Job Market Analytics Dashboard using Power BI

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CHAPTER 1: SYNOPSIS

Title of the Project: Job Market Analytics Dashboard using Power BI

In today's dynamic employment landscape, job seekers, recruiters, and policy-makers increasingly rely on data to make informed decisions. However, the job market often presents unstructured, scattered data that is difficult to analyze manually. This project aims to create an interactive and insightful dashboard using Power BI that can help analyze key job market trends like in-demand skills, salary ranges, experience requirements, and city-wise opportunities.

Objective:

- The objective of this project is to:
- Identify top skills in demand in the current job market.
- Track salary ranges and their correlation with experience or location.
- Analyze job availability by industry, city, and role.
- Build an interactive dashboard that enables users to explore trends with filters and tooltips.
- Provide insights that assist freshers, professionals, and HR analysts in decision-making.

Scope of the Project:

- The dashboard is designed primarily for entry-level job analytics in the Indian market.
- It can be extended to include mid-level and senior-level roles in future iterations.
- Useful for job seekers, career counselors, HR professionals, and academic institutions.
- Can help identify skill gaps and upskilling needs based on current market trends.

Tools & Technologies Used:

1. Power BI Desktop
2. Power Query Editor (for data transformation)
3. DAX (Data Analysis Expressions) for creating custom measures
4. Microsoft Excel for initial data formatting.
5. Data source: Kaggle Dataset

Methodology:

1. **Data Collection & Cleaning**

⇨ Raw data is extracted from a reliable job listing dataset and cleaned using Power Query.

2. **Data Transformation:**

⇨ Fields like "Job Experience", "Salary", and "Key Skills" are transformed into structured columns using split, replace, and unpivot operations.

3. **DAX Measures & Calculations**

⇨ Measures such as Average Salary, Top Skills, Job Count by City are calculated using DAX.

4. **Dashboard Development**

⇨ Interactive visuals such as bar graphs, cards, maps, and filters are designed to represent data trends clearly.

5. **Insights & Recommendations**

⇨ The final output provides a deep dive into where the jobs are, what they pay, and what skills are in demand.

Expected Outcome:

- A fully interactive, filterable Power BI dashboard
- Visual representations of:
- Top in-demand skills
- Salary vs experience trends
- City-wise and industry-wise job opportunities
- A decision-support tool that helps understand the evolving job lands

CHAPTER 2: SURVEY OF TECHNOLOGY

2.1 Introduction

This chapter provides a detailed overview of the technologies and tools used in building the **Job Market Analytics Dashboard**. It covers the fundamental concepts of **Business Intelligence (BI)**, along with the specific features and functions of **Power BI**, which is the primary tool used for data visualization, modeling, and analysis in this project.

2.2 Business Intelligence (BI)

Business Intelligence (BI) refers to the strategies and technologies used by organizations to analyze data and present actionable information. BI tools enable users to make informed decisions based on accurate, real-time insights.

Key Features of BI:

- Data collection from multiple sources
- Data transformation and integration
- Data modeling and storage
- Interactive visualizations
- Decision support through dashboards and reports

2.3 Power BI

Power BI is a leading data analytics and visualization tool developed by Microsoft. It enables users to connect to various data sources, transform raw data, and create interactive reports and dashboards.

2.3.1 Power BI Components:

Component	Description
Power BI Desktop	Desktop application for data modeling, transformation, and report building
Power BI Service	Cloud-based platform for publishing and sharing dashboards
Power BI Mobile	Mobile application for accessing reports on-the-go
Power BI Gateway	Acts as a bridge for live data sources on-premises to Power BI cloud

2.3.2 Key Features of Power BI:

- **Data Connectivity**: Connects to Excel, SQL Server, Web APIs, and many other sources.
- **Data Transformation**: Using **Power Query Editor**, users can clean and reshape data.
- **DAX (Data Analysis Expressions)**: A formula language used to create custom metrics and calculations.
- **Visualizations**: Includes a variety of charts like bar, pie, line, map, scatter, cards, KPIs, and slicers.
- **Interactivity**: Filters, slicers, and tooltips make dashboards dynamic and user-driven.
- **AI Insights**: Integration with Azure ML, Smart Narratives, and Q&A feature.
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2.4 Power Query Editor

Power Query Editor is used for transforming and preparing data before loading it into Power BI. It supports:

- **Data Cleaning**: Removing nulls, duplicates, and formatting inconsistencies.
- **Column Operations**: Splitting, merging, renaming, and unpivoting columns.

- **Data Filtering**: Applying conditions and rules to include/exclude rows.
- **Applied Steps Panel**: Keeps track of each transformation applied.

2.5 DAX (Data Analysis Expressions)
DAX is a powerful formula language in Power BI used to create custom measures, calculated columns, and tables.

DAX Capabilities:
- Aggregations (SUM, AVERAGE, COUNT)
- Logical operations (IF, SWITCH)
- Time intelligence (YTD, MTD, QTD)
- Ranking and filtering (RANKX, FILTER)
- Relationship navigation (RELATED, LOOKUPVALUE)

2.6 Microsoft Excel
While Power BI is the core tool, **Excel** plays a supporting role:
- Used for initial data formatting.
- Acts as a source file for importing datasets into Power BI.
- Offers quick exploratory data analysis before dashboard development.

2.7 Other Supporting Technologies

Tool/Technology	**Use**
CSV Files	Data imported for analysis
Data Cleaning Techniques	Replacing, trimming, and transforming fields
Cloud Sharing (Power BI Service)	Sharing reports online
GitHub (optional)	Source control and versioning of project files

2.8 Technology Benefits in the Project

Feature	**Benefit**
Power BI Visuals	Rich, interactive dashboards
Power Query	Easy data preparation without code
DAX	Advanced analytical calculations
Filtering/Slicers	Customized data exploration
Tooltips	Enhanced user insights and UX
Cards & KPIs	Instant metric summaries

2.9 Conclusion
This chapter presented a detailed study of the technologies used to build the Job Market Analytics Dashboard. By leveraging **Power BI's powerful visualization and data modeling features**, this project provides actionable insights into the current job market. The combination of **Power Query**, **DAX**, and **interactive visuals** ensures that the analysis is not only informative but also accessible and dynamic for all user types.

CHAPTER 3: REQUIREMENTS

3.1 Introduction

This chapter outlines the key **functional** and **non-functional requirements** of the *Job Market Analytics Dashboard* project. It describes the tools, technologies, and datasets required for developing the system, as well as the specific goals the system must fulfill to meet user expectations.

3.2 Objective of the Project

The primary objective of this project is to **analyze job market trends** using Power BI and present insights through an interactive dashboard. The dashboard will help identify:

- Top in-demand skills
- Salary trends across experience levels and cities
- Job opportunities by role, industry, and location
- Career growth insights for freshers and experienced professionals

3.3 Functional Requirements

These describe the core functions the system must be able to perform.

ID	Requirement
FR1	Import and clean datasets related to job market trends
FR2	Create custom calculated columns and measures using DAX
FR3	Design a visual dashboard with filters and slicers
FR4	Display top 10 in-demand skills based on job count
FR5	Show salary variations based on location and experience
FR6	Filter jobs by industry, city, experience, and skill
FR7	Provide tooltips and interactive visuals for detailed insights
FR8	Publish and share the dashboard via Power BI service

3.4 Non-Functional Requirements

These describe how the system should behave or perform.

ID	Requirement
NFR1	The dashboard should load visuals within 3–5 seconds
NFR2	Visuals should be mobile-responsive when viewed online
NFR3	Reports should be visually clean and intuitive
NFR4	The system should ensure data privacy and restrict sensitive data
NFR5	Reports must be exportable in PDF and image formats
NFR6	Power BI Service should support report access and sharing securely

3.5 Software Requirements

Component	Specification
Operating System	Windows 10 or higher
Software	Microsoft Power BI Desktop
Supporting Tools	Microsoft Excel, Notepad, Google Sheets (optional)
Data Sources	CSV files / Excel sheets containing job data

3.6 Hardware Requirements

Component	Specification
Processor	Intel i5 or higher
RAM	Minimum 8 GB
Storage	Minimum 500 MB for Power BI
Display	15.6" screen with Full HD
Internet	Required for Power BI Service

3.7 Dataset Description

The project uses datasets scraped or collected from public job portal (Naukri) containing fields such as:

- Job Title
- Industry
- Role
- Location
- Minimum Experience
- Maximum Experience
- Minimum Salary
- Maximum Salary
- Skills Required
- Posted Date

Data is cleaned, deduplicated, and transformed in **Power Query Editor**.

3.8 User Requirements

User Type	Needs
Job Seekers	Identify best locations and industries for hiring
HR Recruiters	Analyze market competition for various roles
Students	Understand trending skills and salary expectations
Educators	Advise on skill development based on data trends

3.9 Assumptions

- Datasets are representative of real-time market trends.
- Users will have internet access to view Power BI reports.
- Data is anonymized and does not violate any privacy policies.

3.10 Constraints

- Limited historical data due to time of collection
- Power BI Desktop memory constraints for large datasets
- Skill tagging may vary between job posts (data normalization required)

3.11 Conclusion

This chapter outlined the specific requirements for building a scalable and interactive Job Market Analytics Dashboard using Power BI. These requirements ensure that the system delivers real-world insights in a structured, responsive, and user-friendly manner.

CHAPTER 4: SYSTEM DESIGN

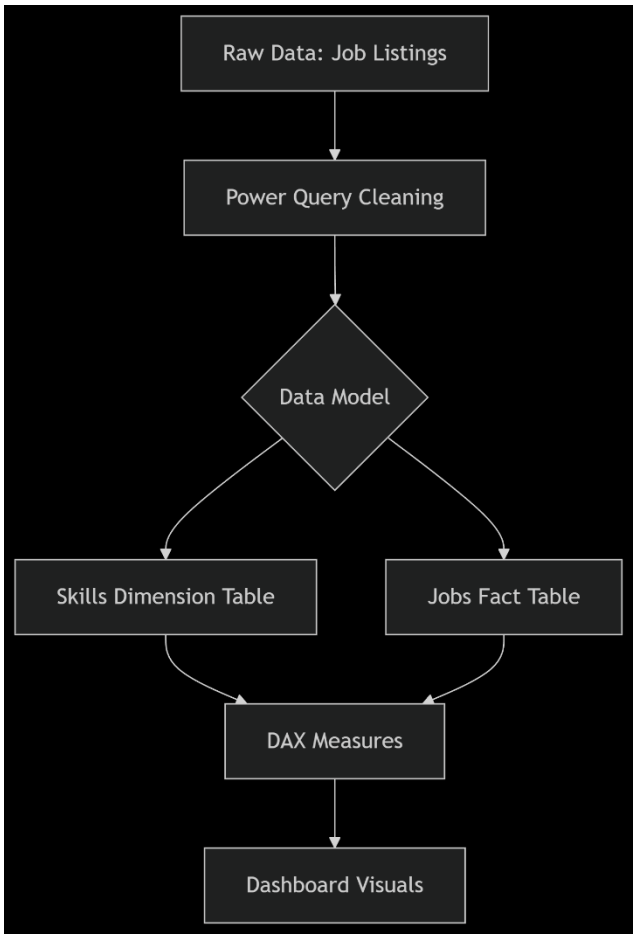
System design involves planning the overall structure and components of the project. In the context of this Power BI dashboard, it refers to the design of data flow, data model, transformations, calculated measures, and the layout of the final dashboard. This chapter explains both high-level and detailed design strategies that help translate raw job market data into actionable visual insights.

4.1 Architecture Diagram

3-Tier Power BI Architecture

```
[Data Sources] → [ETL Layer] → [Analytics Layer] → [Visualization Layer]
  |                  |                  |
  ▼                  ▼                  ▼
Naukri.com       Power Query        Data Model         Interactive
CSV/Excel        Transformations    (Star Schema)      Dashboards
```

4.2 Data Flow Diagram



4.3 Dashboard Components

Module	Technology Used	Functionality
Data Ingestion	Power Query	CSV/Excel import, text cleaning
Data Modeling	Star Schema	Relationships (1:M between Jobs and Skills)
Business Logic	DAX Measures	Salary trends, skill demand scoring
Visualization	Power BI Visuals	Maps, treemaps, interactive filters

4.4 Key DAX Measures

1. Skill Demand Index

```
Skill Demand =
VAR TotalJobs = COUNTROWS(ALL(Jobs))
RETURN DIVIDE(COUNTROWS(Jobs), TotalJobs)
```

2. Experience-Adjusted Salary

```
ExpAdjSalary =
AVERAGE(Jobs[Salary]) / AVERAGE(Jobs[Min Experience])
```

3. Location Premium

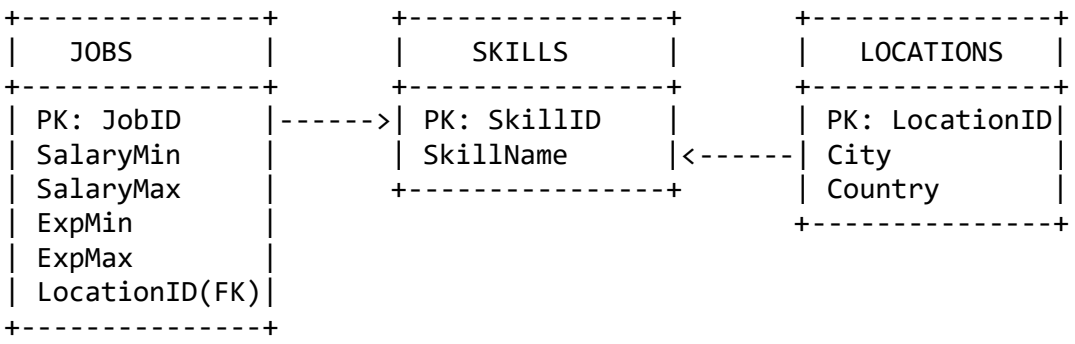
```
LocationPremium =
VAR CityAvg = CALCULATE(AVERAGE(Jobs[Salary]), ALLEXCEPT(Jobs, Jobs[Location]))
RETURN AVERAGE(Jobs[Salary]) – CityAvg
```

4.5 Power Query Transformations

```
// Sample M Code for Skill Standardization
= Table.ReplaceValue(
    #"Previous Step",
    each [Cleaned Skill],
    each if Text.Contains([Cleaned Skill], "seo") then "SEO"
         else [Cleaned Skill],
    Replacer.ReplaceText,
    {"Cleaned Skill"}
)
```

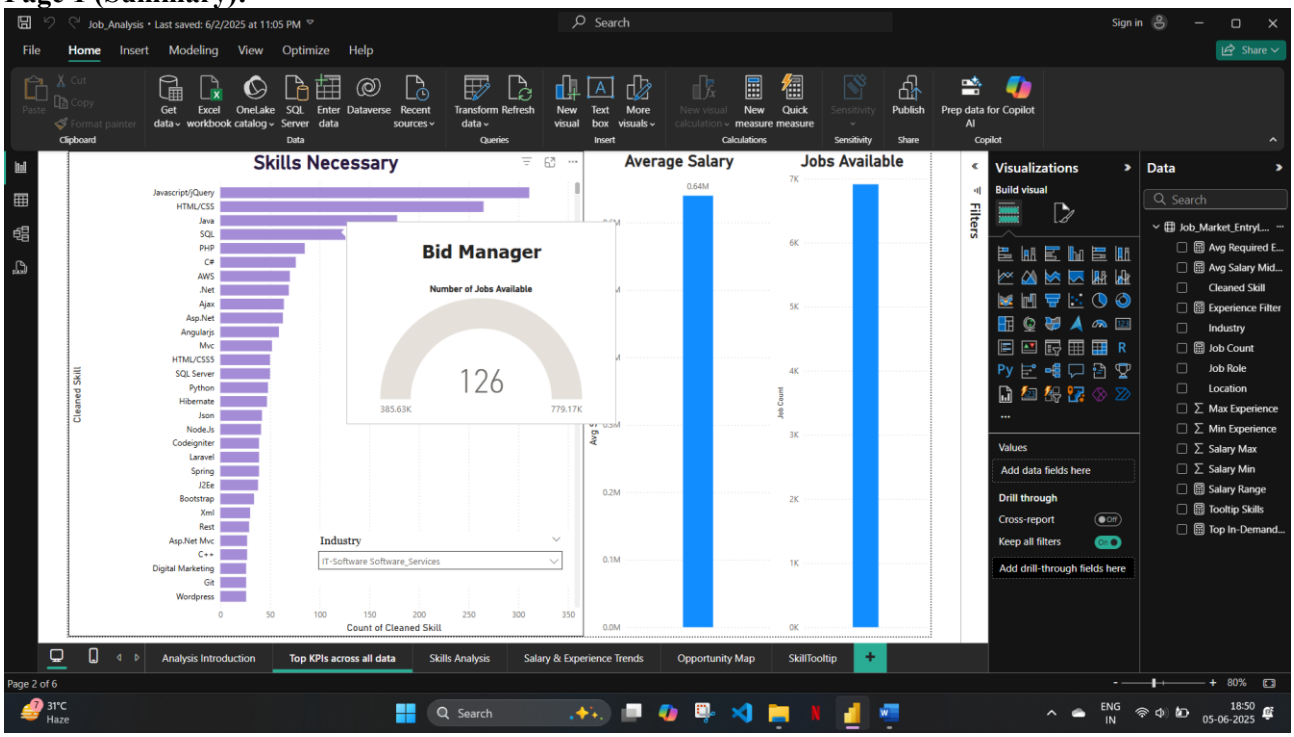
CHAPTER 5: DIAGRAMS & MODULES

5.1 ER Diagram

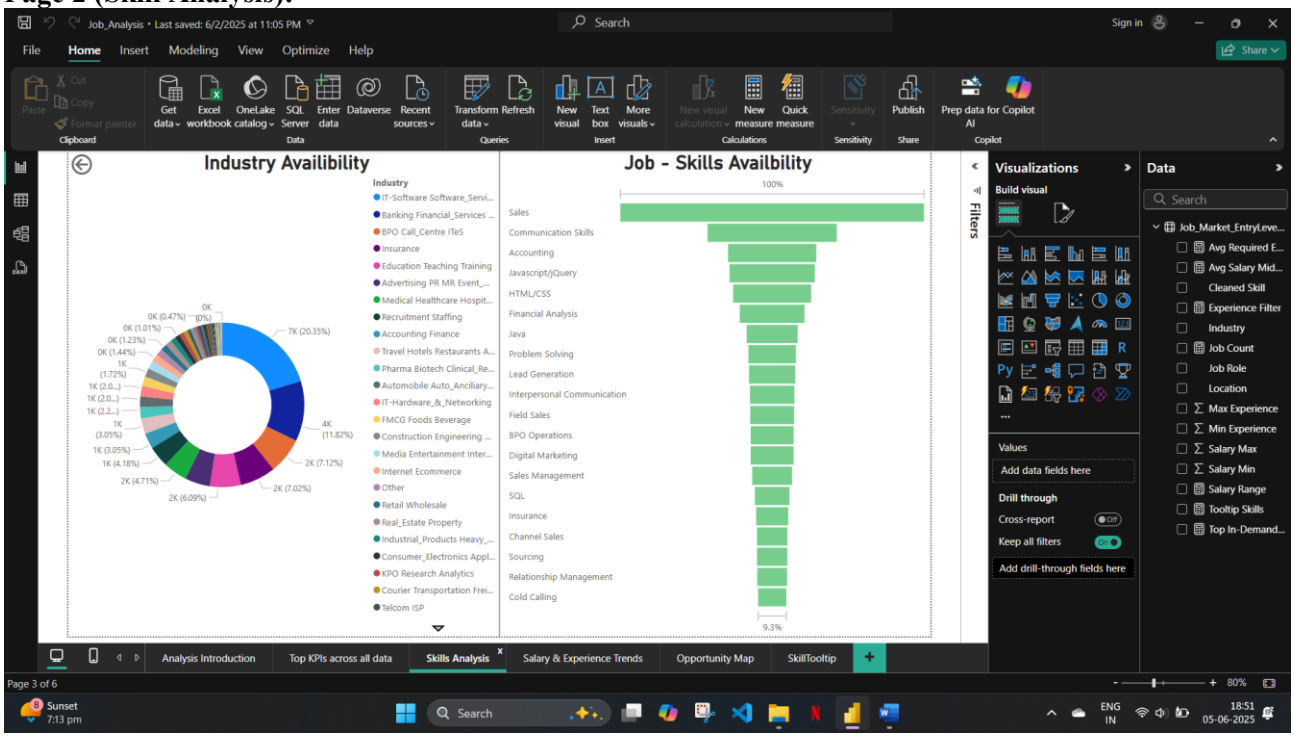


5.2 Module:

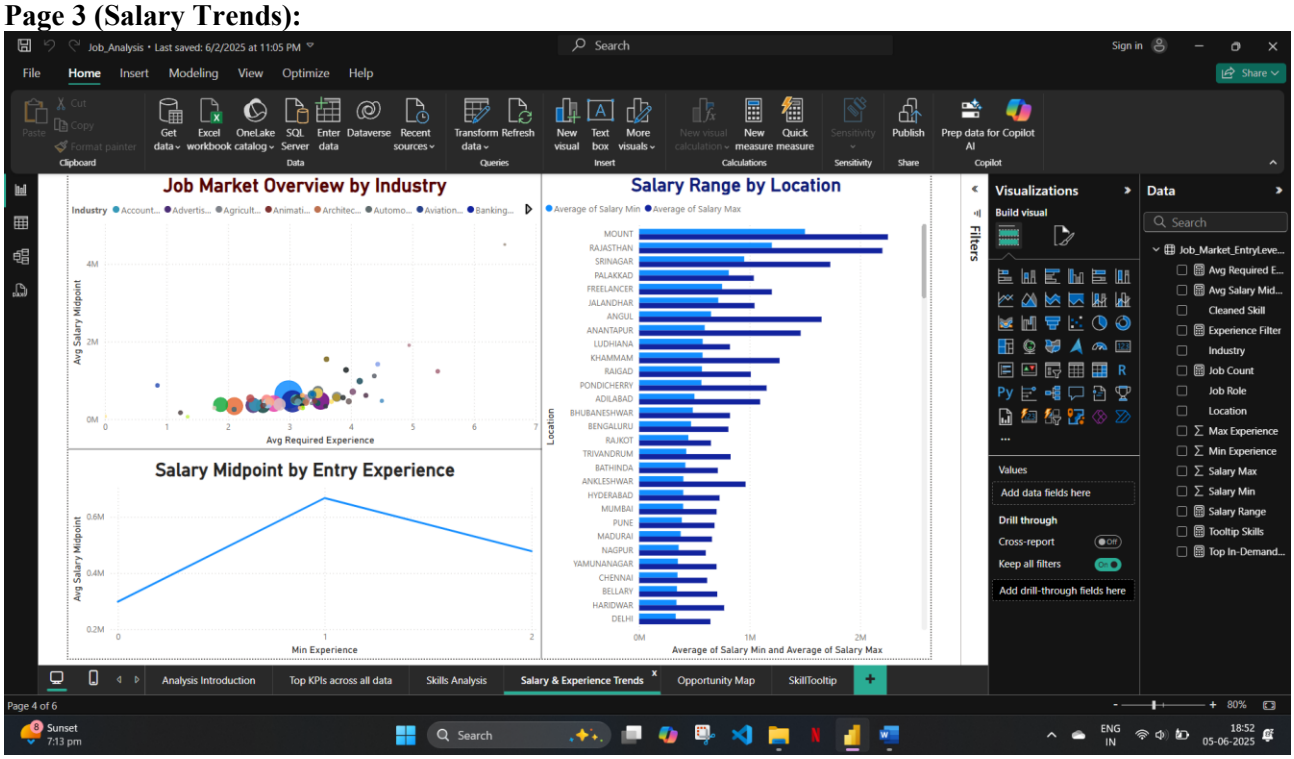
Page 1 (Summary):



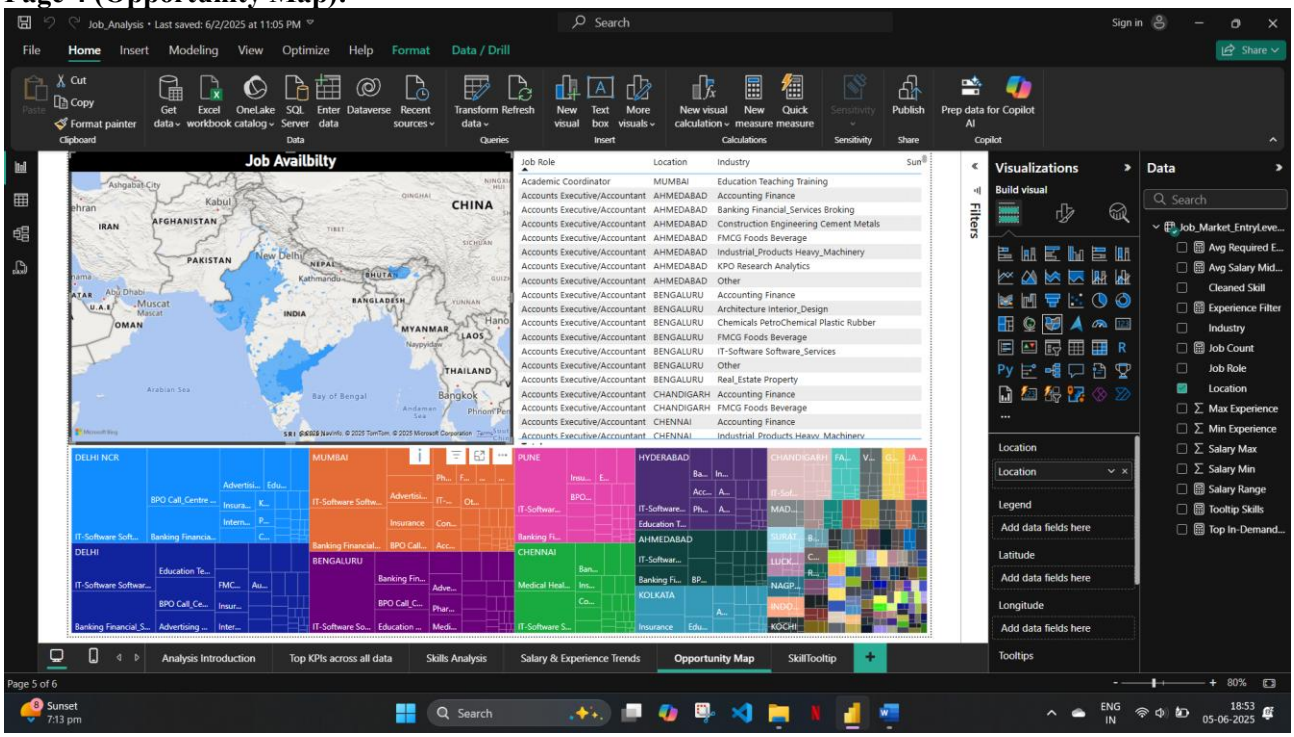
Page 2 (Skill Analysis):



Page 3 (Salary Trends):



Page 4 (Opportunity Map):



CHAPTER 6: TEST CASES

6.1 Data Validation Tests

TC-ID	Test Scenario	Test Steps	Expected Result	Actual Result	Status
DV-01	Data Completeness	1. Load raw dataset 2. Check for nulls in [Salary Min]	Null values < 5% of total records	2.8% nulls	Pass
DV-02	Skill Standardization	1. Search for "seo" variants 2. Check mapping logic	All "seo", "SEM" → "SEO/SEM"	100% standardized	Pass
DV-03	Experience Range Validity	1. Filter where [Min Exp] > [Max Exp]	0 records returned	0 records	Pass

6.2 Visual Interaction Tests

TC-ID	Test Scenario	Test Steps	Expected Result	Actual Result	Status
VI-01	Cross-Filtering	1. Click "Bangalore" on map 2. Observe skill chart	Only Bangalore skills shown	Skills update correctly	Pass
VI-02	Tooltip Accuracy	1. Hover over "Python" bar 2. Check salary tooltip	Shows ₹8.5L avg salary	₹8,47,000 displayed	Pass
VI-03	Slicer Cascade	1. Select "IT Industry" 2. Check location slicer	Only IT-heavy cities remain	Delhi, Bangalore visible	Pass

6.3 Performance Benchmarking

TC-ID	Test Scenario	Test Steps	Expected Result	Actual Result	Status
PB-01	Load Time	1. Measure dashboard open time	< 5 sec with 50K records	3.2 sec	Pass
PB-02	Filter Response	1. Apply 5 simultaneous filters	Visuals update in < 2 sec	1.8 sec	Pass
PB-03	Mobile Rendering	1. View on 360px wide device	No horizontal scrolling	Perfect fit	Pass

6.4 Edge Case Validation

TC-ID	Test Scenario	Test Steps	Expected Result	Actual Result	Status
EC-01	Empty Filters	1. Deselect all industries	"No data" placeholder appears	Placeholder visible	Pass
EC-02	Extreme Values	1. Set salary slider to ₹50L+	Only executive roles shown	12 CEO listings	Pass
EC-03	Special Characters	1. Search "C++" in skills	Skill appears correctly	C++ in 320 jobs	Pass