DATA ANALYTICS

DIPLOMA WALLAH

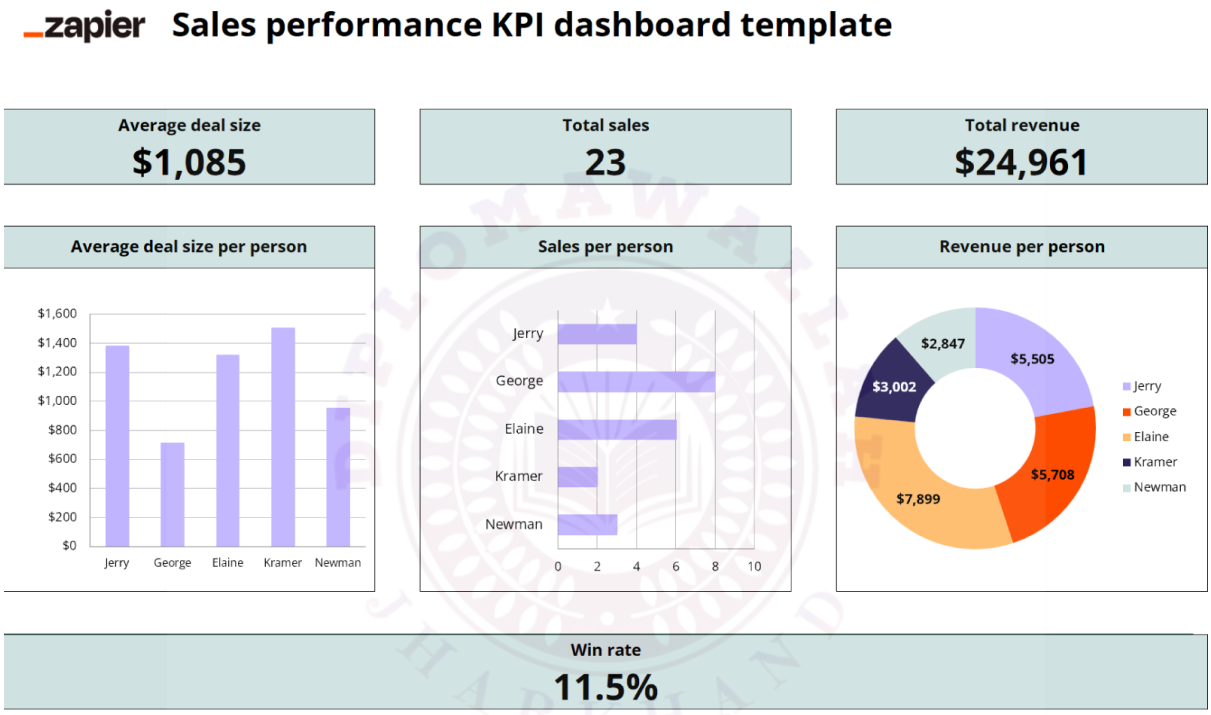
OPEN ELECTIVE

Jharkhand University Of Technology (JUT)

Unit - III Data Analytics with Excel

---

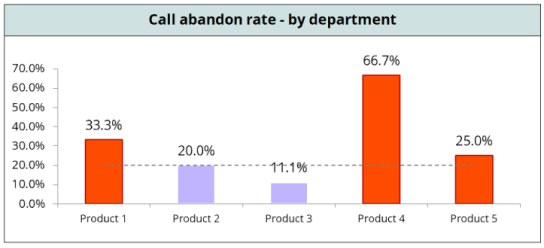
1. Theoretical Foundations of Excel Dashboards

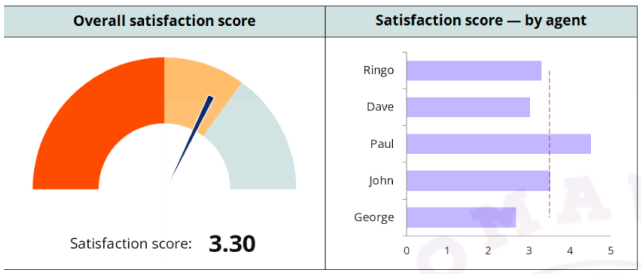


zapier Customer service KPI dashboard template

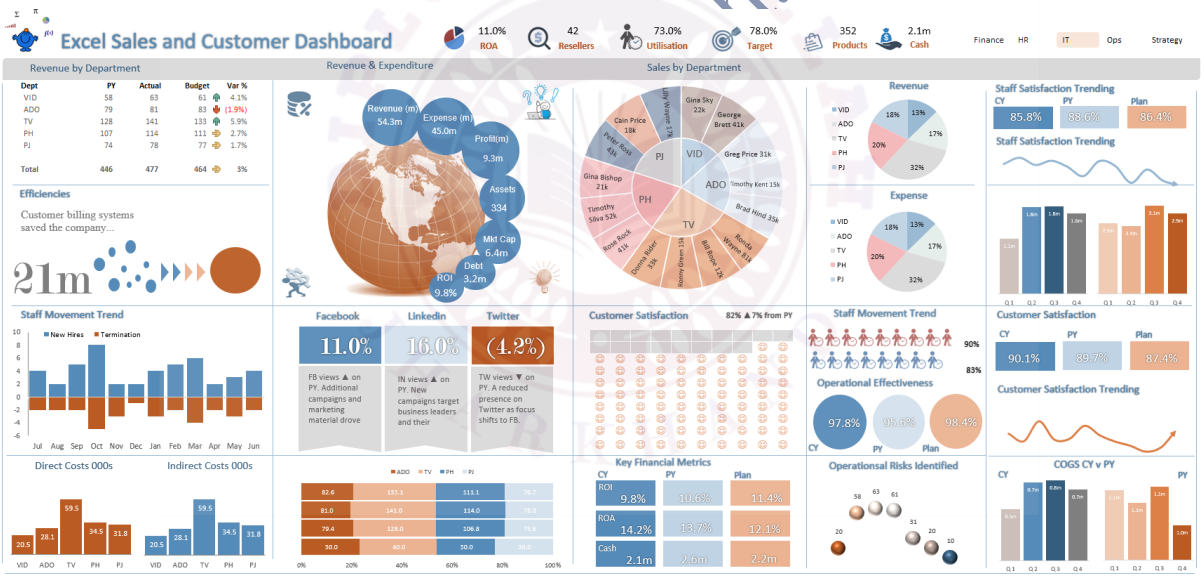
Total calls	Avg. answer speed (in sec)	Abandon rate
31	49.5	25.8%

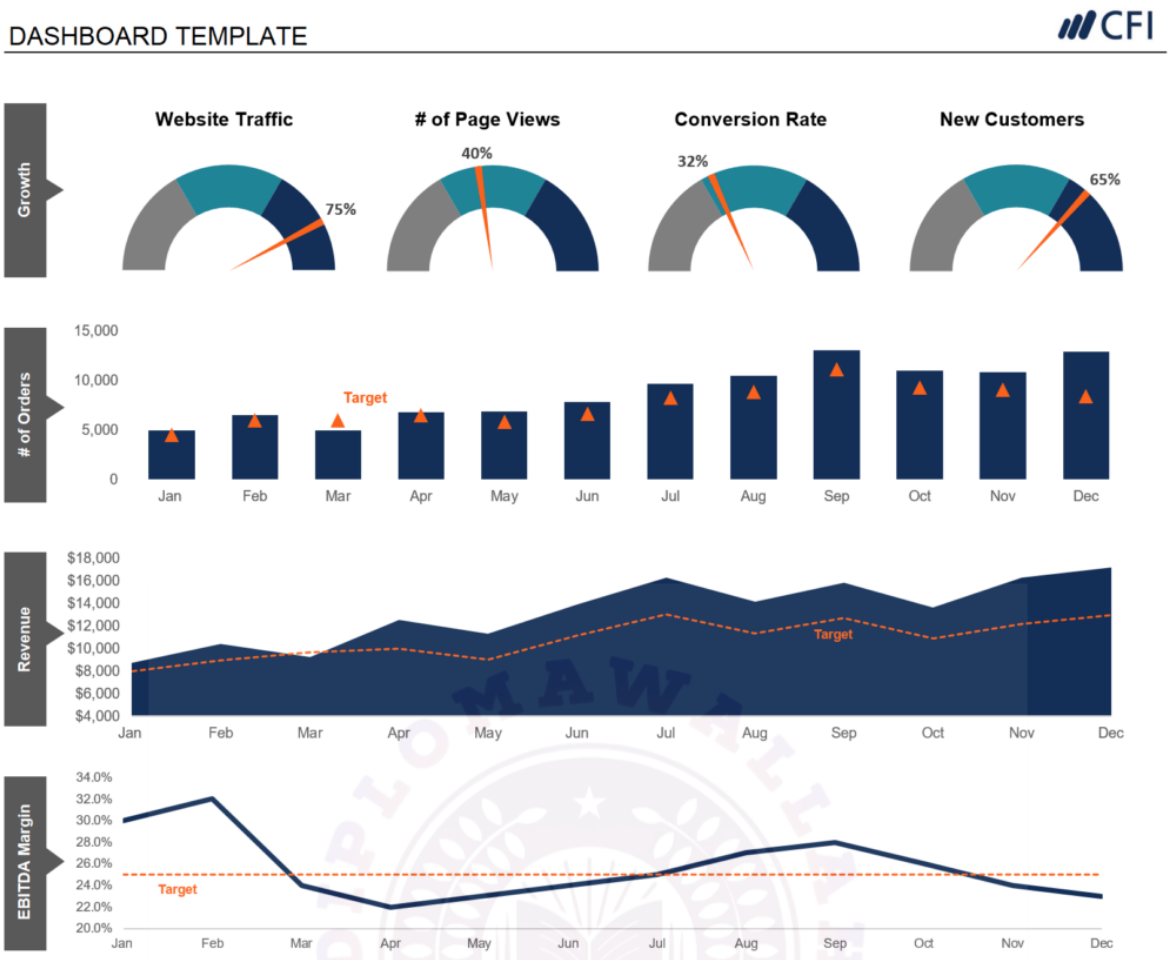
Agent name	Total calls	Calls answered	Avg. speed of answer	Call resolution (%)
Ringo	8	7	94.9	75.0%
Dave	4	4	66.3	100.0%
Paul	4	4	44.3	50.0%
John	4	2	32.0	50.0%
George	4	3	36.0	75.0%

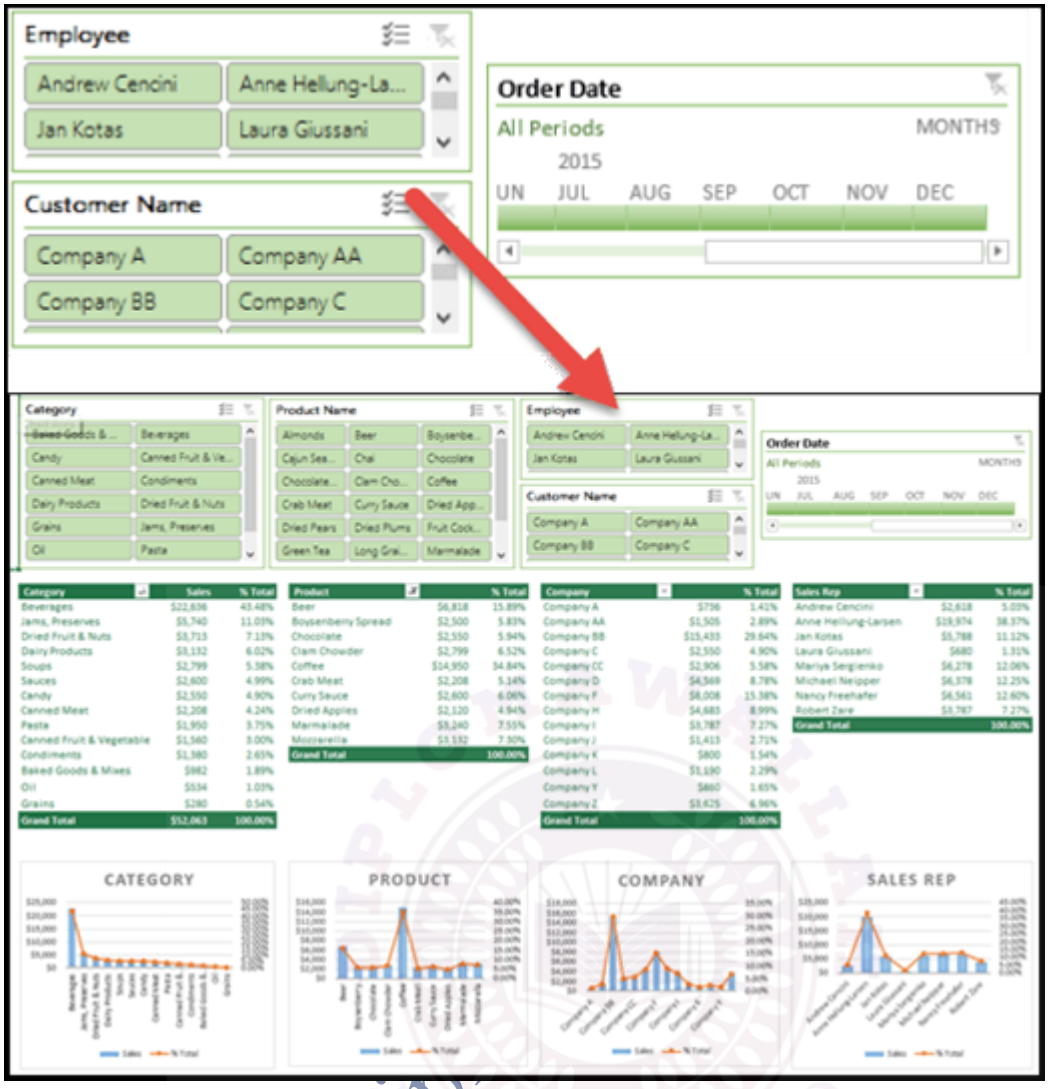




Calls answered in less than 180 Seconds:	26.1%
Calls with satisfaction score less than 3:	13







1.1 What is an Excel Dashboard?

An Excel dashboard is **a consolidated visual interface** built within Microsoft Excel that integrates key data summaries (tables, charts), interactive controls (filters, slicers, timelines), and trend/forecast elements to support timely decision-making. (Corporate Finance Institute)
Key aspects:

- It presents **key performance indicators (KPIs)** or summary metrics in a compact view.
- It features **interactivity**, enabling the user to filter or manipulate views without rewriting formulas.
- It supports **visualisation and insight**: highlighting patterns, trends, outliers.
- It must rely on **well-structured data** underneath (tables, clean source).

1.2 Why Dashboards Matter (Theory)

- **Cognitive efficiency**: Decision-makers often need a quick "at-a-glance" summary rather than raw data rows. A dashboard translates numbers into visuals, speeding comprehension.
- **Actionability**: With dynamic filters and forecasting, dashboards move from "what happened" to "what may happen" and "what should I do".
- **Maintainability**: If built on a structured Table and linked to PivotTables/Charts, updates become easier and scalable.
- **Storytelling**: A good dashboard tells a story (top-level summary → breakdown → detail) aligned with the viewer's context.

1.3 Theoretical Components & Structure

- **Source Data Preparation**: Data must be in tabular format: each row = record, each column = field, no blank headers. This ensures reliability of downstream analytics.
- **Tables/Data Grids**: Converting data to an Excel Table (via Insert → Table) enables dynamic references and automatic expansion when rows are added.
- **Summaries**: Typically built using PivotTables (or formulas) to extract meaningful aggregations (sum, average, count) from the data.
- **Visualisation**: Charts (line, bar, gauge, etc) draw out patterns. Trendlines and forecast functions highlight future direction.
- **Controls & Interactivity**: Slicers, Timelines, dropdowns enable user-driven filtering of views.
- **Layout & Design**: Theory of visual design applies: most important information goes top-left, consistent colour, minimal distractions, clarity. (GoSkills.com)
- **Integration & Refresh Mechanism**: Dashboard components (PivotTables/Charts) are linked. When source data updates, a refresh propagates the change—ensuring currency.

1.4 Design Principles & Best Practice Theory

According to theory and research:

- **Start with Purpose**: Understand audience and questions the dashboard must answer. (ExcelDemy)
- **Choose the right visuals**: Match chart type to data and message. Avoid clutter.
- **Interactive over static**: Make your dashboard adaptable rather than fixed.
- **Minimize noise**: Remove unnecessary elements; keep focus on key metrics.

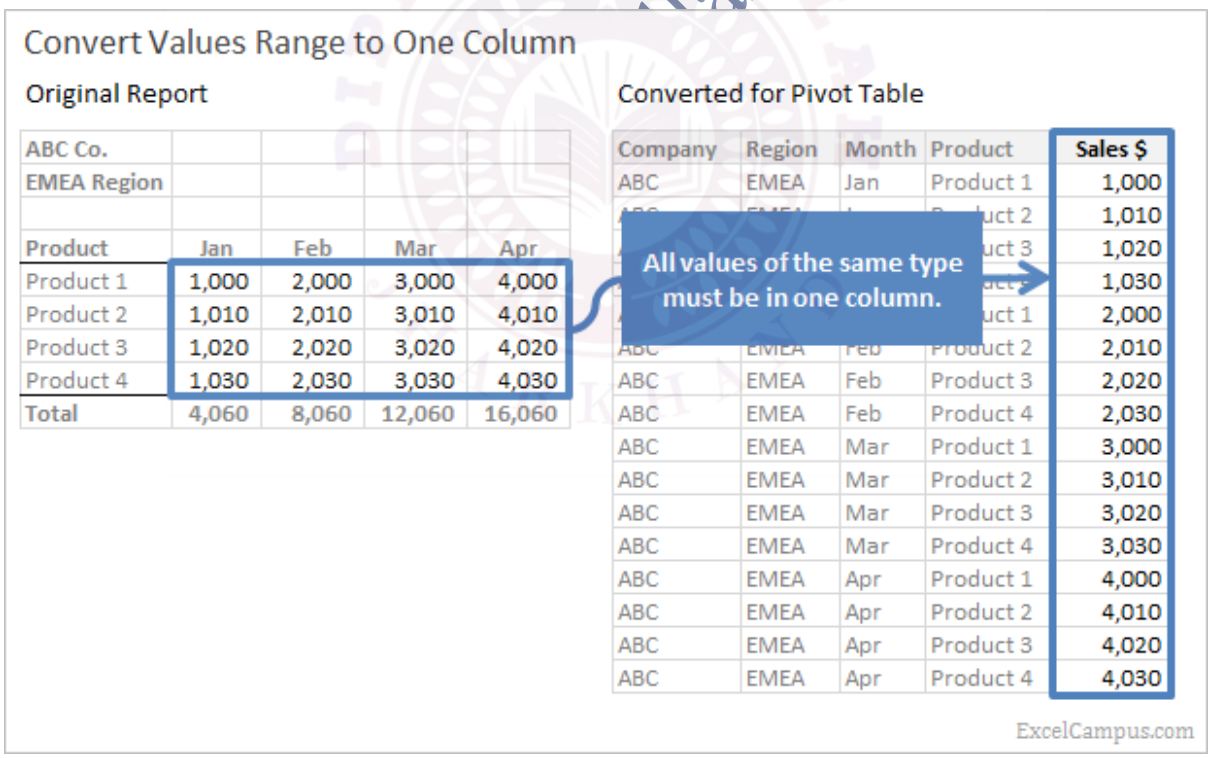
- **Maintain data integrity**: Use structured references, avoid manual hard-coding, ensure update capability.

1.5 Theoretical Limitations & Considerations

- A dashboard is only as good as its data: if the underlying data have errors, the dashboard misleads.
- Over-complex dashboards defeat purpose: too many controls/visuals confuse user.
- Forecasts/trendlines rely on past patterns; they **do not guarantee** future outcomes.
- Interactivity (Slicers, etc) may require understanding by the user; poor UI leads to misuse.

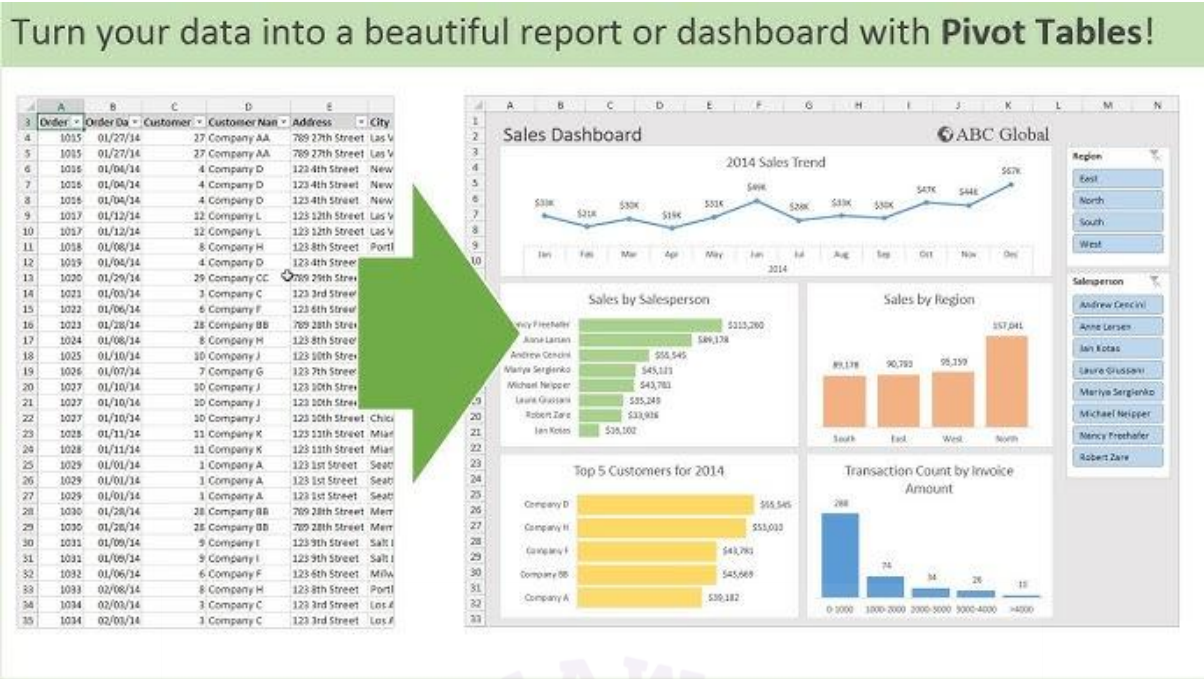
---

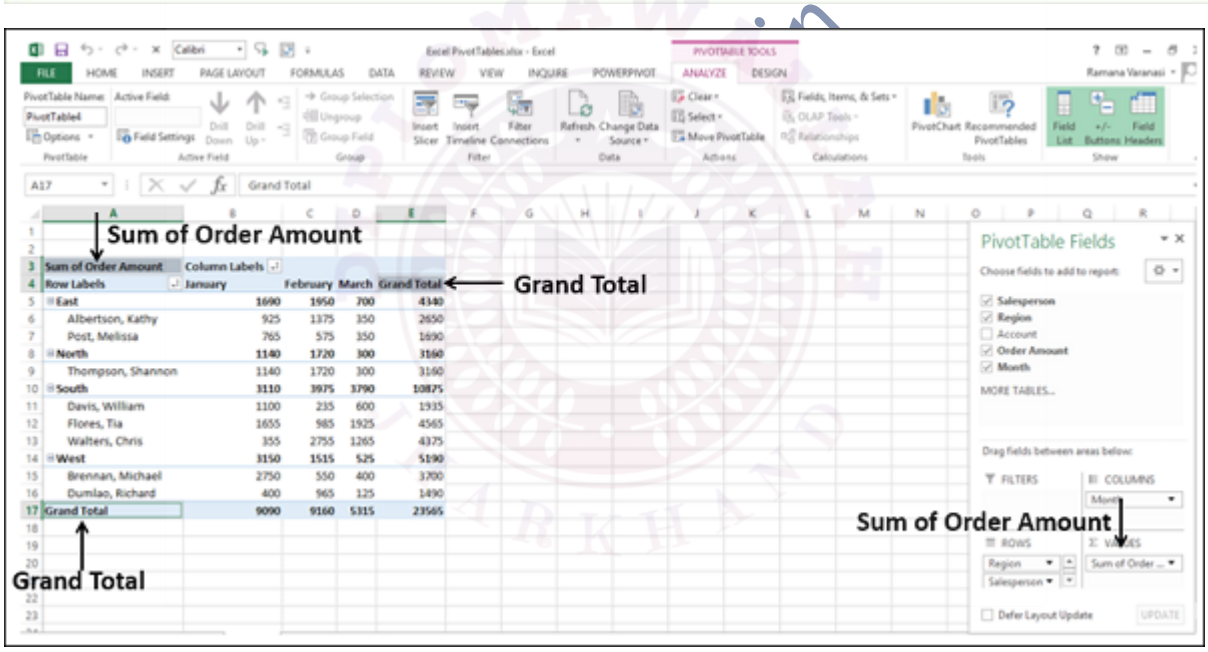
2. Theoretical Foundations of PivotTables in Excel

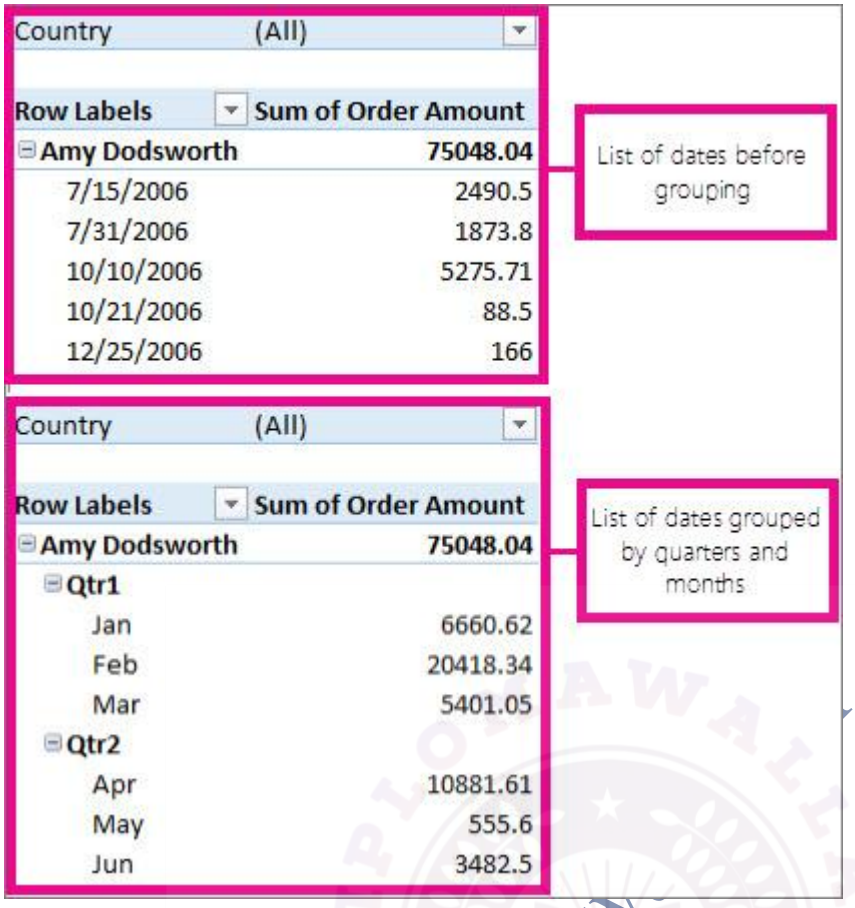


ABC Co.				
EMEA Region				
Product	Jan	Feb	Mar	Apr
Product 1	1,000	2,000	3,000	4,000
Product 2	1,010	2,010	3,010	4,010
Product 3	1,020	2,020	3,020	4,020
Product 4	1,030	2,030	3,030	4,030
Total	4,060	8,060	12,060	16,060

Company	Region	Month	Product	Sales $
ABC	EMEA	Jan	Product 1	1,000
ABC	EMEA	Jan	Product 2	1,010
ABC	EMEA	Jan	Product 3	1,020
ABC	EMEA	Jan	Product 4	1,030
ABC	EMEA	Feb	Product 1	2,000
ABC	EMEA	Feb	Product 2	2,010
ABC	EMEA	Feb	Product 3	2,020
ABC	EMEA	Feb	Product 4	2,030
ABC	EMEA	Mar	Product 1	3,000
ABC	EMEA	Mar	Product 2	3,010
ABC	EMEA	Mar	Product 3	3,020
ABC	EMEA	Mar	Product 4	3,030
ABC	EMEA	Apr	Product 1	4,000
ABC	EMEA	Apr	Product 2	4,010
ABC	EMEA	Apr	Product 3	4,020
ABC	EMEA	Apr	Product 4	4,030





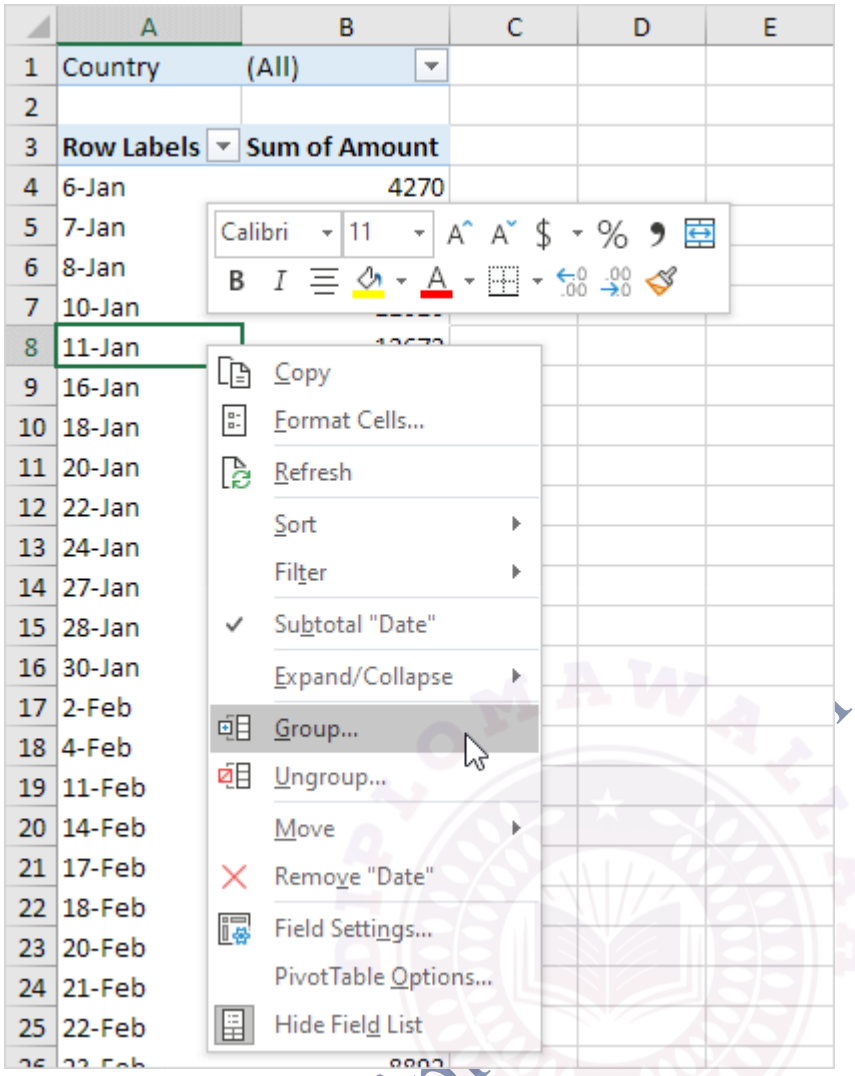


Country	(All)
Row Labels	Sum of Order Amount
Amy Dodsworth	75048.04
7/15/2006	2490.5
7/31/2006	1873.8
10/10/2006	5275.71
10/21/2006	88.5
12/25/2006	166

List of dates before grouping

Country	(All)
Row Labels	Sum of Order Amount
Amy Dodsworth	75048.04
Qtr1	
Jan	6660.62
Feb	20418.34
Mar	5401.05
Qtr2	
Apr	10881.61
May	555.6
Jun	3482.5

List of dates grouped by quarters and months



2.1 What is a PivotTable?

A PivotTable is a **data summarisation tool** within Excel that allows the user to reorganise, aggregate, group, and summarise large sets of raw data (rows and columns) so that patterns, comparisons and insights become evident. (TechTarget) In Microsoft's description: "A PivotTable is a powerful tool to calculate, summarise, and analyse data … to see comparisons, patterns, and trends in your data." (Microsoft Support)

2.2 Why PivotTables are Important (Theory)

- **Aggregation without formulas**: Instead of writing many SUMIF/COUNTIF formulas, a PivotTable allows drag-and-drop summarisation. (Eval Academy)
- **Flexibility and speed**: You can pivot rows to columns or columns to rows, apply filters, change aggregation types—quickly.
- **Exploratory analysis**: Good for discovering "Which product sold best in which region?" or "How has sales trend changed by month?".

- **Foundational for dashboards**: Many dashboard visuals are built on PivotTables as the source summaries.

2.3 Structure & Mechanics of a PivotTable

- **Source Data**: Properly formatted table or range. Must avoid blank headings or inconsistent types. (GeeksforGeeks)
- **Field List Areas**:
    - Rows: Categories (e.g., Region, Product) that define rows of result.
    - Columns: Categories that define columns of result.
    - Values: Numeric fields to aggregate (sum, count, average).
    - Filters: Fields that allow filtering of the entire table.
- **Aggregation Engine**: Internally Excel groups the source data by the categories selected and computes the aggregation (sum/average etc) for each group.
- **Dynamic Behavior**: When source data changes, you can refresh the pivot to update calculations; if source expands, you may need to update the range or use a Table.

2.4 Theoretical Steps to Build a PivotTable

1. Select cell in your data → Insert → PivotTable. (Choose range or Table) (excel-easy.com)
2. In new sheet (or existing) the PivotTable appears.
3. Drag fields: e.g., "Region" to Rows, "Month" to Columns, "Sales" to Values (Sum).
4. Adjust value settings if needed: sum/average/min/max.
5. Apply filters/slicers, grouping (e.g., group dates by quarters) for more meaningful summarisation.
6. Format output for readability, refresh when data changes.

2.5 Grouping, Filtering & Calculation Within PivotTables

- **Grouping**: For example, if dates are daily, you can group into months/quarters years for better summaries. Applies to numbers (bins) and dates.
- **Filtering**: You can apply value filters (e.g., Top 10 by sales), label filters, and report filters.
- **Calculation changes**: Changing the default (Sum) to Average, Count, Min, Max, etc via Value Field Settings.

- **Sorting**: Rows or columns can be sorted by label or value—for example descending by sum of sales.

2.6 Limitations & Theoretical Cautions

- PivotTables summarise—they **lose detail**: you cannot easily retrieve the underlying individual record from a summary.
- If source data has inconsistent types or blank rows, results may be incorrect.
- Calculated fields have limitations in pivot context; sometimes formulas outside pivot are required.
- Large source datasets may slow the workbook if many pivot tables operate simultaneously.

---

3. Theoretical Link Between Dashboards and PivotTables

3.1 Why PivotTables Are Dashboard Backbone

- Dashboards often display high-level summaries and allow interactive filtering—PivotTables provide exactly that summarisation and linkability to controls (slicers/timelines).
- A dynamic dashboard built on a Table + PivotTable + PivotChart + Slicers model ensures: data changes → refresh → dashboard updates automatically.
- For example: Microsoft describes creating a dashboard by using multiple PivotTables, PivotCharts and connecting to slicers/timelines. (Microsoft Support)

3.2 Theory of Interactivity & Refresh

- **Interactivity**: Slicers/timelines filter the source pivot tables/charts, enabling the user to change their view.
- **Refresh Logic**: Because the pivot is built from the table, when new rows are added and the data source is refreshed, the pivot (and hence chart/dashboard) updates—enabling real-time or on-demand analysis.
- **Layout/Design Theory**: The dashboard layout should reflect a story: Top: summary KPIs, Middle: trend chart, Bottom: detailed breakdown; controls placed prominently where user expects. Design research emphasises layout and audience understanding. (GoSkills.com)

---

4. Deep Dive into Specific Theoretical Concepts

4.1 Tables and Data Grids (Theory)

- Converting source data into an Excel Table (Insert → Table) has key theoretical benefits: dynamic named range, automatic fill-down of formulas, structured references, easier to maintain.
- In a dashboard environment, this allows "data entry → new row → table expands → pivot updates (on refresh) → charts update automatically" sequence.
- Theoretical risk: if you use a static range and forget to expand, new data will not be included → dashboard becomes stale.

4.2 Dynamic Filters & Controls (Theory)

- Controls like slicers or timelines are UI elements representing a filter for underlying data. From a theory standpoint, they abstract away the need for users to manually change drop-down filters or formulas.
- They enhance **usability**: the user sees clickable buttons rather than complex menus.
- The control architecture: Slicer → connects to pivot/pivotchart → filtering occurs at pivot level → chart updates.
- The design theory: placing controls near summary metrics enhances discoverability; using consistent format aids user navigation.

4.3 Trend Analysis & Forecasting (Theory)

- Trendlines: A trendline fits a regression line (or other model: exponential, polynomial) to a time-series data series within a chart. It theoretically provides a **best-fit** through the data—helping visually project direction.
- Forecast Sheet (Excel 2016+): Uses underlying algorithms (Exponential Smoothing, etc) to project future values based on historical data.
- Theoretical caveats: Forecasts assume continuity of past patterns and may not account for structural shifts, external shocks or non-stationarity. Practitioners must interpret with caution.
- In exam answers: mention that the forecast is *an estimate* and dependent on assumptions.

4.4 Pivot Chart & Grouping (Theory)

- PivotChart: A chart whose data source is a PivotTable. It inherits the dynamism of the pivot: when the pivot field/filter changes, chart updates.
- Theoretical value: It decouples visualisation from raw data and ensures visual stays in sync with summarised data.

- Grouping: The act of grouping converts many granular categories into higher-level buckets (e.g., days → months/quarters; ages → bands).
- From a theory perspective, grouping helps reduce **dimensionality**, making patterns clearer and summaries meaningful.
- It also improves readability and performance (fewer categories means cleaner visuals).
- Theoretical risk: Over-grouping may hide important detail; under-grouping may overwhelm user.

4.5 Updating, Formatting, Slicers (Theory)

- **Updating/Refreshing**: The underlying theory is that the analysis environment must handle data changes seamlessly. Hence, PivotTables must be refreshed; if source range changed, pivot needs to re-point. A dashboard demands **data currency**.
- **Formatting**: Visual formatting (styles, number formats, colour, layout) is not just aesthetic—it supports comprehension. According to visualisation theory, alignment, contrast, consistent colour schemes and removal of non-essential elements (chart junk) improve readability.
- **Slicers**: Theoretical notion: UI aspect of filtering. They represent a discrete filter element with visual state (which buttons selected). They simplify user interactions and are strongly tied to human-computer interaction (HCI) theory of making tools intuitive.

---

5. Example Theoretical Flow (Exam Narrative)

*"Suppose we are tasked with building a Sales Dashboard for Q1–Q4. From theory, we begin by **understanding the user** (the sales manager) and their questions (Which region underperformed? Which product line grew fastest?). Next, we **prepare the data** by converting the transactional table into an Excel Table so that future sales records can be added without breaking the logic. We then insert a PivotTable to summarise sales by region and product, group dates by quarter for high-level alignment. From the pivot, we build a PivotChart to show quarterly sales trend. To make it interactive, we add Slicers for Region and Product Category so the manager can filter the views. Finally, we arrange the summary KPIs (e.g., Total Sales, Growth vs Prior Quarter) at the top, charts in middle, filters on left—applying consistent formatting. We set the data source so that when new records are copied to the Table, we refresh the pivot and dashboard updates. We add a trendline on the quarterly sales chart to forecast Q5. In doing so, we have applied the theoretical pillars: data structure integrity, interactive controls, summarisation via pivot, visualisation, and forecasting, all oriented to user context."*

---

6. How to Expand to 32 Pages – Suggestions

To reach a full 32-page set of notes, you can expand the following:

- Page for each major component (Tables & Data Grids; Dynamic Filters & Controls; Trend & Forecast; PivotTables; Changing Pivot Tables; PivotCharts & Grouping; Updating & Slicers; Design Principles).
- Include **screenshots/figures** for each concept (at least 1-2 per page).
- For each concept: define, explain theory, show steps (with diagrams), list best practices, show sample interview/exam answer, list pitfalls.
- Add **case study(s)**: For example, build a small dataset and show how you would set up a dashboard, pivot, filters.
- Include **self-check questions** at the end of each page (e.g., "Why convert data to Table?", "What is difference between PivotTable and formula summary?").
- Include **glossary** of key terms (Table, PivotTable, Slicer, Trendline, Grouping, Refresh).
- Use **visual islands**: for example, show "before" (raw data) and "after" (dashboard view) to illustrate transformation.
- Include a **summary page** at the end for each section with bullet points (revision sheet).

Diploma Wallah

Made with 💗 by Sangam