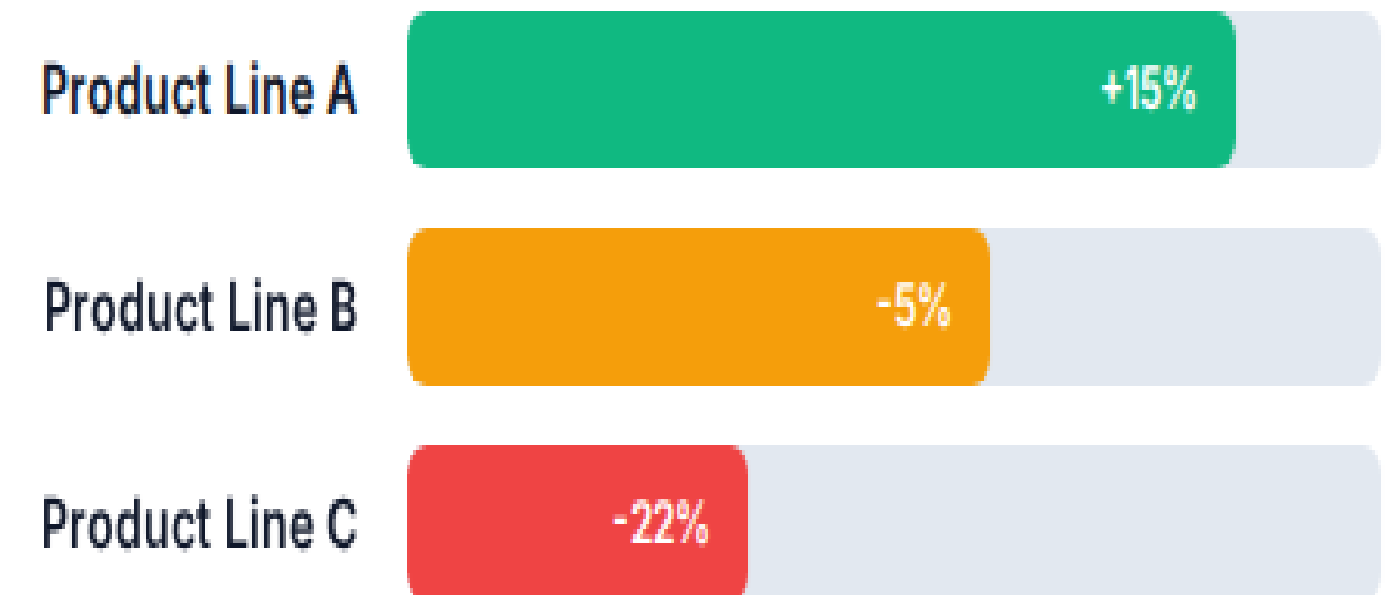
Variance Analysis

Gaps Against Targets

- Variance analysis tracks the exact differences between actual performance and your target budgets or prior periods.

$$\text{Variance \%} = \frac{\text{Actual} - \text{Budget}}{\text{Budget}} \times 100$$

VARIANCE TO BUDGET %



Create comparison measures (Actual vs Target/Budget) using DAX, then display with Clustered Column/Bar Chart, Waterfall Chart, or KPI visual

Contribution Analysis

Segment Shares

Contribution analysis breaks down exactly how much each product, region, or customer cohort contributes to your overall margin total.

$$\text{Contrib \%} = \frac{\text{Segment Metric}}{\text{Total Aggregate}}$$

The Waterfall Solution

Standard charts show totals, but Waterfall Charts visualizes step-by-step changes, bridging the gap between start and end values.

Ideal for explaining sequential profit drops directly to executive leadership.

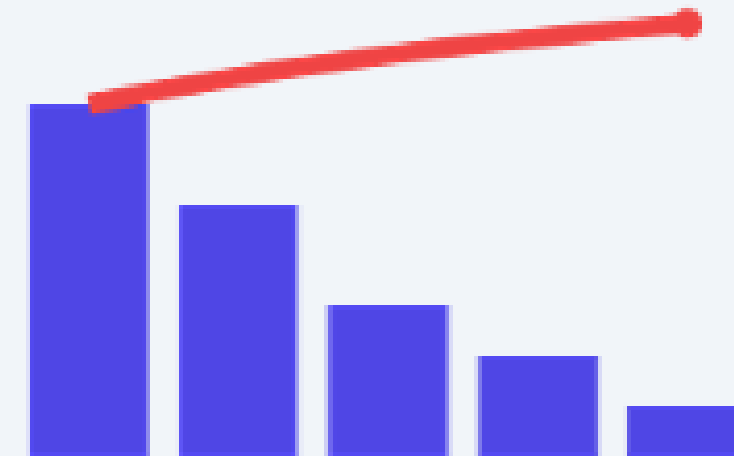
Visualizations pane → Waterfall Chart (to show how categories contribute to the overall change)

Pareto Analysis (The 80/20 Rule)

Strategic Prioritization

- In business, roughly 80% of outcomes (such as revenue or profit loss) flow from 20% of contributors (such as top customers or product errors).
- **Focus:** Helps prioritize finite developer and analyst resources.
- **Combo Charts:** Track individual values alongside cumulative lines.

PARETO CHART STRUCTURE



Line and Clustered Column Chart (Visualizations pane) combined with a cumulative percentage DAX measure

Ranking Analysis

Top N vs. Bottom N

Instead of loading entire catalogs, isolate the core performers at either end of your dataset to pinpoint issues instantly.

- Performance: Isolate top sales drivers.
- At-Risk Targets: Expose bottom products dragging down profit.

</> Implementation Path

Deploy rankings in Power BI using:

```
RankSales = RANKX(ALL(Products), [Total Sales])
```

Filters pane → Top N filter, or create a RANKX() measure and use it in any chart or table

Moving Averages

Smoothing Volatility

Raw performance data often has predictable seasonal dips, like weekend drops. Moving averages strip out this noise.

This reveals the true underlying trend line, making it much easier to assess long-term direction.

Dynamic Windows

Analysts adjust their analysis windows based on typical business cycles:



7-Day: For retail operations.



30-Day: For monthly financial reporting.

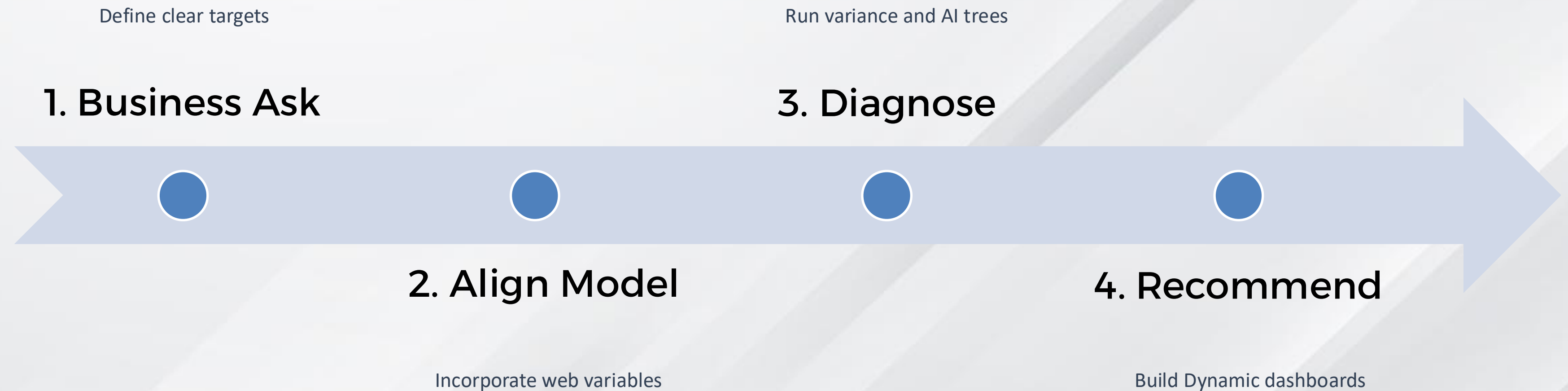
Create a Moving Average DAX measure (Modeling → New Measure) and display it in a Line Chart (Analytics pane moving average is only available for certain visual types/versions)

The Analyst Strategy Matrix

Analyst Objective	Analytical Framework	Preferred Power BI Visuals
Map long-term patterns	Trend Analysis	Line Charts with Moving Average layers
Evaluate target performance	Variance Analysis	Bullet Charts, Red/Green KPI Cards
Isolate core contributors	Pareto Analysis	Combo Line/Column Chart
Identify top & bottom items	Ranking Analysis	Filter Pane Top N, DAX RANKX()
Predict upcoming quarters	Forecasting	Analytics Pane with 95% confidence bands

The Enterprise Analyst Workflow

Steps:



Presenting to Leadership

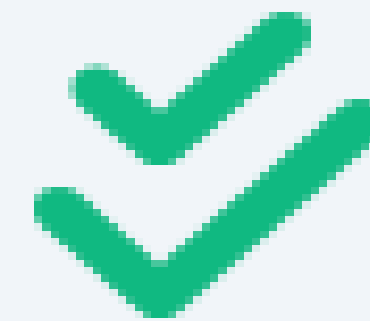
Communicating the Solution

Build a clean, high-impact dashboard tailored for your executive leadership team.

- “ Smart Narrative: Clear bullet points summarizing the issue, cause, and recommendation.
- ↔ What-If Parameters: Let executives test multiple scenarios dynamically to see results instantly.

Executive Decision

Switched carriers, immediately recovering 8% of profit margins starting in Quarter 4.



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Demo on Power BI



Exercise: Advanced Analysis

Using your Sales Dashboard from previous lectures:

1. Import external data by connecting to a public website and loading a relevant dataset (e.g., exchange rates or population data) into Power BI.
2. Combine and prepare the data by relating the external dataset to your existing sales model and validating the relationships. For example, linking the sales transaction date to the date in the exchange rate table.



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Exercise

Exercise: Advanced Analysis

3. Perform advanced analysis by creating at least two of the following: Forecast, Decomposition Tree, Key Influencers, or Anomaly Detection visual.
4. Apply analytical techniques by adding one trend analysis visual and one comparison such as Variance, Pareto, Ranking, or Running Total.
5. Create a dashboard that summarizes your insights and includes at least two business recommendations based on your analysis.



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Exercise

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07**Key Points**

External data enriches Power BI reports by adding valuable business context.

AI features such as Key Influencers, Decomposition Tree, Forecasting, and Anomaly Detection help uncover deeper insights automatically.

Advanced analytical techniques like Trend, Variance, Pareto, Ranking, and Averages support better business decision-making.

Combining multiple analytical methods provides a more complete understanding of business performance.

You can use Copilot in Power BI to generate insights using natural language.

Lecture 08:

- Real-World Departmental Use Cases



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Next Lecture



Thank You