

SkillPath: A Smart Career and Placement Analytics Portal for Higher Education Institutions

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Abstract

In many higher education institutions, students begin serious placement preparation only during their final academic year. This late start often results in rushed skill development, limited industry alignment, and dependence on academic scores for short-listing. Although career guidance platforms and placement management systems exist, they usually operate independently and fail to provide continuous tracking of a student's growth from the first year to graduation. This gap highlights the need for a structured and integrated solution that connects career planning, skill verification, and placement analytics within a single institutional framework.

This paper presents SkillPath, a Smart Career and Placement Analytics Portal designed to support long term career development and data driven placement decisions. The proposed system allows students to select a career domain early in their academic journey and provides a structured year wise roadmap outlining required skills, certifications, projects, and experiential milestones. Instead of relying solely on self declared skills, the system incorporates assessment based validation to ensure authenticity and credibility.

A readiness scoring mechanism evaluates employability using multiple parameters, including academic performance, verified skills, internships, and project experience. The readiness score is explainable and accessible to placement authorities, enabling fair and transparent shortlisting. By integrating governance control, structured development, and analytics driven evaluation, the proposed system aims to bridge the gap between academic learning and industry expectations while improving institutional placement efficiency.

Keywords: Career Guidance; Placement Management; Skill Verification; Employability Analytics; Readiness Scoring; Higher Education

1 Introduction

The employability of engineering graduates has become a growing concern in higher education institutions. Although universities provide structured academic knowledge, industry expectations increasingly emphasize practical skills, real-world exposure, and domain specialization. This mismatch often results in graduates who are academically qualified but not adequately prepared for professional environments.

In many institutions, structured placement preparation begins only in the final academic year. Students are required to quickly prepare for interviews, technical tests, and recruitment processes within a short period. Such a late-stage approach does not allow consistent skill development across earlier years of study. As a result, career preparation becomes reactive rather than progressive.

To address these challenges, this paper introduces SkillPath, a Smart Career and Placement Analytics Portal. The proposed system integrates early career domain selection, structured year-wise roadmap planning, assessment-based skill validation, and readiness scoring within a unified institutional framework. The objective is to support systematic skill development and enable data-driven placement decisions.

2 Literature Review

The shift towards digitized placement management has been extensively documented as a necessity for modern educational institutions to handle increasing student volumes and recruiter expectations. Recent research highlights that traditional manual processes are being replaced by web-based solutions that offer centralized role-based access for students, coordinators, and placement officers. These systems not only eliminate the inefficiencies of fragmented communication but also establish a foundation for more complex, analytics-driven decision-making in the recruitment lifecycle.[1][2]

Beyond simple workflow management, contemporary studies emphasize the integration of machine learning to predict student employability through multi-parameter analysis. Researchers have demonstrated that incorporating factors such as technical skills, internship experience, and project contributions alongside academic marks provides a more holistic view of student readiness. Advanced predictive models, specifically those utilizing ensemble methods like Random Forest and Gradient Boosting, have achieved high accuracy in forecasting placement outcomes, thereby allowing for early identification of students who require additional training.[3][4]

There is also a growing consensus in the literature regarding the "skills gap"—the discrepancy between academic curriculum and industry requirements. Systematic reviews suggest that while higher education provides theoretical depth, students often lack transferable employability skills such as critical thinking and adaptability. To bridge this gap, scholars advocate for "work-integrated learning" (WIL) models that embed practical assessments and reflective practice into the curriculum from the onset of the degree. These frameworks suggest that continuous, assessment-based skill validation is more effective than the traditional, end-of-cycle certification model.[5]

2.1 Existing System

In current institutional frameworks, career preparation is typically a reactive process confined to the final academic year. Traditional systems rely on manual data entry and fragmented records, such as physical spreadsheets and email trails, which are prone to clerical errors and lack centralized transparency. Furthermore, candidate shortlisting is primarily dependent on academic grade thresholds, which often fail to account for technical competencies or practical project experience. This absence of a structured, longitudinal tracking mechanism prevents institutions from providing personalized interventions early in a student's academic journey.

2.2 Proposed System

The proposed SkillPath framework addresses these limitations through an integrated and structured approach. Students select a preferred career domain during the early stages of their academic journey. Based on this selection, the system provides a pre-defined roadmap outlining required technical skills, recommended certifications, project milestones, and internship expectations for each year.

To ensure credibility, students must validate self-declared skills through structured assessments. A readiness score is calculated using weighted evaluation of academic performance, validated skills, project contributions, certifications, and internship experience. This score supports transparent and objective placement filtering.

Table 1: Comparison Between Existing and Proposed System

Feature	Existing System	Proposed SkillPath
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Career Planning	Final Year Only	From First Year
Skill Validation	Manual Verification	Assessment-Based
Shortlisting Criteria	CGPA Focused	Multi-Parameter Readiness Score
Progress Tracking	Limited	Continuous Monitoring
Governance Control	Minimal	Role-Based Access

3 Methodology

The development of SkillPath follows a systematic methodology consisting of architectural design, module implementation, and evaluation mechanisms.

3.1 System Architecture

The system is designed using a layered architecture approach to ensure modularity and scalability. The architecture consists of three primary layers: presentation layer, application layer, and data layer.

The presentation layer manages user interaction and provides dashboards for students and placement authorities. The application layer handles business logic including authentication, roadmap generation, skill validation, and readiness score computation. The data layer stores structured academic data and flexible skill-related records.

3.2 System Modules

The system is composed of the following functional modules:

Career Domain Module. Enables early selection of professional specialization.

Roadmap Module. Provides structured year-wise development guidance.

Skill Assessment Module. Validates technical skills through structured evaluation.

Readiness Scoring Module. Computes employability readiness using weighted parameters.

Placement Analytics Module. Supports filtering and data-driven shortlisting. The readiness score is calculated as:

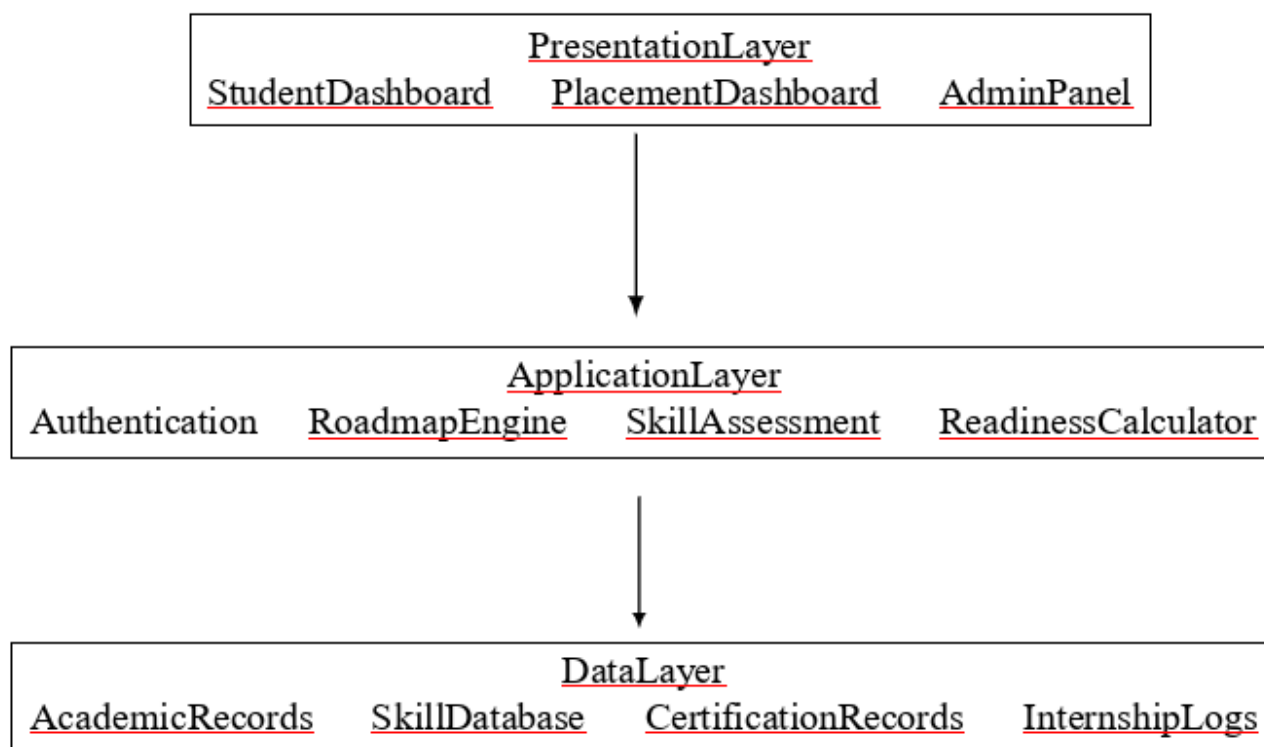


Figure 1: Detailed Layered Architecture of SkillPath System

where each parameter represents academic performance, validated skills, project experience, certifications, and internship exposure respectively.

Table 2: Weight Distribution for Readiness Parameters

Parameter	Weight Value
Academic Performance (A)	0.25
Validated Skills (S)	0.30
Projects (P)	0.20
Certifications (C)	0.15
Internships (I)	0.10

4 Results and Discussion

The proposed system was evaluated in a controlled academic environment using structured student data.

Implementation of roadmap-based guidance resulted in improved consistency in skill acquisition across academic years. Students were able to track their development progress through dashboard visualization.

The readiness scoring mechanism enabled placement authorities to filter candidates using structured performance indicators instead of relying exclusively on academic thresholds.

Dashboard Visualization. Screenshots of the student dashboard, roadmap progress interface, and placement analytics panel are presented to demonstrate the system functionality.

Table 3: Sample Readiness Score Calculation

Parameter	Score Obtained
Academic Performance	80
Validated Skills	85
Projects	75
Certifications	70
Internships	65
Final Readiness Score	78.25

The evaluation indicates that structured validation and analytics-driven filtering improve transparency and reduce manual verification effort.

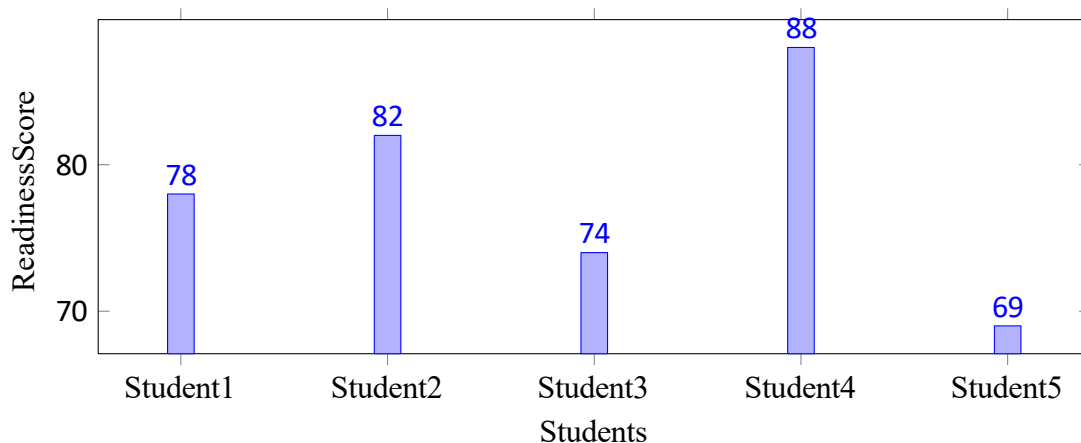


Figure 2: Sample Readiness Score Distribution

4.1 System Interface Screenshots

The following figures present key system interfaces of the proposed SkillPath portal, including the student dashboard, roadmap tracking interface, and placement analytics panel. These screenshots demonstrate real-time progress monitoring and readiness evaluation.

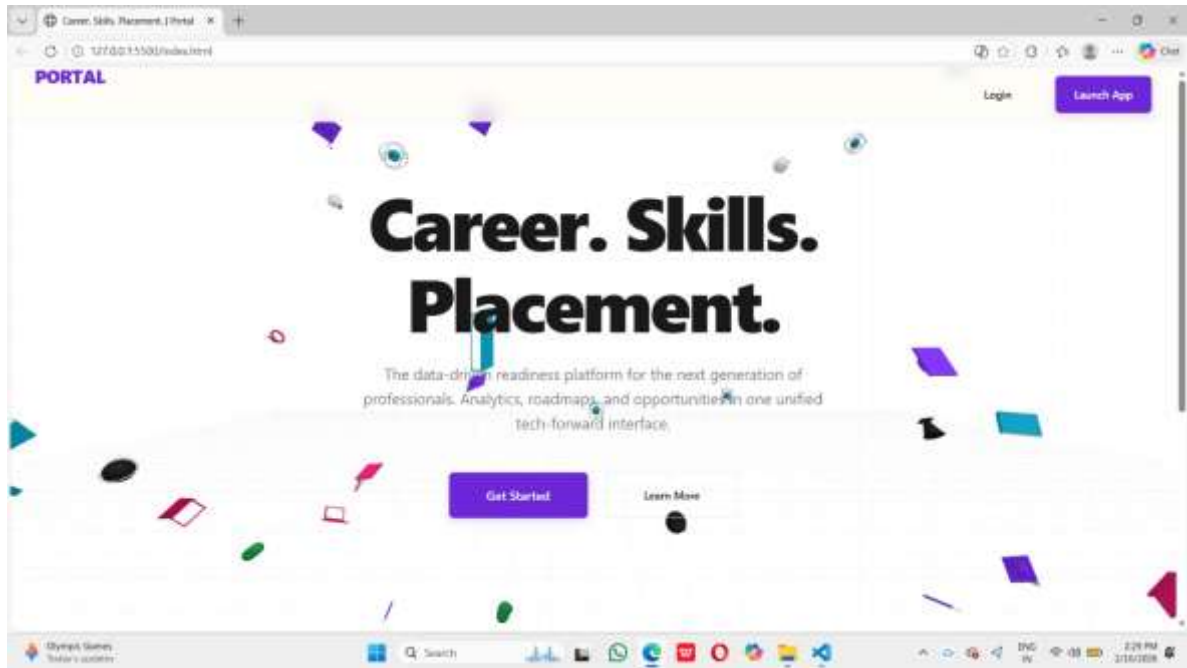


Figure 3: Student Dashboard Interface



Figure 4: Roadmap Progress Tracking Interface

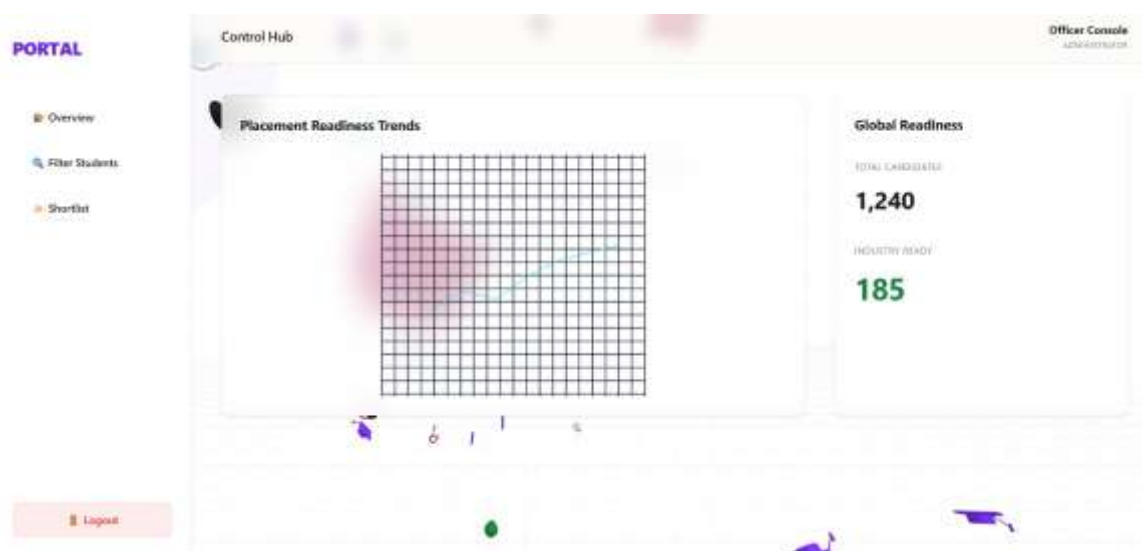


Figure 5: Placement Analytics Dashboard

5 Conclusion

This paper presented SkillPath, a Smart Career and Placement Analytics Portal developed to enhance employability preparation within higher education institutions. The system integrates structured roadmap planning, assessment-based skill validation, and readiness scoring into a unified institutional framework.

The layered architecture ensures scalability and modularity, while the readiness model enables transparent placement decision-making. Experimental evaluation demonstrates improved efficiency in candidate monitoring and filtering.

Future enhancements may include adaptive roadmap updates based on industry demand and integration with external skill certification platforms.

Author(s) Contributions

MS. S. Sujatha conceptualized the research framework and provided academic supervision throughout the development of the project. The student authors contributed to system design, module implementation, database structuring, experimental evaluation, and preparation of the manuscript. All authors reviewed, revised, and approved the final version of the paper.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this research work.

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