

TnP Vision: Automation and Analysis of Campus Placements in Colleges

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Abstract—This paper represents an Enterprise Resource Planning (ERP) system for Training and Placement Cell in educational institute campuses. The proposed system called TnP Vision aims to automate the entire placement process. It is an interactive software platform that focuses on student data management and analysis to digitise practices, providing visibility into students' success, and providing a forum for employers to streamline the hiring process. It provides insights for all participants on placement activities. Apart from the existing systems, tracking student's progress and predicting areas of improvement is the core focus. Built on top of the Django framework, it uses python backed data analytics modules to peruse the candidate's information. Web Scrapping is inherited to scrape placement posts from LinkedIn.

Keywords—Data Visualization, Data Analysis, Neural Networks, Predictive Analysis, Web Scrapping.

I. INTRODUCTION

Training and Placement activities have recently been a pillar in improving students' performances and college reputation. However, the departments' in-charge is still forced to work on many elements manually leading to several issues. While there are other digital solutions in the market, they are lacking in analytics and automation. TnP Vision is developed based on the Training and Placement cell located at educational institutes to store and retrieve student and company registration. The Training and Placement cell maintains a large database that contains all student information such as records, academic performance, and company details such as company profile, eligibility methods, and services. The software returns this data and displays it as required by the user.

Despite the digital era Training and Placement cells follow a manual way of organizing drives which is quite tedious and time-consuming. Management has become a field that must be performed in just a few clicks in a digital world like today. Various software and websites are available for placement drive management, student data analysis, performance tracking and testing. Nevertheless, educational institutes find it hard to have an application on a single platform to meet all their requirements. As a result, the concept of "TnP Vision" emerged to provide a one-stop destination for all services, including not only on-spot placement drive management, but also review and study of

student data, visual representation of data, and data protection assurance.

University syllabus is different for different areas of study, assuming a US-based educational system. It keeps on changing on a field level and a major level. These changes are very complicated as options for choices in the selection of subjects differ on basis of directors, schools, etc. This can be used as an analogy to understand how data can be handled in other sectors of educational institutes [1].

One major sector in colleges and universities is the Training and Placement Cell, where a huge amount of data has to be handled quickly and efficiently. It is noticed that still a major number of colleges conduct placement activities and handle drive's data manually due to a lack of efficient and relevant applications. TnP Vision focuses on ease in entering and retrieving data, customized access to users and uniquely analyse and represent data in a much easy and diagrammatic way. Curriculum mapping has recently piqued the imagination of many people, as there is an increasing need to shape broader instructional units and save money by eliminating duplication [2]. TnP Vision learns from this analogy for its efficient features. It also provides a good number of features and facilities to handle onsite drives with not much overhead of entering or typing every entry. TnP Vision also provides features for companies and recruitment teams to give easy but customized feedback, view profiles and get quick access to student data while interviewing. TnP Vision also handles the onsite notification and Email management functionality which ultimately reduces the manual work of Training and Placement Officers (TPOs) and volunteers. This way not only the data management is at ease but also data security comes into the picture and no loss or tampering of data is also ensured, leading to a fair game for all the students. With the motive of ease, digitalization and loyal work handling this paper propose the system: TnP Vision - One stop solution for all the placement activities.

The paper is divided into the following sections: The literature survey is discussed in section II. The architecture, modules, interfaces and components are discussed in section III. A detailed description of the proposed system is discussed in section IV. Section V depicts TnP Vision's simulation and analytics components.

II. LITERATURE SURVEY

ERP systems for Training and Placement cells in educational institutes are integrated software platforms focusing on student information management and analysis with a consideration of overall achievements and activities. Training and Placement Cells will be referred to as TnP Cell from now on.

Cocubes, Calyxpod and Superset are few similar products for TnP Cell available in the market. Managing placement activities and storage of data is the primary focus of these products. By the documentation available on the internet and by hands-on experience of these products, features and other required study is done. Thus, details of drawbacks in these systems are concluded as lack of Data Analysis and less priority for "On Spot" management.

In 2013, Goel S. et al., [3] described, resource collection management and planning are also an important part of building online systems especially that include the flow and student management in enterprise resource planning in technical educational institutions.

In 2017, Trimukhe S. et al., [4] explained in-depth about online placement management and various scenarios that should be considered in online training and placement systems.

In 2018, Raji M. et al., [5] mentioned in Modeling and Visualizing Student Flow, data visualization is a crucial and detailed process including deep segregation and study of data. It helps for future analysis as well.

Rufiange S. et al., [6] described a detailed of how a huge amount of data has to be abstracted on different levels with different perspectives.

Sadana R. et al., [7] mentioned explicit knowledge about visualisation tools used in the education field to communicate the context and substance of educators and instruction and relationships between complex elements in representational problems are analysed using different journals.

In 2019, Olive D. M. et al., [8] A considerable amount of research has been done in the field of LMS (Learning Management System), and a simplified system is developed to analyze various courses, as discussed in a quest for a one-size-fits-all neural network: early prediction of students at risk in online courses. It eliminates the hassle of having to construct a neural network for each system. In the proposed scheme, different students from various courses are assessed, as well as their interview reviews. As a result, developers are looking for a standardised method to evaluate and produce their output.

In 2019, Thomas D. M. et al., [9] mentioned in data analysis by web scraping using python have stated the methods to extract relevant information from social sites. The gathered data is very unstructured which needs to be sorted and stored in a readable structure.

In 2019, Matta P. et al., [10] majorly focused on methods of web scraping. The availability of these resources has helped a lot of entrepreneurs to grow their business.

Since the administration of student record changes entails. Several executive branches, as well as the organic integration of several agencies, must be organised, but the school's institutional ratios remain uneven [11].

The approach followed for the study was to split different aspects of TnP Vision and refer to context related to them from various sources. This study helped in figuring out some needs and drawbacks of the market like lack of specific data analysis, predictions and digital management of ongoing events.

TABLE I. COMPARISON OF AVAILABLE SOFTWARE WITH PROPOSED SOLUTION

Name of Product	Drawbacks	Project Strategy to overcome drawbacks
Online Training and Placement System [4]	Paper only gives the visualization in graphical format about the placed students.	Analysis of data extracted from previous drives, tests conducted, certifications and academic progress is done using an algorithm designed by the authors.
Modelling and visualizing Student Flow [5]	Paper does not consider extracting specific results.	Individual outcomes are derived from student data to determine their poor and strong areas, which will eventually aid the college and students in self-evaluation.
Cocubes [12]	Data Analysis and visualization is not on the priority	Special dashboards are provided with different levels of abstraction using filters and classification facilities based on departments and colleges to provide a visual representation of the data. Different types of logic are also used to analyze the data in such a form to figure out student's areas of weaknesses and strengths.
Calyxpod [13]	On spot drive management facility is not provided.	A special dashboard for Company HR is available to mark the progress and clearing status of candidates. The details required will be filled in and retrieved easily by the respective authorities and volunteers.
Superset [14]	Data visualization in per student format is not available	Data Analysis of an individual candidate is carried out and updated regularly.

III. SCOPE OF STUDY

The proposed system named TnP Vision is a web-based candidate / company information system. TnP Vision is designed based on the Training and Placement cell located at education institutes to maintain and restore student and company enrollment at the Training and Placement Cell. All student information, including documents, academic results, and company specifics, including company history, eligibility requirements, and facilities is kept in the Training and Placement Cell's vast student database. The system retrieves this information and shows it as the user specifies. The system provides a place to view student's personal and corporate information.

A. Operating Environment

The software being developed is running under Windows/Linux OS with Django Server at the backend and ReactJS at the frontend. To store and retrieve data, a database server is supposed to exist in the cloud. Since the framework is web-based, it will be largely compliant with any computer that has internet connectivity and a web browser that supports JavaScript performance shown in figure 1.

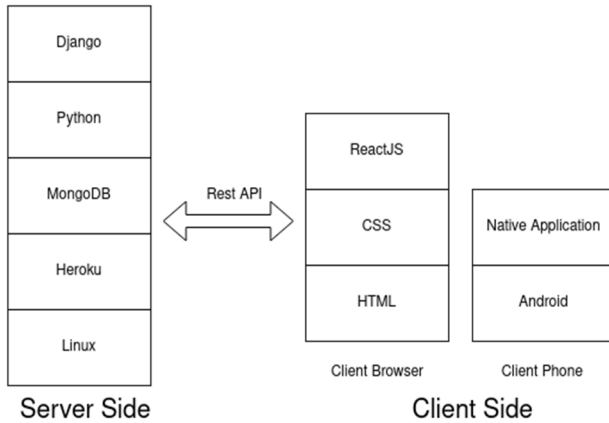


Fig. 1. Technology stack

B. Functional Requirement

- **Training and Appointment Work:** Displaying Campus interview schedules, Briefing and announcing results.
- **Student Activities:** These activities include student enrollment with relevant and verified information found on excel sheets.
- **Administrative Services:** These functions include the administration of all legal matters such as verification and registration of teams, companies and human resource skills, etc.

C. Assumptions and Dependencies

- Staff access control is predetermined. Employees who are not part of the process are not allowed to access the system.
- Jobseekers are from any field of engineering.
- Verification and validation of use cases are handled by an internal database.

IV. PROPOSED MODELING

A. System Architecture

TnP Vision's proper structure plays an important role in its easy and efficient flow of data shown in figure 2. Every stakeholder has access after thoughtful study of existing theories about the same. A feature that has to be included or not to be included is a deep study to make all the facilities available for users without burdening them with lots of information on display [16].

Database: With the number of students enrolled in both conventional and online classes, a massive amount of data comes from students' curriculum [15]. MongoDB is a NoSQL, schema-less database that can have flexibility on how to store data. In the system data is unstructured. The

student record holds different certificates, internships, projects which will vary from student to student and since SQL requires joins to query such data which is a costly operation in terms of computation NoSQL is used for the system.

Middleware: The middleware is built upon Django due to its inbuilt security, scalability and essential web framework modules. The application comprises different roles which are supported by groups present in Django. Web scraping, data analysis and visualization require libraries that are strongly built in python.

Student: Students are expected to sign in at all times to view and update profiles, view dashboards and track certain progress of his or her drive. The student will also be able to view his or her drawing from a previous application.

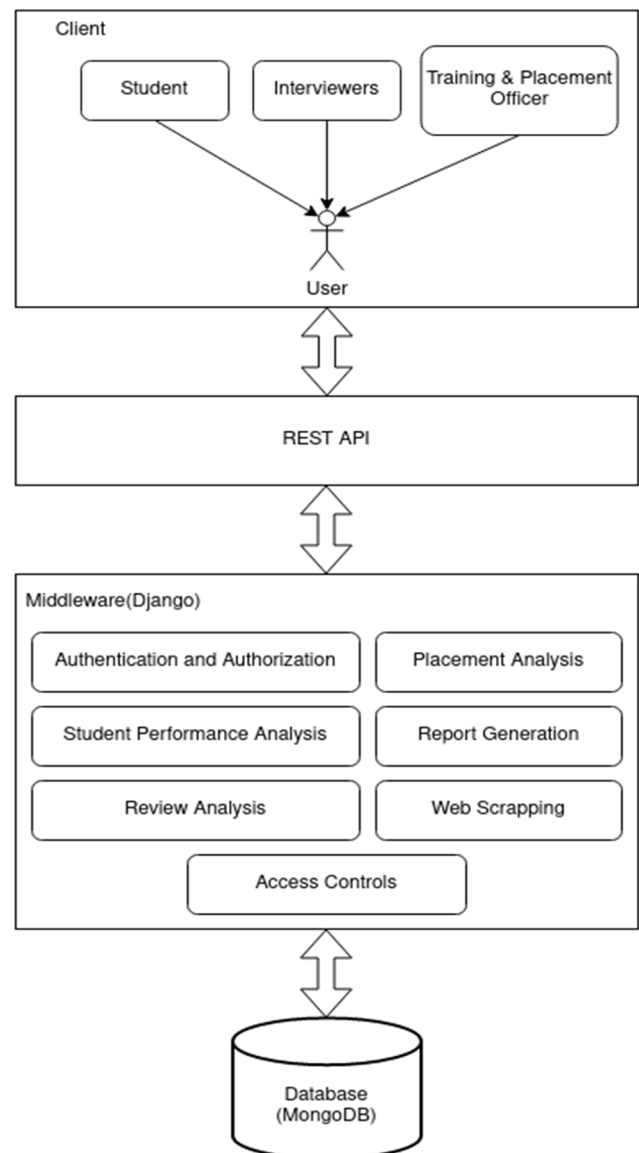


Fig. 2. Architecture of the proposed system

TPO: Administration is having the greatest power over the system. Administrators can issue a permit for the registration of students and companies. Managers are responsible for uploading and updating drive and student

data. Management can be said to be something that keeps the whole system.

Interviewer: This group needs to inform the authorities in the TnP cell and log in according to each schedule. The team is also able to access the student profile. They are responsible for providing and updating updates as the process progresses. They are also able to keep track of student progress.

B. Overall Description

Product Perspective: The in-house software product is developed for a new smart ERP system that supports the Training and Placement of educational institutes. The software works and easily integrates with various types of documents that can be imported into the data. This is not intended to replace the existing system but to support it. Currently, no software supports all functions the way TnP Vision does.

C. Product Features

Connecting Multiple Stakeholders on One Platform:

A single placement activity involves many stakeholders who need to work together and coordinate. Transfer of data from one hand to another, securely and without any mishandles is a severe necessity. TnP Vision ensures an easy to understand UI and multiple features for all the stakeholders to work efficiently and handle the data with a click of a button.

Analytics: Based on the student's performance and his input information, analytics is generated which is used to keep a minute eye on each student's activities. Apart from the student, institutional-based analytics such as students placed, average package etc. is being displayed.

Systematic Recruitment: The recruitment process is made in such a way that is easy to schedule with just a few clicks, consists of existing templates or previously used templates to create a placement drive, the interviewer can get summarized information of the student.

Performance Tracking Analysis: During a placement drive, the continuous and tedious task of keeping a track of students quickly and efficiently is one of the major needs. With well-developed and efficient libraries, the analysis of students is a game of tic tac toe. TnP Vision provides the most effective functionalities to keep the track of students in a few clicks.

Digital Scoring and Archiving: The students' results in the interview will be graded digitally. This data can be used to produce analytics and recommendations on where the student wants to change and where he or she excels. This data is archived and is available for retrospective research in the future.

D. Analysis of Student Master Employability Value

Analysis of a student's employability value is done using the data that can be extracted through every drive a candidate appears for. Two major factors are considered out of which one is a permanent contributing factor whereas the other is an additive value factor. Simple questions, "What is the Test Score?" and "What does the interviewer think about him/her?" helps to understand the origin of the problem and

base for the solution. The first question leads to factor 1 which is the analysis of a student's test score in a particular placement drive.

Analysis of Student Test Score:

Assume a student's score is as follows,

- Aptitude = A%
- Technical = T%
- English = E%
- Psychometric = P%

Here, a scope of two different analysis:

1. Technical Job Employability
2. Non-Technical Job Employability

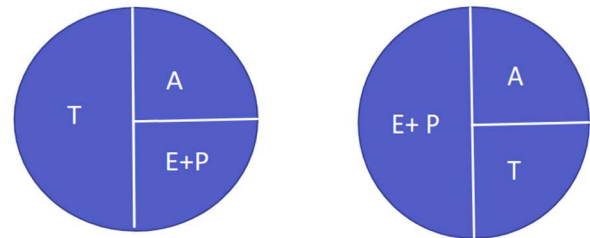


Fig. 3. Mathematical model

The above figure 3 shows the contribution of students' scores in the calculation of a particular analysis. The contribution of the technical test score is 50%, the aptitude test score is 25% and English and Psychometric combined is 25% of the entire value for this step for technical analysis as defined in equation (1). Similarly, E and P's combined contribution here is 50% whereas T's contribution is 25% in the non-technical analysis as defined in equation (2). This value defined as the first sub-master value as follows:

$$TEAS_1 = \frac{1}{2}(T) + \frac{1}{4}(A) + \frac{1}{4}(E + Ps) \quad (1)$$

Here, representing the Technical employability analysis score for the first sub-master value.

$$NTEAS_1 = \frac{1}{2}(E + Ps) + \frac{1}{4}(A) + \frac{1}{4}(T) \quad (2)$$

Where,

T: Technical &

A: Aptitude,

E: English &

Ps: Psychometric.

$NTEAS_1$: represents the Non-technical employability analysis for the first sub-master value.

Now, the second question leads to a different analysis of reviews and ratings a student gets. As discussed this value is additive and can make or break the deal. Again have the same two types of analysis: Technical and Non-Technical Analysis [17]. Calculate second master employability value by the contribution of technical rating (T %), communication rating (C %) and personality rating (Pr %) as 50%, 25% and 25% respectively for technical job employability analysis as defined in equation (3) and 25%, 50% and 25% respectively

for Non-Technical Job Employability analysis as defined in equation (4).

$$TEAS_2 = \frac{1}{2}(T) + \frac{1}{4}(C) + \frac{1}{4}(Pr) \quad (3)$$

Here, representing the Technical employability analysis score for the second sub-master value.

$$NTEAS_2 = \frac{1}{2}(C) + \frac{1}{4}(T) + \frac{1}{4}(Pr) \quad (4)$$

Where,

C: Communication,

T: Technical &

Pr: Personality.

$NTEAS_2$: represents the Non-technical employability analysis for the second sub-master value.

Now both the Sub-Master Values are added where their contribution is 50% each. This addition is added to the review as the next step. Reviews that the system gets are positive (1), negative (-1) and neutral (0). A weight of 25% is assigned to this, i.e., 25% is added or deducted respectively or no change is there if a neutral review is given.

Finally, the value obtained from all the above steps has to be multiplied by a System Confidence Value. This value is dependent on the number of drives the student has appeared for [18].

$$MEV = (S) \times (V) \quad (5)$$

Here, representing the Master Employability Value

S is a System Confidence Value and

V is a Value received

The above algorithm focuses on extracting as much useful information as possible to identify the skills of students. This flow of building and designing an algorithm is an approach learned by the concepts of association relationships, decision trees and learning agent's contributions in the analysis. Real-time usages of these concepts are studied via various sources and research papers [19].

V. EXPERIMENTAL RESULT AND DISCUSSION

TnP Vision uses cube.js as its analytical platform via an open-source analytical application programming interface (API). It is primarily used to build internal business intelligence tools. It is a separate server especially used for analysis in TnP Vision. Because of using a separate server, the system gets exceptional efficiency and speedup.

Comprehensive statistics analysis and its visualization is a key feature of TnP Vision. Students eligible for particular drives, progress rate of students getting hired, drives eligible for college and companies hiring every year are some very important elements covered by TnP Vision. This mined data is crucial for the system and handling it is studied via detailed explanation [20].

Figure 4 below shows some statistics of students based on a particular drive result so that the system knows how many per cent of students appeared for that drive. The analysis of

the pending rejected and accepted students are taken based on a single drive.

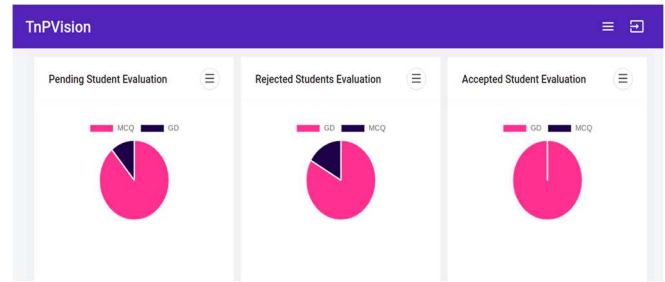


Fig. 4. Students per drive

It also shows visualized data for a particular drive in three aspects, Pending students, Rejected Students and Accepted Students. Each card shows the percentage of students from all the rounds in the form of pie charts.

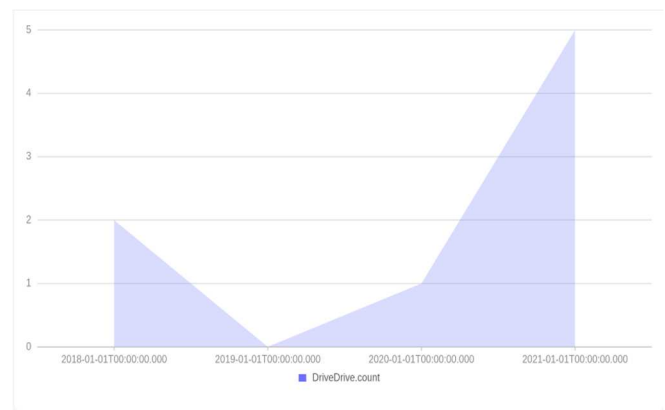


Fig. 5. Drives per year

Figure 5 shows the analysis of drives held per year. For the year 2018, the number of companies visiting campus for hiring was 2 whereas for the year 2021 the number is seen to be raised to 5. Thus, with the help of the above area graph, users can analyze the change in company count that visits college every year, making it easy for the college to track the progress.

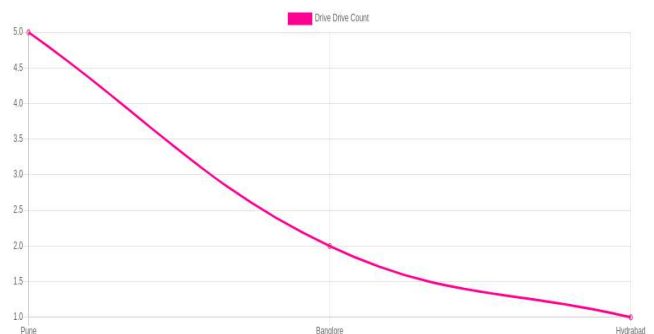


Fig. 6. Drives per location

Figure 6 shows the number of drives as per the location of the job. For example, companies that provide jobs for Pune city location are 5 until the day of analysis.

ID	Job Title	Location	Drive Date	Company	Salary	Tenth	Twelfth	Diploma	Actions
1	Sheryl Drive	Hydrabad	1/1/2018, 11:59:00 AM	Test Company 1	60000-160000	50	50	50	
2	Jules Drive	Pune	1/1/2018, 11:59:00 AM	Company 2	60000-160000	50	50	50	
3	Mary Drive	Pune	1/2/2020, 11:59:00 AM	Company 3	60000-160000	50	50	50	
4	William Drive	Banglore	1/25/2021, 11:59:16 AM	Test Company 1	60000-160000	50	50	50	

Fig. 7. Drive details

Figure 7 shows the details of all drives that are completed, yet to complete and in progress. Each drive's name, location of employment, date of recruitment, CTC provided etc. is shown in a tabular format. Features like sorting and filtering according to these criteria, i.e. columns are also made available. On further clicks, one can access the complete details of the drive and update changes.

VI. CONCLUSION AND FUTURE WORK

In this paper, TnP Vision aims towards creating a single digital platform for the management of ongoing placement activities, automation of major processes, analysis of data on various levels and secure transfer of data.

As future work, a generic API will be developed which will be used by third-party applications efficiently and conveniently to be able to expand the scope and features of the system. Also, deepening the analysis using different technologies and algorithms is expected to be done.

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