# Excel Manual – Session 01

## Objective

The objective of this session is to provide a comprehensive introduction to essential Excel skills. By the end of this session, you will have a solid understanding of data literacy, advanced data structuring, and importing data from the web in Excel.

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## 1. Data Literacy, Lifecycle, and Understanding Data

### Data Literacy

Data literacy is the ability to read, understand, create, and communicate data as information. It involves understanding how data is collected, analyzed, and used to make decisions.

**Importance:** Enhances decision-making, improves problem-solving skills, and allows for more effective communication of insights.

### Statistical Foundations

Statistical foundations provide the basic principles and methods for collecting, analyzing, interpreting, and presenting data.

**Key Concepts:**

- **Population and Sample:** Population is the entire group you want to draw conclusions about, while a sample is a subset of the population.
- **Variables:** Characteristics or properties that can take on different values (e.g., age, income, temperature).
- **Scales of Measurement:** Nominal, ordinal, interval, and ratio scales used to classify data.

## Descriptive Statistics

Descriptive statistics summarize and describe the main features of a dataset.

**Key Measures:**

- o **Central Tendency:** Mean (average), median (middle value), and mode (most frequent value).
- o **Dispersion:** Range (difference between highest and lowest values), variance (measure of variability), and standard deviation (average amount by which values differ from the mean).
- o **Visualization:** Using charts and graphs like histograms, bar charts, and box plots to visualize data distribution and patterns.
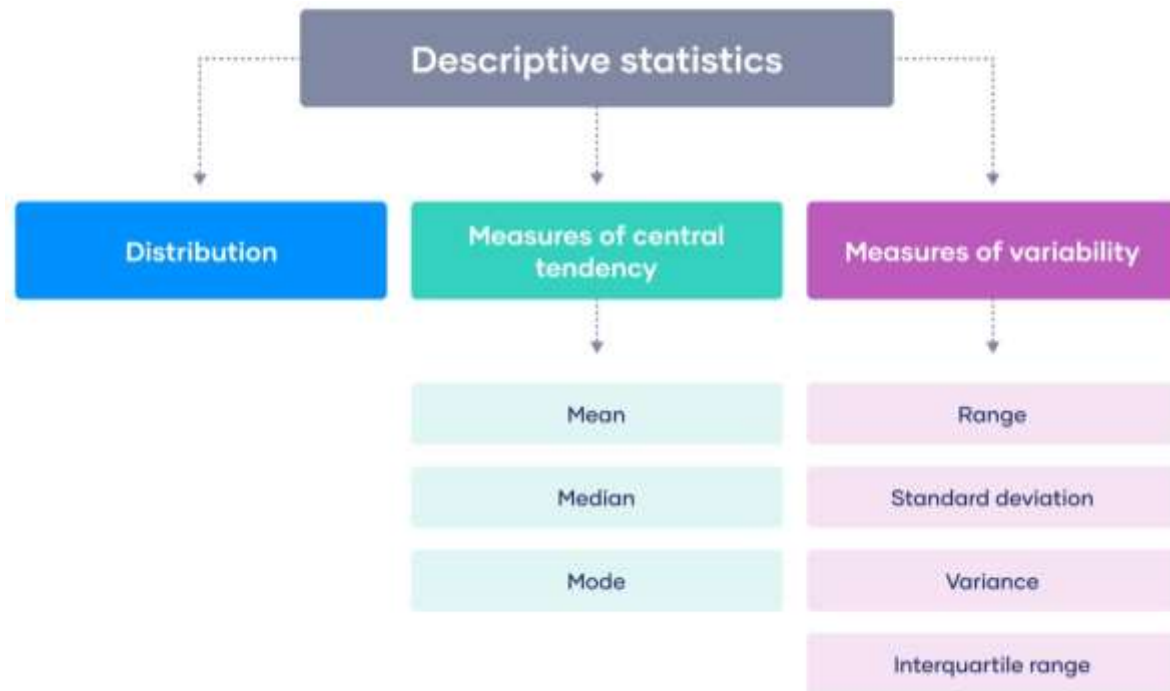


## Understanding Data

**Data** is a collection of facts, figures and statistics collected and stored for reference and analysis.

Understanding data involves recognizing different data types, sources, and methods for cleaning and preparing data for analysis. Key concepts include:

- **Data Types:** Text, numbers, dates, and Boolean.
- **Data Sources:** Databases, web pages, spreadsheets, and APIs.
- **Data Cleaning:** Removing duplicates, handling missing values, and correcting errors.

## Data Lifecycle

The data lifecycle encompasses all stages that data goes through from creation to deletion. Key stages include:

- **Data Collection:** This initial stage involves gathering raw data from various sources. The quality and accuracy of data collected at this stage directly impacts the effectiveness of subsequent stages.

- **Data Cleaning and Preparation:** Critical for ensuring the reliability of the dataset, this stage involves removing errors, inconsistencies, and irrelevant data. Proper data cleaning enhances the accuracy of analysis and decision-making processes.

- **Data Analysis:** At this stage, the cleaned data is examined to extract meaningful insights. This involves looking for patterns, correlations, and trends that can inform business decisions or scientific conclusions.

- **Data Visualization:** Here, data is transformed into graphical representations like charts and graphs. Visualization makes it easier to understand complex data sets and communicate findings clearly.

- **Data Interpretation:** This involves making sense of the data and its visualizations to draw actionable conclusions. It's about understanding the 'why' and 'how' behind the data.
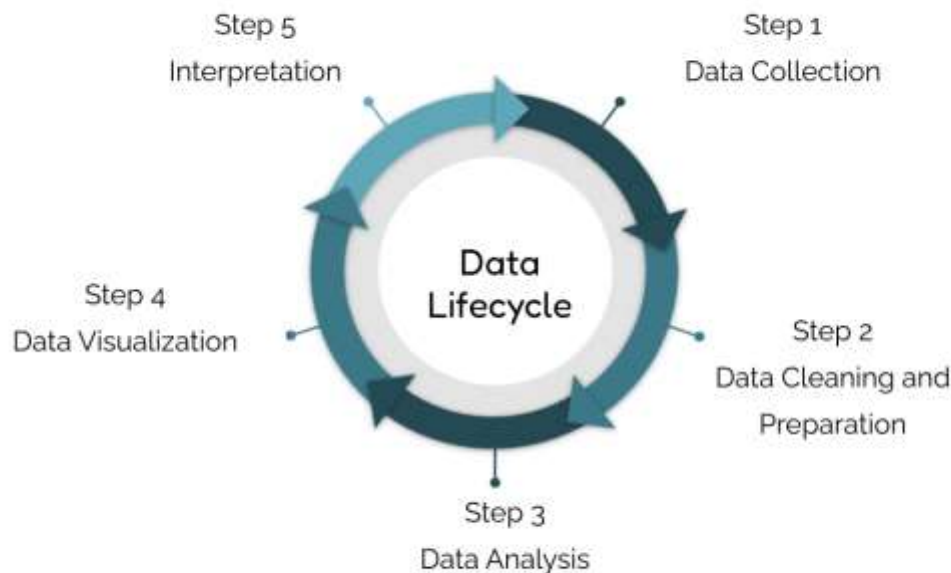
## 2. Advanced Data Structuring

Advanced data structuring in Excel involves organizing data to facilitate efficient analysis.

**Long and Wide Format Tables**

- **Long Format:**
    - **Description:** Each row represents a single observation, and variables are stored in multiple rows.
    - **Example:**

| ID | Variable | Value |
|----|----------|-------|
| 1  | Height   | 170   |
| 1  | Weight   | 65    |
| 2  | Height   | 160   |
| 2  | Weight   | 55    |

- **Wide Format:**
    - **Description:** Each variable is stored in its own column, and rows represent different observations.
    - **Example:**

| ID | Height | Weight |
|----|--------|--------|
| 1  | 170    | 65     |
| 2  | 160    | 55     |

**Columns Represent Variables**

- **Description:** Each column in your dataset should represent a single variable or attribute of the data.
- **Example:**

| Name  | Age | Gender |
|-------|-----|--------|
| Alice | 25  | Female |

**Rows Represent Observations**

- **Description:** Each row should represent a single observation or record. This ensures that each entry is consistent and can be easily analyzed.
- **Example:**

| CustomerID | Name | PurchaseAmount |
|---|---|---|
| 101 | John | 150.00 |
| 102 | Jane | 200.00 |

**Variable Should Have Distinct and Easy to Understand Names**

- **Description:** Use clear, distinct names for your variables to avoid confusion and ensure that anyone reading the dataset can easily understand what each column represents.
- **Example:**
  - Good: CustomerID, OrderDate, ProductPrice
  - Bad: C_ID, OD, P_P

**Variable Name in First Row**

- **Description:** The first row of your dataset should contain the variable names (headers). This makes it clear what each column represents.
- **Example:**

| Name | Age | Gender | Sales |
|---|---|---|---|
| John | 30 | Male | 5000 |

**There Should Be No Empty Columns and Rows in the Dataset**

- **Description:** Ensure that there are no completely empty rows or columns, as these can cause issues with data analysis and processing.
- **Example:**

  - **Good:**

| ID | Name | Age |
|---|---|---|
| 1 | Max | 28 |
| 2 | Zoe | 32 |

o **Bad:**

| ID | Name | Age |
|----|------|-----|
| 1  | Max  | 28  |
|    |      |     |
| 2  | Zoe  | 32  |

## Numerical Values Should Not Have Text Values in the Column

- **Description:** Ensure that columns meant for numerical data do not contain text values, as this can cause errors in calculations and data analysis.

- **Example:**

    o **Bad:**

    | ProductID | Price  |
    |-----------|--------|
    | 1         | 20.00  |
    | 2         | twenty |

    o **Good:**

    | ProductID | Price |
    |-----------|-------|
    | 1         | 20.00 |
    | 2         | 25.00 |

## Define Unique Identifiers

- **Description:** Use unique identifiers for each record to ensure that each observation can be uniquely identified. This is especially useful for linking data across different tables.

- **Example:**

    | CustomerID | Name | Age |
    |------------|------|-----|
    | 101        | John | 30  |
    | 102        | Jane | 25  |

### 3. Import Data (from Web in Excel)

Excel allows you to import data directly from web pages.

- **Importing Data:**
    1. Go to the Data tab.
    2. Click From Web.
    3. Enter the URL of the web page and click OK.
    4. Select the data tables you want to import and click Load.

**Refreshing Data**

- **Refreshing Imported Data:**
    o Go to the Data tab and click Refresh All to update the data from the web source.

## Conclusion

This session provided essential Excel skills, covering data literacy, advanced data structuring, and importing data from the web. You learned to read, interpret, and organize data efficiently and dynamically integrate external data sources. These skills form a solid foundation for effective data management and analysis in Excel.