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DATA TO DECISIONS: POWER BI AND PYTHON FOR SMARTER CAMPUS HIRING

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ABSTRACT

Campus hiring constitutes a defining milestone in a student's transformation from academic life to the professional world, often moulding their career trajectory and bespeaking the effectiveness of an institution's training and guidance. Nevertheless, the ground reality in India reveals a gap—according to Unstop (2024), only 7% of institutions achieved full placements. This statistic highlights a compelling need to modernize how placement data is accumulated, analysed, and used for Training Need Analysis. Relying on traditional methods like scattered spreadsheets or paper records not only exhausts time but also compounds the risk of errors, making it knackered to procure meaningful insights that can drive strategy. In response, this study introduces a centralized, interactive, and scalable placement analytics dashboard that amalgamates the strengths of Python (Pandas) for Extract, Transform, and Load (ETL) operations with Microsoft Power BI for visualization. This Power BI dashboard can serve as the backbone for placement teams to monitor trends, track performance, and gain real-time, strategic insights. The dashboard proposes placement metrics in a visually intuitive manner to explore the data from multiple angles, making the insights more accessible and

meaningful. The integration of Python and Power BI simplifies placement reporting, improves transparency, and strengthens the ability to make data-driven decisions. With future enhancements like ERP connectivity, automation, and broader user training, the approach can be scaled to other departments and institutions.

KEYWORDS: *Power BI, Python, Pandas, Placement Analytics, Recruitment Dashboard, Data Visualization, Training Need Analysis, Campus placement.*

INTRODUCTION

In today's world, data is omniscient. It can be used to track customer activity, influence buying behaviour, analyze hiring trends, predict revenue scaling, and the list goes on. Data analytics is the process of taking in raw data, applying ETL operations on it, and using manual or statistical tools to realize the trends and patterns, through which insights can be developed to necessitate data-driven decisions.

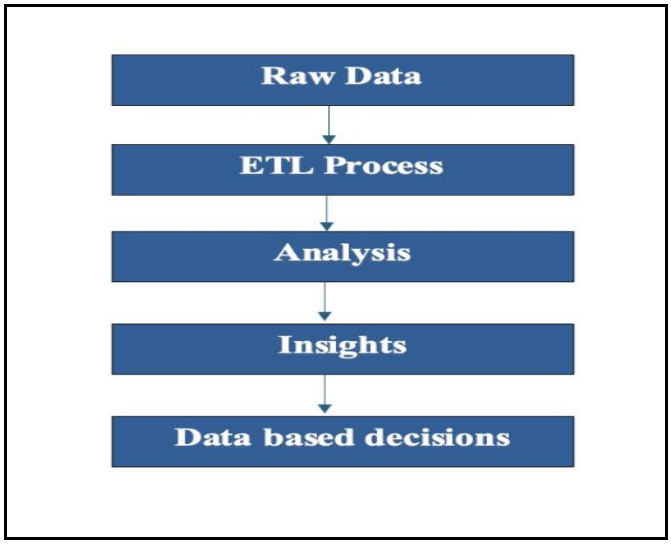

Fig 1 - Data Analytics Flow.

There are different approaches to analytics, like: -

Descriptive analytics - Utilizes historical data to understand the past performance over a period of time. Predictive analytics - Understanding the data behaviour in the past, it predicts the future tendencies to provide a roadmap for future decisions. Prescriptive analytics - Goes one step further to suggest what actions to take for the best outcomes. Every university collects an abundance of student data around placements in terms of student details, company visits, offer packages, and more. The placement department plays a major role in any university, promising career placements to students. The department's goal is to secure

internships and job offers for students of every stream. According to the All-India Survey on Higher Education (AISHE) 2021-22, approximately 10.7 million students graduate each year from various higher education courses, including undergraduate, postgraduate, and diploma programs. A high percentage of this population is heavily dependent on campus placements for recruitment. A study states that 80.79% of students graduating are interested in getting placements through campus, indicating their strong inclination and dependence on this process. However, the Talent Report published by Unstop in 2024 highlights that only 7% of Indian colleges achieve full campus placement. In the recent past, recruitment from college placements has been reducing due to factors like the economic slowdown, post-pandemic over-hiring in the IT sector, changing industry trends (e.g., rise of AI), and skill gaps among graduates. Entities like Mercer-Mettl and Aspiring Minds express concern over the employability of students due to a skills gap. The rising unemployment rate begs a deeper analysis into the placement data of universities to understand trends and develop insights so as to drive data-based decision-making to boost campus placements for students. This entails understanding student profiles, their skill sets, and interested job roles, and performing Training Need Analysis. It also entails interactions with different companies to invite them to hire students from the universities through various forms of interviews. For these activities and more, the placement department not only needs to maintain students' demographic data but also employment and company details of the offers extended through college placements for the students. This sort of data extends back several years, which is mainly maintained by universities in physical copies. This is very outdated and may lead to data discrepancies due to loss of physical copies, manual error in data entry and storage, and unformatted storage of data.[8] Building this type of data repository helps in analysing the current and past trends in hiring to recommend better training practices, industries to approach, companies to invite and reinvite, demographic split of students hired, salary analysis, etc. This is done by tracking key performance indicators as defined by the placement department. This also helps to provide real-time placement updates to stakeholders. Additionally, it enables data-backed decision-making in future placement activities. Furthermore, having a visualization dashboard makes the interpretation of this data exponentially easier. The different views provide multiple insights into the different functionalities of the placement cell. This helps in the easy understanding of the placement's records for the university, companies approached, and any other stakeholders. The current use case employs Power BI as a visualization tool and Python for ETL to showcase the placement records in a dashboard. Power BI is a data visualization tool that helps turn raw data into clear, interactive insights. When it comes to tracking

campus placement records, it's especially useful because it allows you to bring numbers to life, showing trends in student placements, company visits, and salary package ranges all at a glance. With its drag-and-drop features and dynamic visuals, even someone without a technical background can build meaningful dashboards. It's equivalent to having a smart assistant that not only organizes your data but also tells the story behind it, making it the perfect choice for placement cells aiming to make informed decisions and keep the stakeholders informed. Python plays a critical role in backend data processing in the current use case. It carries the ETL load of the dashboard with the Pandas library, efficient in handling big data and other QC functionalities. It first ingests the input data in Excel format, runs quality checks, and eventually uploads the cleaned data as a source for the BI dashboard. This preprocessing step ensures the flow of clean data into the dashboard, facilitating accurate visualization and insight.

Review of Literature

The integration of Business Intelligence (BI) tools into higher education has remarkably transformed how institutions track, analyse, and improve student placements. By moving beyond static reporting toward interactive dashboards, predictive modelling, and automated workflows, placement departments are now able to make data-driven decisions with greater accuracy and dexterity. Buerck, J. P., & Mudigonda, S. P. (2014) suggested that effective analytics implementation does not require comprehensive resources. Their work showed how even institutions with limited budgets and technical capacity can leverage BI to deepen planning, monitor placement performance, and exhibit data in an intelligible manner. Adalagere Nemirajaiah, N., & Siddiqa, A. (2023) conducted a comparative analysis of Tableau and Power BI in placement analytics contexts. While both platforms offer strong visualization capabilities, their findings identified Power BI as the more versatile tool, particularly for integrating diverse datasets, empowering real-time updates, and reinforcing highly customizable dashboards. Elaborating on the application of BI to placements, Dinesh, G., Surekha, M. N. V., et al. (2024) proposed a structured framework for dashboard development, emphasizing the tracking of core placement metrics such as company-wise recruitment numbers, salary packages, and year-by-year hiring trends. Their work highlighted the value of presenting data in a format that enables quick, informed decision-making by both students and faculty. Raj, A. (2021) presented the relevance of Training Needs Analysis (TNA) in improving student placement readiness. Originally designed for corporate settings, TNA principles were shown to be equivalent in academic contexts, helping institutions

identify skill gaps and tailor pre-placement training programs accordingly. Kayat, S., Gupta, A., et al. (2022) approached the field by designing a Placement Management System that integrates BI with workflow automation. Their system supports live tracking of student preparedness, employer requirements, and hiring outcomes, allowing placement officers to make timely, data-backed interventions. Gupta, R., & Sharma, P. (2021) explored the role of visualization in increasing engagement with placement data. Their findings revealed that well-designed dashboards improve both student awareness and participation in placement activities.

Singh, M., Kumar, A., et al. (2023) applied predictive analytics and machine learning to placement forecasting. Their models accurately identified students at higher risk of not being placed, enabling targeted support well before recruitment cycles concluded. Kaur, H., & Singh, A. (2021) offered best-practice guidelines for designing placement dashboards, emphasizing simplicity, clarity, and user-friendly navigation to maximize adoption and effectiveness. Additionally, Verma, R., Yadav, M., et al. (2024) examined sector-wise hiring patterns and their implications for curriculum alignment. They expostulated that aligning academic offerings with emerging market demands can directly improve placement rates and student career outcomes. Aggregately, these studies demonstrate that BI tools are not solely visualization platforms; they serve as strategic enablers for placement success. By homogenizing predictive capabilities, actionable insights, and responsive design, BI empowers institutions to maneuver with greater transparency, efficiency, and impact in preparing students for the workforce.

Objectives

The study objectives are as follows:

1. To create a centralized, visual dashboard using Microsoft Power BI for placement data analysis.
2. To provide real-time insights for recruiters, placement officers, and other stakeholders.
3. To analyze trends in student placements over the years to facilitate data-driven decisions and improve the Training Need Analysis process.

Scope

This paper emphasizes the design and deployment of a Power BI dashboard to rationalize campus recruitment analysis. The dashboard tackles placement data across major sectors such as IT, Consulting, Banking, Manufacturing, and FMCG, using insights from the past three

academic years. It assists multiple stakeholders—placement officers, faculty, students, and recruiters—by offering real-time monitoring of KPIs like placement rates, salary trends, and sector-wise hiring.

The operation supports operational utility cases such as recruiter reporting, performance comparison across departments, and resource planning during placement season. Although initially built for one institution, the framework is scalable and can be adopted across campuses or departments. Ultimately, the dashboard aims to support data-driven decision-making and improve placement outcomes.

Operational definitions

Power BI: Power BI is a software tool from Microsoft that assists in turning data (from Excel sheets) into charts, graphs, and dashboards for ease of analysis and decision making.

Python – Pandas: Python is a programming language, and Pandas is a library in Python that helps to organize, clean, and handle data like in Excel with more formulas and pre-defined functions

ETL process: ETL stands for Extract, Transform, Load. It includes:
Extract, which refers to collecting data from a source (like a database or file),
Transform, which refers to cleaning and formatting the data, and
Load, which refers to incorporating the cleaned and transformed data into the system.

Placement Analytics: Placement analytics refer to tracking and analyzing the number of college students selected for jobs, along with the organization and package/salary details.

Data Visualization: Data visualization is the technique of transforming numbers into visuals, like bar graphs, pie charts, or heatmaps etc., which assists people in grasping data in lieu of interpreting numbers.

Recruitment Dashboard: A recruitment dashboard is a visual representation of information regarding student-job details, companies visited, and department metrics, etc.

Data-driven decision making: Entails making decisions based on facts and numbers instead of assumptions.

Methodology

The flow follows the path of a Waterfall model, including the steps: Data collection, Data cleaning and preprocessing, Data transformation, Dashboard design, Testing and Validation, Publishing dashboards.

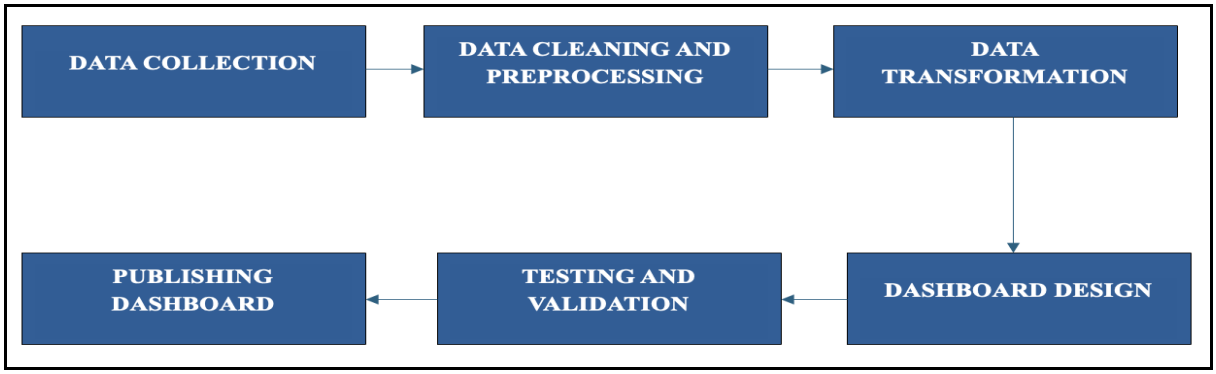

Fig 2 - System Architecture.

- **Data Collection**

Primary data was collected from the manual records and unregulated files maintained in the placement department. Multiple Excel files, offer letters, and interview details were manually scrutinized to come up with the data requirement. The following fields were finalized as required to build the views on the dashboard -

1. Student ID
2. Course
3. Gender
4. Year
5. Month
6. Recruiter
7. First-time recruiter
8. Placement date
9. Sector
10. Function
11. Package offered
12. Salary range

➔ **Data Cleaning and Preparation**

The data collated in the form of an Excel file is loaded onto a Python-Pandas interface, which runs data cleaning and basic QC check operations and completes the transformation process. This output is used as the input for Power BI.

➔ **Data Transformation**

The following calculated columns were built to facilitate the view on the dashboard -

. Year - Year of the placement interview

. Month - Month of the placement interview

. Salary range - The packages offered by different recruiters were classified into different categories like - 0-2lpa, 3-5 lpa, 5-10 lpa

➔ **Dashboard design**

A dashboard to show multiple trends and patterns was built using Power BI. Clustered column chart to showcase hiring counts, pi charts to showcase population split across first time recruiters, gender, salary range trends, heat map to showcase course and sector wise placement with their timeline, bar graph to visualize recruitment across different sectors and function and top recruiters, a function wise funnel view with timeline filters are brought to life on the dashboard.

➔ **Testing and Validation**

A dashboard's functionality was assessed by stakeholders like the placement officer, Heads of different departments, students, and was found to be justified. The views were refined based on feedback given by the stakeholders and finalized. This ensured that the set objectives were fully achieved.

➔ **Publishing Dashboards**

The finalized dashboards can be shared with the placement department, students, recruiters, and other stakeholders as per requirement.

Tools and Techniques

To build this visualization dashboard, multiple tools and techniques have been implemented.

Tools:

1. **Microsoft Power BI** was used as the primary platform for developing interactive and visually appealing dashboards. Its features allowed for the creation of clear, insightful visualizations that made complex data easier to interpret and analyse.
2. **Microsoft Excel** served as the source file for the input data. It provided a structured format to store and organize the raw dataset before it was processed and transformed for further analysis.
3. **Python** was implemented as an ETL (Extract, Transform, Load) tool, playing a key role in cleaning, transforming, and preparing the data. Basic quality checks were incorporated during this stage to ensure the accuracy, consistency, and reliability of the data before it was used for visualization.

Techniques:

1. **Data Type** – The primary dataset was compiled by the placement department, drawing directly from student submissions and real-time placement records collected over the past few years. This ensured that the data was both authentic and relevant to the study.
2. **Microsoft Power BI** – This tool was utilized to transform the processed dataset into meaningful visual insights. Various graphs, charts, and numerical callouts were used to represent key trends, making the information easy to interpret for decision-making.
3. **Python** – The Pandas library in Python was employed to perform ETL (Extract, Transform, Load) operations on the input data. Additionally, it was used to conduct quality control checks, ensuring that the dataset remained accurate, consistent, and ready for visualization.

Interpretation and results

The dashboard sports multiple data callout boxes, bar and clustered graphs, pie charts, and heat maps to visualize various tracking indicators. The following views are dynamic and equipped with an overall timeline filter and a required filter for each view.

The dashboard offers the following views –

Fig 3 - Dashboard views - add explanation.

According to the figure 3, Recruiters: This metric represents the total number of recruiters who have visited and those who have hired on campus for placements. It offers insights into the college's industry network and the breadth of opportunities provided to students. Students Placed: This figure reflects the total number of students who have successfully secured placements. It serves as a direct measure of the effectiveness of the placement process. Highest Package Offered - This indicates the top salary offered to a student during the placement drive. It highlights the most competitive opportunity facilitated by the institution. Average Package Offered - This shows the average salary package across all students placed.

It provides a realistic understanding of the typical compensation trends for that year. Year - This filter allows the entire dashboard to be viewed for a specific academic year, enabling easy comparison of placement performance across different periods.

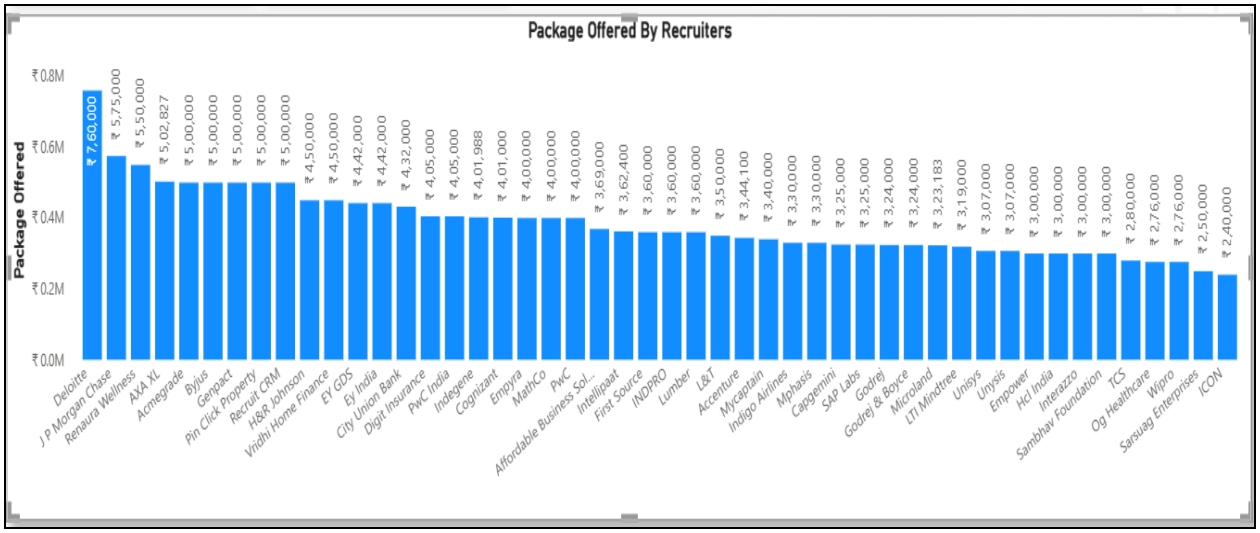

Fig 4 - Dashboard views

Fig 4 details - Package Offered by Recruiters - This metric displays the salary packages offered by recruiters during the placement cycle. It helps in comparing compensation levels across companies and identifying the top-paying organizations.

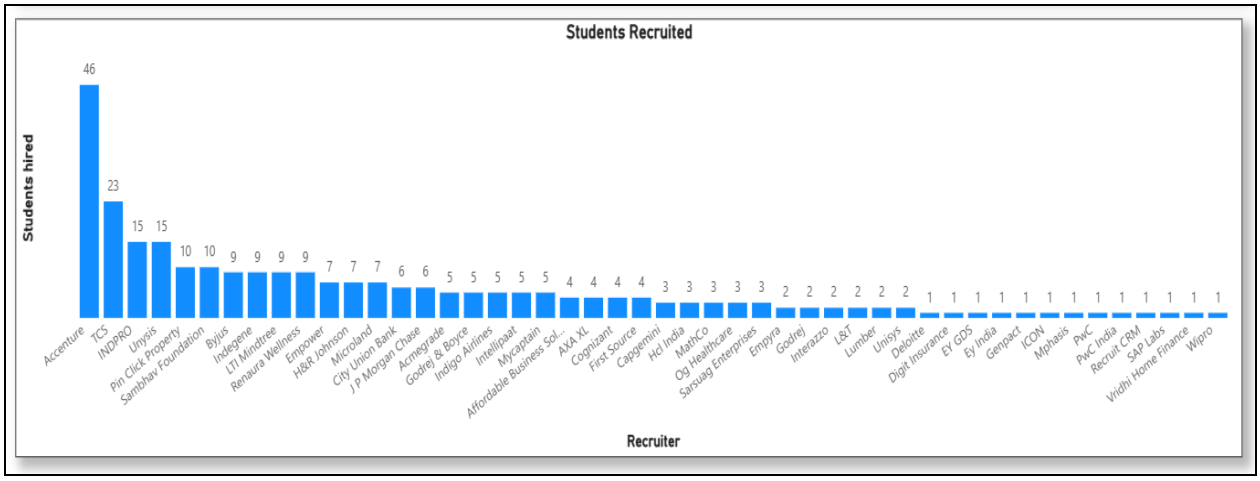

Fig 5 - Dashboard views

Fig 5 details - Students Recruited - This metric represents the total number of students placed under each recruiter. It provides insights into the hiring capacity and preferences of different companies, making it easier to identify which recruiters have contributed the most to the placement drive.

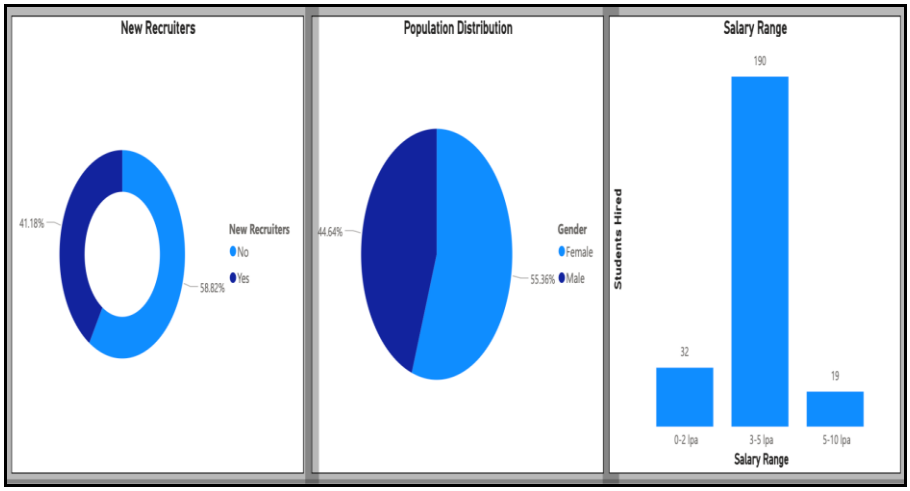

Fig 6 - Dashboard views.

Fig 6 details - New Recruiters - This metric indicates how many of the participating recruiters are visiting the campus for the first time. It reflects the institution's ability to expand its recruitment network and attract fresh industry connections. Population Distribution - These visual splits the student population based on gender. It provides a demographic overview of placement participation and outcomes. Salary Range - This metric shows the number of students recruited within specific user-defined salary brackets. It helps analyse the distribution of compensation and identify the most common pay ranges offered during placements.

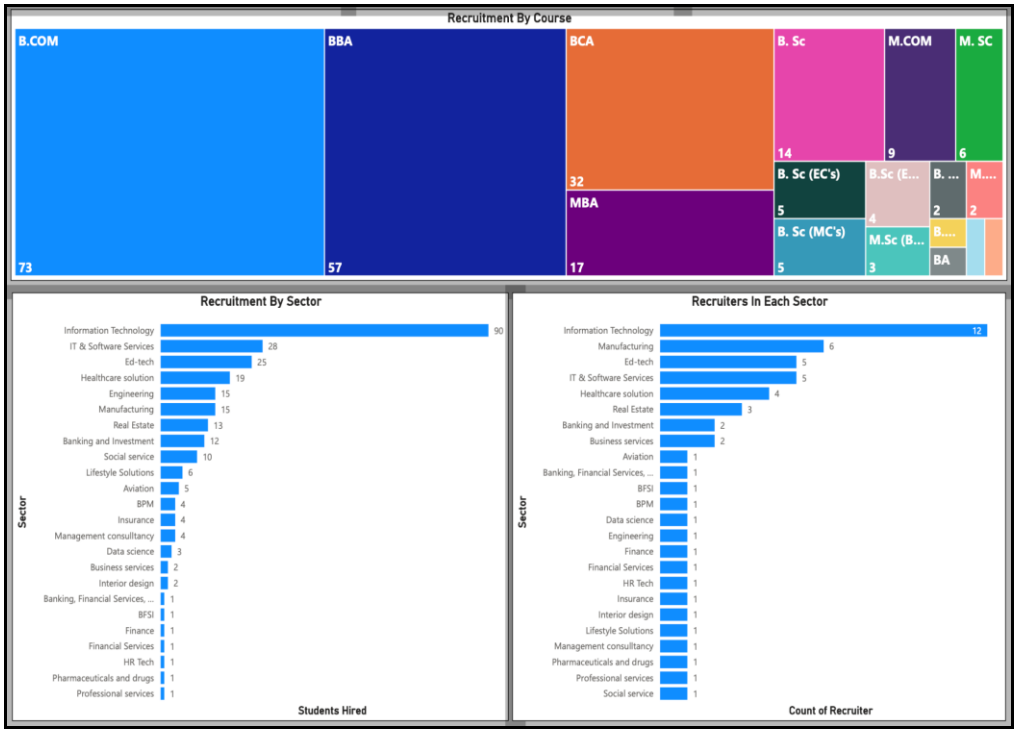

Fig 7 - Dashboard views

Fig 7 details - Recruitment by Course - This metric displays the total number of students placed in each academic course, such as B.Com, BBA, and others. It helps identify placement trends across different streams of study. Recruitment By Sector - This shows the total number of students placed in various industry sectors, such as IT, Data Science, and more. It offers insights into which industries are most active in hiring from the institution. Recruiters In Each Course - This metric counts the number of recruiters operating within each industry sector, such as IT, Data Science, and others. It provides a clear view of sector-wise recruiter engagement during the placement drive.

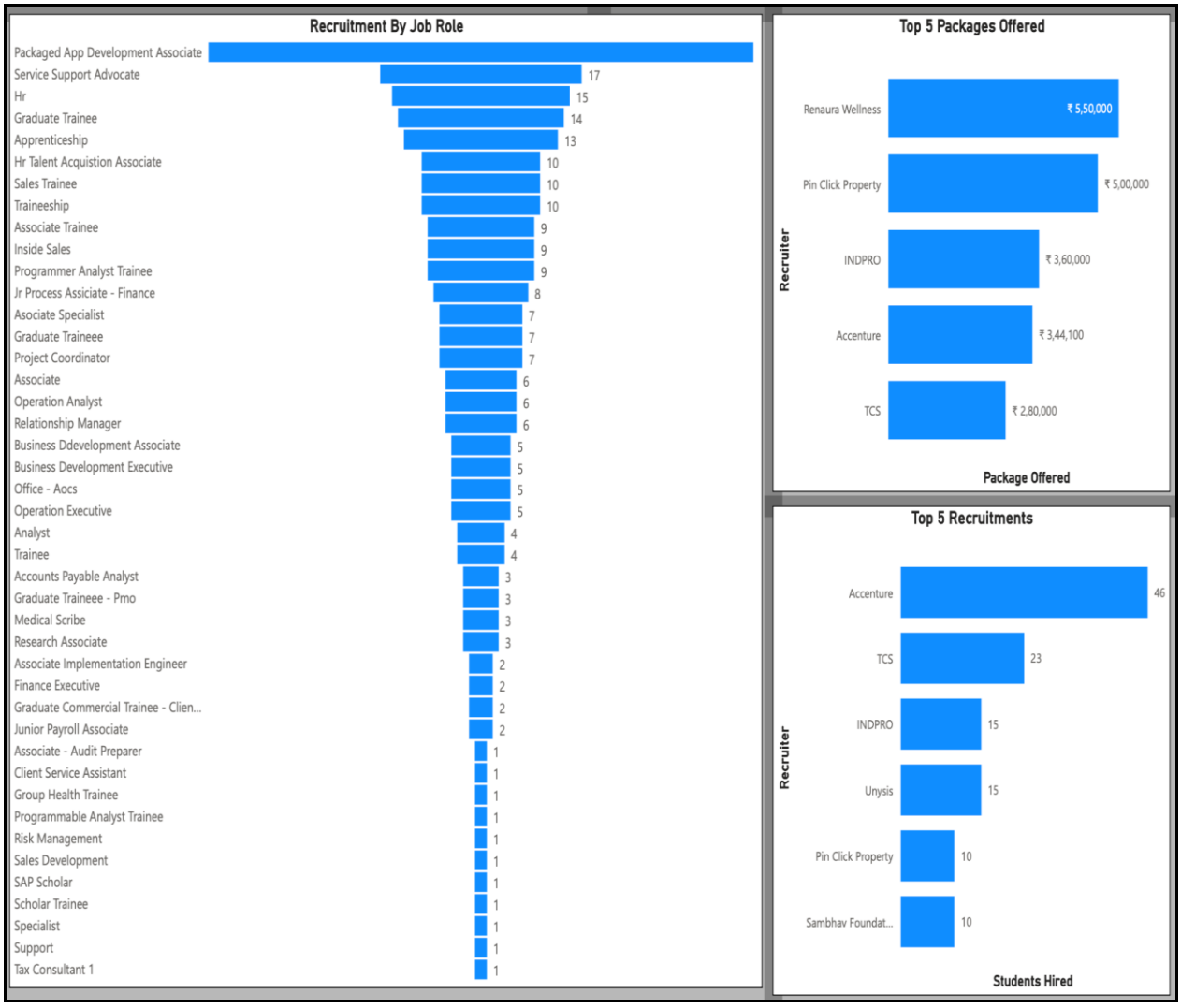

Fig 8 - Dashboard views.

Fig 8 details - Recruitment by Job role - This metric represents the total number of students placed under various functional roles, such as Graduate Trainee, Consultant, and others. It highlights the diversity of job opportunities facilitated through the placement process. Top 5 Packages Offered - This section showcases the five highest salary packages secured by

students. It serves as a benchmark for the most competitive offers of the placement cycle. Top 5 Recruitments - This metric lists the recruiters who have offered the highest salary packages to students. It provides insights into the top-paying organizations participating in the placements.

Fig 9 - Dashboard views.

Fig 9 details - Student Recruitment Timeline - This metric tracks the number of students recruited over the course of the hiring timeline. It helps identify peak placement periods and trends in hiring activity. Recruiter Timeline - This represents the number of recruiters visiting the campus across different stages of the hiring timeline. It offers insights into the flow of recruitment activity throughout the placement season. Hiring Sectors - This metric highlights

the industry sectors that are actively recruiting students during the current placement cycle. It provides a real-time view of the sectors generating the most opportunities.

Findings

1. **Improved Insights Through Interactive Visuals** – The use of Power BI dashboards simplified the interpretation of complex placement data by presenting it in a clear, visual format, making it easier to spot patterns and trends quickly.
2. **Growth in Recruiter Engagement** – Analysis revealed a steady rise in both repeat and first-time recruiters, indicating that the institution's recruitment network is steadily widening.
3. **Course- and Sector-Wise Trends** – Placement data showed variations across academic programs and industry domains, with IT and Data Science consistently ranking among the top hiring areas.
4. **Patterns in Salary Distribution** – Visualizations highlighted well-defined salary ranges, showing a strong average package along with a few exceptional high-value offers.
5. **Recruitment Seasonality Insights** – Timeline analysis uncovered specific periods with peak placement activity, offering guidance for scheduling future drives in sync with recruiter availability.
6. **Accurate Analysis Through Centralized Data** – Combining Excel-based source files with Python-driven ETL processes ensured that the placement dataset was clean, organized, and ready for meaningful analysis.
7. **Comprehensive Placement Tracking** – The Power BI dashboard brought together key metrics—such as recruiter count, students placed, salary bands, and sector-wise hiring—into one view, streamlining decision-making.
8. **Identification of High-Performing Areas** – Visual exploration of the data pinpointed both sectors and courses with the highest placement rates, aiding in targeted academic and industry engagement.
9. **Job Role and Salary Insights** – The dashboard revealed clear trends in the types of roles offered and the corresponding pay scales, providing a benchmark for market expectations.
10. **Understanding of Hiring Timelines** – Time-based visuals highlighted when recruitment activity was at its peak, helping optimize planning for upcoming placement seasons.

Limitations

Regardless of its benefits, the study has a few limitations:

1. The current dashboard framework depends on manually aggregated data, which may introduce inconsistencies and time lags, potentially impacting data reliability and decision accuracy.
2. The absence of integration with institutional ERP systems constrains the system's capacity for real-time data synchronization and automated updates.
3. Effective utilization of the dashboard necessitates foundational proficiency in Power BI, posing a learning curve for users without prior exposure to data visualization tools.
4. The availability of historical placement data was limited, potentially impacting the depth and reliability of trend insights.

Nevertheless, these limitations do not supersede the value the dashboard brings to placement management.

Recommendations

1. The data collection process can be streamlined to maintain a proper data repository with an automated data collection process.
2. A specific data input template can be maintained with a well-defined input data repository [such as databases, SharePoint] to eliminate manual collection and storage of data.
3. The input data QC process can be made more robust by implementing extensive checks on each column.
4. An input database can be maintained instead of using Excel sheets, and an ERP system can be employed for real-time data synchronization.
5. A specified unit with personnel at different layers can be trained on Power BI and maintained for performing regular data refreshes and handling any glitches on the dashboard if they come up.
6. A separate executive view with view access can be developed for sharing with recruiters, including certain specific views, AI-based visuals, and the ability to filter on student information. This can potentially replace student portfolios altogether.
7. Timely updates on Training Need Analysis should be implemented based on the insights drawn from the dashboard.
8. Firewalls and privacy protection aspects can be investigated to protect data and privacy.

CONCLUSION

The integration of Python and Power BI in managing and visualizing campus placement data represents more than just a technological upgrade—it reflects a shift towards a culture of

informed, data-driven decision-making in higher education. Traditionally, placement departments have relied on static reports, spreadsheets, and manual compilation processes to communicate outcomes and track recruitment activities. This method, while functional, often consumed significant time, risked inconsistencies, and limited the depth of analysis. The present approach moves beyond these constraints by bringing together Python's versatility in data processing and Power BI's capability for dynamic, interactive visualization. Using Python for Extract, Transform, and Load (ETL) operations, as well as for rigorous data quality checks, the system ensures that the information feeding the dashboard is both accurate and reliable. This level of integrity builds confidence among stakeholders, from placement officers to institutional leadership, who can make timely and well-grounded decisions. On the visualization front, Power BI transforms complex datasets into clear, actionable insights presented through an intuitive dashboard interface. This allows users—technical or otherwise—to explore trends, compare performance across cohorts, and identify opportunities for improvement without navigating through raw data tables. The resulting dashboard has already demonstrated tangible benefits: streamlining the reporting process, enabling real-time tracking of placement activities, and supporting a more proactive approach to employer engagement. Placement officers can quickly assess which industries or organizations are most active, track student performance against recruitment metrics, and adjust outreach strategies accordingly. This agility in decision-making is crucial in a competitive hiring environment where opportunities can emerge and close within short windows. It is important to acknowledge that the system is not without limitations. The current implementation still involves manual inputs for certain data points, faces constraints in achieving complete real-time integration with external systems, and requires targeted training for staff to fully leverage its capabilities. However, these challenges are not insurmountable. With incremental enhancements—such as API integrations with recruitment portals, automated data ingestion from institutional databases, and periodic upskilling sessions for placement teams—the platform can evolve into a fully automated, self-sustaining solution. Looking ahead, this integration has the potential to become a cornerstone in institutional placement strategies. Beyond tracking outcomes, it could incorporate predictive analytics to forecast hiring trends, identify skill gaps, and inform curriculum design in collaboration with academic departments. Such developments would not only improve student employability but also strengthen the institution's reputation in the job market. In an era where data is a decisive asset, the synergy of Python and Power BI offers a scalable,

adaptable, and impactful model for transforming placement operations—one that aligns with both immediate operational needs and long-term strategic goals.

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