

# Data Analysis Life Cycle

The Data Analytics Life Cycle is a structured and iterative process used to convert raw data into meaningful and actionable insights for business decisions. It is not a straight linear flow but a continuous loop, where learnings from later stages often require revisiting earlier ones. An actionable insight should be aligned with business goals, provide proper context, be relevant to the problem, specific enough to guide decisions, offer something new, and be clearly understandable. Modern analytics follows a hub-and-spoke model where Implementation and Monitoring sits at the center, and all other phases connect to it and are refined based on outcomes.

## Phase 1 — Discovery (Problem Understanding)


**Goal:** Clearly understand the business problem and objectives.

**What happens here:**

- Identify the business problem
- Define goals and success criteria
- Understand stakeholders' needs
- Identify available data sources
- Frame key questions

**Example:** Company notices a **15% drop in sales**. Questions defined:

- Which products dropped most?
- Which regions are affected?
- Did customer behavior change?
- Any pricing or marketing impact?

**Phase 2 — Data Collection and Access**  involves gathering required data from multiple sources. Internal sources include CRM, ERP, and transaction systems. External sources include public datasets, research reports, and third-party providers. Direct sources include surveys and interviews. Technically, this phase includes setting up SQL or NoSQL queries, API integrations, authentication methods, and ensuring data privacy compliance. The focus is on getting the right data with proper access and permissions.

**Goal:** Gather all required data from different sources.

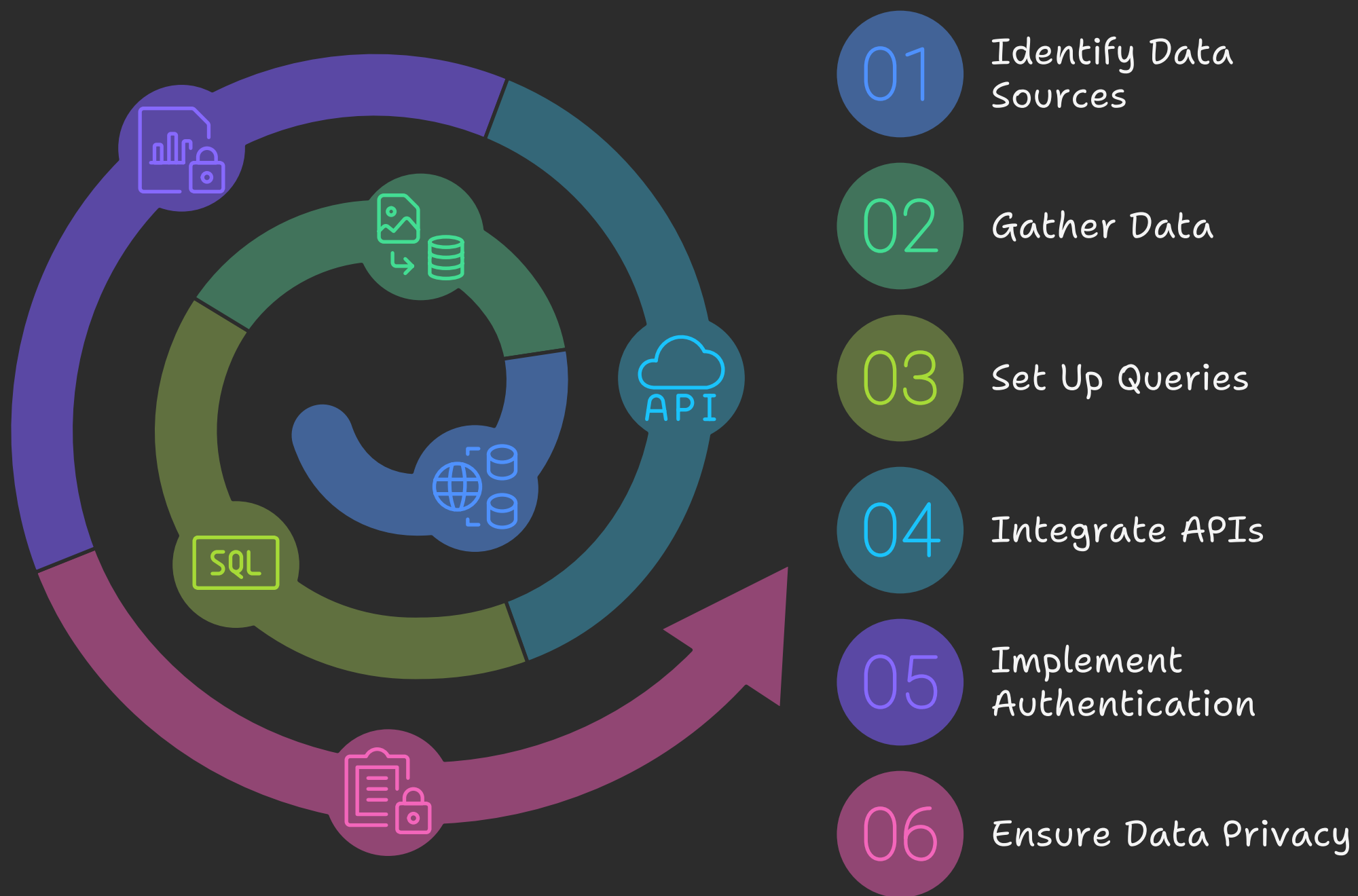
**What happens here:**

- Collect structured & unstructured data
- Extract from databases, APIs, files, logs, tools
- Combine multiple sources if needed

**Example:** Data collected from:

- Sales database
- Website analytics
- Marketing campaign reports
- Customer feedback data

## Data Collection and Access Phase



**Phase 3 — Data Cleaning and Preparation** 🧹 is usually the most time-consuming step. The core rule is that poor-quality input leads to poor-quality results. Tasks include fixing inconsistent formats, removing duplicate records, handling missing values, correcting calculation errors, and detecting outliers. For example, dates written in different formats or duplicate order entries must be standardized and cleaned. Two approaches are used: ETL (clean before storing) and ELT (store first, clean later). Common tools include Python, data cleaning platforms, and big data processing tools.

**Goal:** Make data usable and reliable.

**What happens here:**

- Handle missing values
- Remove duplicates
- Fix incorrect entries
- Convert data types
- Merge datasets
- Create derived columns

**Example:**

- Missing prices filled with median
- Duplicate orders removed
- Date fields converted to proper format
- Region names standardized

**Output:** Clean, structured dataset

## Data Cleaning and Preparation: Ensuring Quality Results



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**Phase 4 — Exploratory Data Analysis (EDA) and Model Planning** 🔍 is where analysts explore patterns and relationships before building models. They analyze distributions, correlations, trends, and seasonality. Types of analysis include univariate [single variable], bivariate [two variables], multivariate [many variables], time-based, and geographic analysis. This work is done in an analytic sandbox — a safe environment for experimentation. Outputs include early hypotheses, candidate features, and a plan for training and testing datasets.

**Goal:** Explore patterns, trends, and anomalies.

**What happens here:**

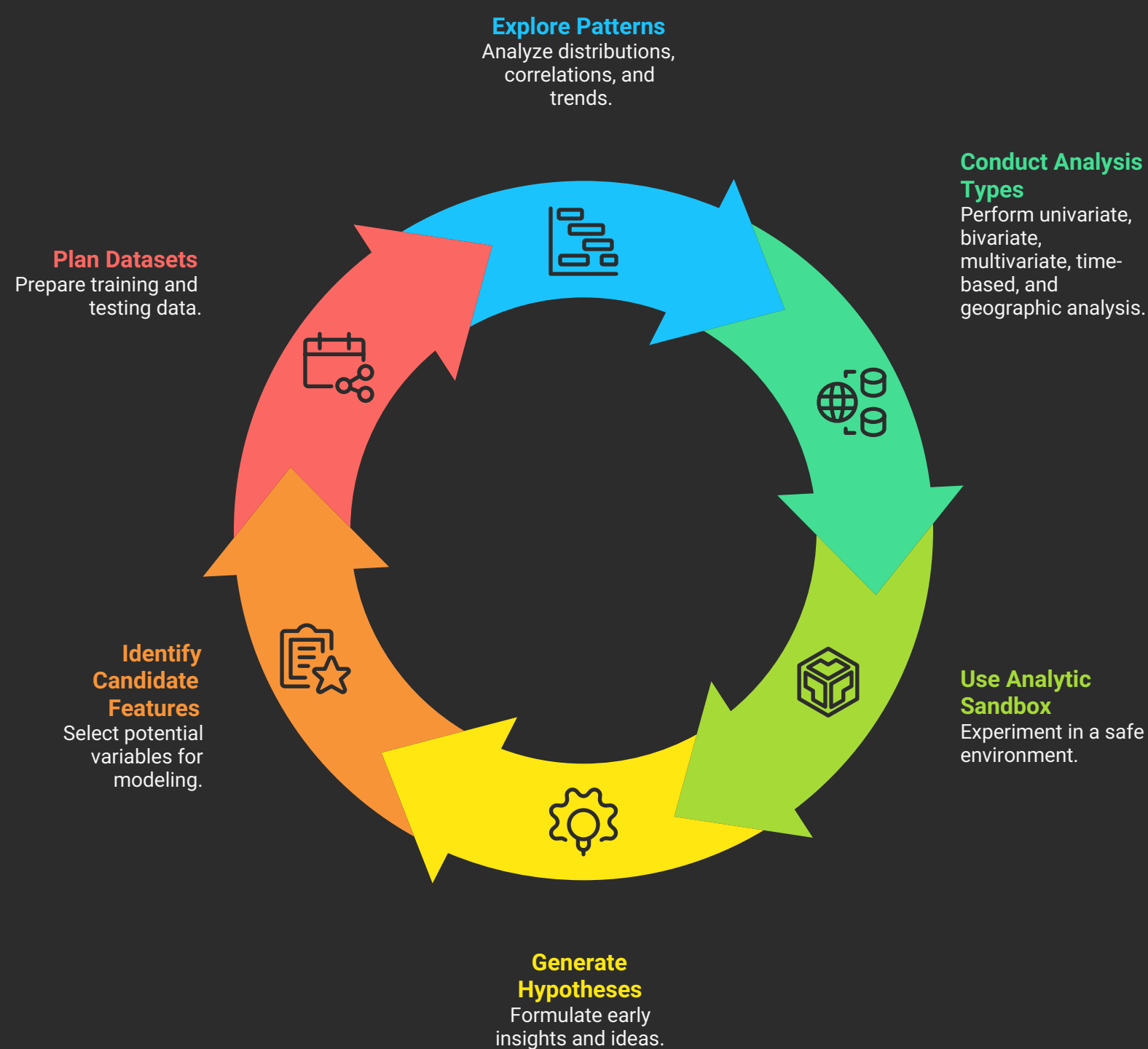
- Summary statistics
- Visualizations [charts, plots]
- Correlation checks
- Distribution analysis
- Segment comparisons

**Example Findings:**

- Sales drop mainly in **South region**
- Mobile category declined sharply
- Conversion rate dropped after website redesign

**Output:** Initial insights + hypotheses

# Exploratory Data Analysis Cycle



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## Phase 5 — Advanced Analysis and Modeling

Apply analytical or statistical methods to answer questions.

### What happens here:

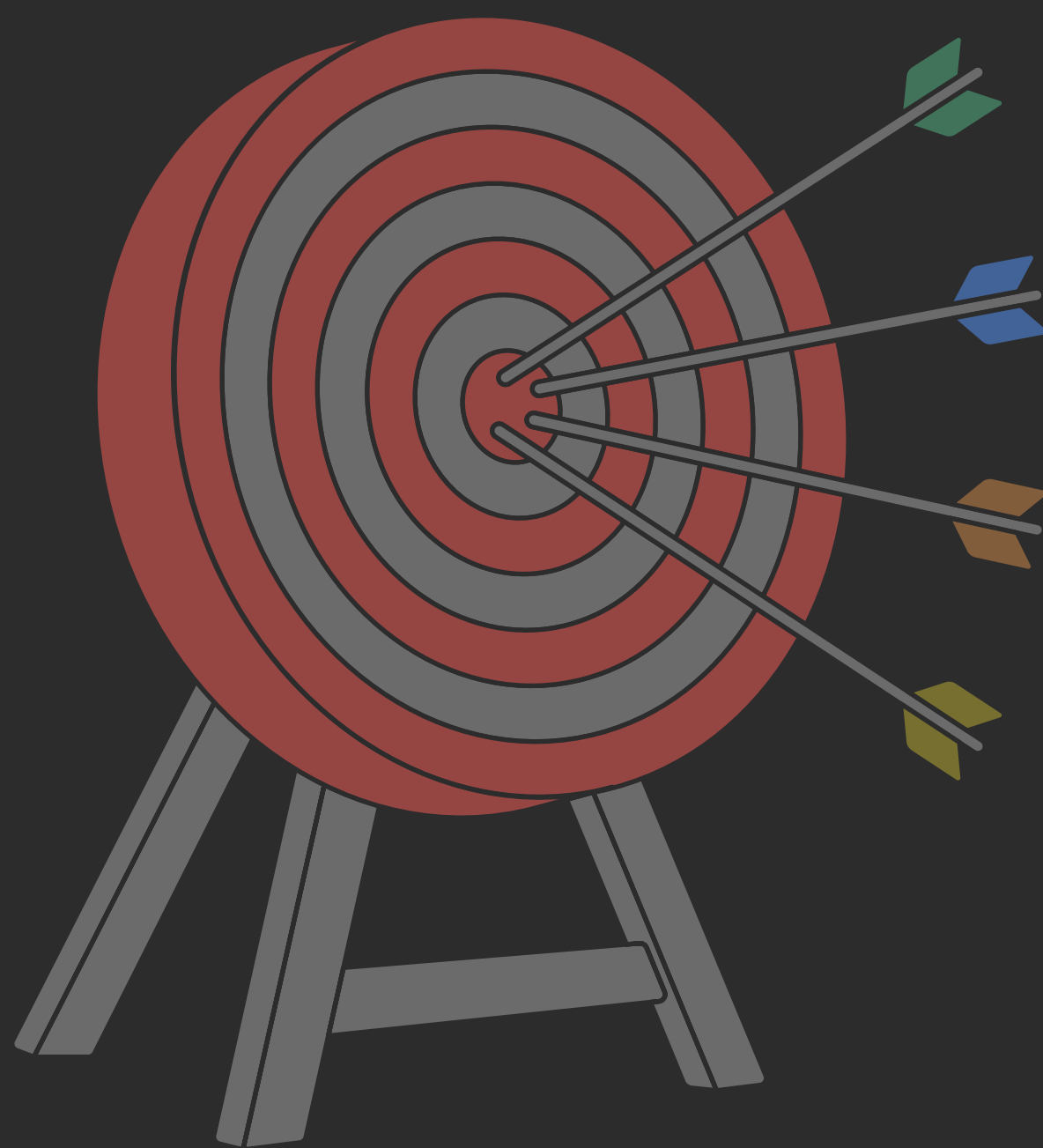
- Statistical tests
- Forecasting
- Segmentation
- ML models (if needed)
- Trend analysis

### Example:

- Regression shows price increase reduced demand
- Customer segmentation shows budget buyers churned
- Time-series shows decline started after shipping fee change

applies statistical and machine learning methods to extract deeper insights. Analytics can be descriptive [what happened], diagnostic [why it happened], predictive [what may happen], or prescriptive [what should be done]. Model development includes feature selection, model training, parameter tuning, and validation on separate data. Tools commonly used include Python, R, SQL, Excel, and specialized analytics software.

# Advanced Analysis and Modeling Process



## Advanced Analysis and Modeling

Core process of extracting insights



## Model Development

Steps to build and validate models



## Analytics Types

Categories of insights derived



## Tools

Software used in the process

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## Phase 6 — Validation & Evaluation

**Goal:** Check whether results are correct and useful.

**What happens here:**

- Validate assumptions
- Cross-check with stakeholders
- Test model accuracy [if ML used]
- Compare with business reality

**Example:**

- Validate price sensitivity with A/B test data
- Confirm trend with marketing team timeline

**Output:** Verified insights

## Phase 7— Visualization and Data Storytelling :

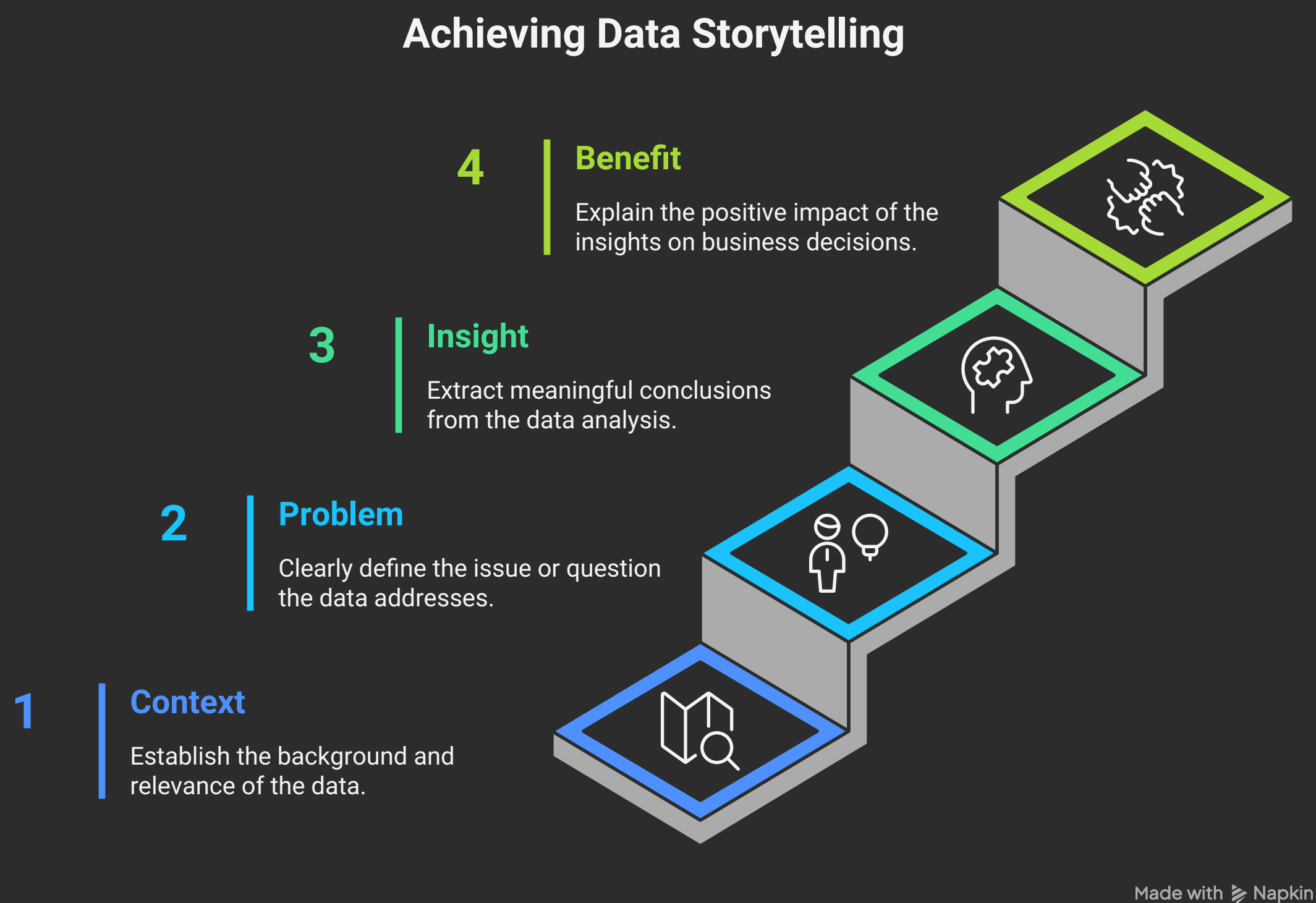
**Goal:** Communicate findings clearly.

**What happens here:**

- Dashboards
- Charts & graphs
- KPI summaries
- Business reports
- Storytelling with data

**Example:**Dashboard shows:

- Region-wise drop
- Category decline
- Impact of pricing & shipping changesconverts technical findings into business-friendly communication. The objective is to make insights understandable for non-technical stakeholders. Effective storytelling follows a logical flow: context, problem, insight, and benefit. Charts such as bar charts, line graphs, and heatmaps are used to support the message. Tools like Power BI, Tableau, Qlik, and Excel help present results clearly.



### Phase 8— Implementation and Monitoring :

turns insights into real actions. Organizations usually start with a pilot project before full deployment. Teams compare expected results with actual outcomes and measure performance. If results are not satisfactory, analysts revisit earlier phases and refine the approach. This makes the lifecycle continuous and improvement-driven.

# Data Analytics Implementation Cycle

