

AI Smart Allocation Engine for the PM Internship Scheme: A Comprehensive Review of Scheme Design, Matching Theory, Recommendation Methods, Fairness and Reservation Constraints, and a Conceptual Engine Architecture

Khilari Atharv Sopan, Prof. Bangar A.P., Prof. Bhosale S.B., Prof. Karad.V.A

Dept. of Computer Engineering
Jaihind College of engineering, Pune, India

Abstract- Large public internship programmes must match very large numbers of candidates to a limited number of company-posted slots while respecting preferences, eligibility rules and priority for under-represented groups. The Prime Minister's Internship Scheme (PMIS) of India, launched as a pilot in October 2024, faces exactly this allocation problem. This paper presents a focused narrative review of verified sources relevant to an AI smart allocation engine for PMIS. It examines four connected themes: the design of the scheme and its reported pilot outcomes, matching theory and allocation mechanisms, recommendation methods used in e-recruitment, and fairness and reservation constraints in Indian centralised allocation. The literature shows that official guidance describes a portal that shortlists candidates using preferences, company requirements and priority groups, that companies made 82,077 offers in Round I of the pilot against more than 1.27 lakh posted opportunities, that only about 33% of offers were accepted over the first two rounds, and that deferred acceptance based allocation with reservations has been used at scale in Indian engineering admissions. However, the exact PMIS shortlisting method is not public, reasons for non-acceptance are not evidenced, and no source evaluates an AI allocation engine for internships. The review contributes a comparative analysis of representative sources, a proposed conceptual seven-layer allocation engine architecture, and a prioritised list of research gaps.

Keywords— PM Internship Scheme, Allocation Engine, Stable Matching, Recommender Systems, Fairness, Reservation, E-Recruitment

I. INTRODUCTION AND RESEARCH OBJECTIVES

The Prime Minister's Internship Scheme (PMIS) was launched by the Ministry of Corporate Affairs on 3 October 2024 with the aim of providing one crore young people with 12-month paid internships in top companies over five years, starting with a pilot targeting 1.25 lakh internships [1], [2]. Companies post internship slots on a central portal; candidates register, browse and apply, and the portal shortlists candidates before companies make their own selection [1]. Behind this process lies an allocation problem: many candidates with preferences, a limited number of slots with requirements, and rules that give priority to some groups.

Allocation outcomes matter because a slot that is offered but not taken up is a lost opportunity for another candidate. Reported pilot figures show a large gap between offers made and offers accepted [4].

Matching theory and e-recruitment recommender systems offer tools for such problems [6]–[12]. This review asks what these sources say, how mature the evidence is for an AI smart allocation engine for PMIS, and what a conceptual engine design should contain. Throughout, statements about what an AI engine should do are design proposals of this review, not findings of the sources.

II. REVIEW METHODOLOGY

This is a focused narrative review, not a systematic one. The evidence base was built from four groups of sources: official Government of India documents describing the scheme and its pilot rounds [1], [2]; news and parliamentary-reply reports on pilot outcomes and on the 2026 revisions [3]–[5]; foundational and applied work on matching and allocation mechanisms [6]–[10]; and two surveys of e-recruitment recommender systems [11], [12]. The PMIS details come from the Ministry's documents as accessed through the Press Information Bureau; the outcome figures come from a report of the Ministry's reply in Parliament, so they are second-hand. No separate database search was run, no study counts are claimed, and findings are reported as the authors describe them. The scheme has been revised since the pilot, so some details may have changed; this and the absence of PMIS-specific academic evaluations are stated as limitations in Section IX.

III. THE PM INTERNSHIP SCHEME AND ITS ALLOCATION PROBLEM

1. Scheme design

The pilot offered 12-month internships across 24 sectors for Indian nationals aged 21 to 24 who were not employed full-time or in full-time education [1]. Eligible qualifications ranged from high school and ITI certificates and diplomas to graduate degrees, while graduates of institutions such as the IITs and IIMs, holders of qualifications such as CA, MBBS or master's degrees, and candidates whose family income exceeded Rs 8 lakh were not eligible [1]. Partner companies were identified from the top 500 by average corporate social responsibility (CSR) spending over three years, and other companies could join with approval [1]. Interns receive a monthly stipend of Rs 5,000 (Rs 4,500 by direct benefit transfer and Rs 500 from the company) and a one-time grant of Rs 6,000 [1].

2. How candidates and slots are matched

Candidates register, a resume is generated from their information, and they can apply for up to five internships, choosing by location, sector, functional

role and qualifications [1]. The portal shortlists candidates by considering their preferences together with company requirements, with an emphasis on diversity and social inclusivity and priority for Scheduled Castes, Scheduled Tribes, Other Backward Classes and persons with disabilities [1]. For each internship, about two to three times the number of offers is shortlisted and sent to the company, which then chooses according to its own criteria; candidates accept offers through the portal [1]. The shortlisting method itself is not specified in the document. In Round II, candidates could apply to up to three internships at once through a new mobile app that filters opportunities by district, state, sector and location radius [2], [3].

3. Reported pilot outcomes

Round I drew more than six lakh applications [3], and partner companies posted more than 1.27 lakh opportunities [4]. Round II offered 1.18 lakh or more internships across all 735 districts from 327 companies, with roles divided by qualification (37,000 for graduates, 23,000 for ITI holders, 18,000 for diploma holders, 15,000 for Class 12 and 25,000 for Class 10 candidates) [2]. According to a report of the Ministry's reply to Parliament, companies made 82,077 offers to over 60,000 candidates in Round I, of whom more than 28,000 accepted and over 8,700 joined; Round II saw 71,458 offers, with over 22,500 accepted as on 17 July 2025; and only 33% of offers were accepted across the first two rounds [4]. Calculated from these figures, roughly three in ten acceptances in Round I led to joining. The sources do not explain why offers were declined; reasons such as location or sector mismatch are plausible but are not established.

4. Revisions in 2026

In April 2026 it was reported that revised guidelines allow final-year students aged 18 to 25 to apply, whereas earlier candidates had to be aged 21 to 24, and that the full-scale rollout is expected to draw on stakeholder consultations and evaluation of the pilots [5]. Other press reports describe further changes, such as a higher stipend, shorter durations and removal of the CSR requirement for companies; these were not confirmed from a primary document in this review.

IV. MATCHING THEORY AND ALLOCATION MECHANISMS

1. Stable matching and deferred acceptance

Gale and Shapley formulated the college admissions problem, in which applicants and institutions with quotas have preferences, and gave the deferred acceptance procedure that always produces a stable assignment, meaning no applicant and institution would both prefer each other to their assigned match [6]. Internship allocation has the same two-sided, capacity-limited structure.

2. Labour-market clearinghouses and school choice

Roth analysed the clearinghouse for medical interns and residents in the United States and linked the stability of its matches to the success of the system [7]. Abdulkadiroglu and Sonmez studied school choice as a mechanism design problem and showed that some widely used mechanisms give students an incentive to misstate their preferences, while deferred acceptance for students does not [8]. For PMIS, this suggests that a rule which rewards candidates for listing their true preferences is important when the number of preferences is capped.

3. Optimal assignment

When the aim is to maximise total fit instead of stability, the allocation can be treated as an assignment problem; Kuhn's Hungarian method solves one-to-one assignment optimally in polynomial time [10]. Stable and optimal approaches optimise different things, so an engine must state which objective it serves.

4. Reservations at scale in India

Baswana et al. designed and implemented a joint seat allocation process for over 500 programmes across 80 technical institutions in India, including the IITs, based on deferred acceptance [9]. Complex affirmative-action seat reservations required algorithmic innovations: a heuristic for common quotas spanning several programmes, a method to use unfilled reserved seats, and an approach to reduce variability in reserved-category admissions while retaining fairness [9]. The process went live in

2015, and a 70% reduction in vacancies at the IITs was reported [9]. This is the closest Indian precedent for PMIS, because both involve priority groups and the problem of offers that are not taken up.

V. RECOMMENDATION METHODS FOR MATCHING

1. E-recruitment recommender systems

A systematic review of recommender systems for e-recruitment, covering 2012 to 2020, collected 896 papers and included 63; it classified them as content-based (26.98%), collaborative filtering (6.35%), knowledge-based (12.7%), hybrid (20.63%) and other types (33.33%), and found a trend towards hybrid and non-traditional techniques [11]. Assessment was mostly by machine learning metrics (41.67%), followed by challenge-specific metrics (22.92%), expert validation (20.83%) and utility measures (14.58%) [11].

2. Challenges in e-recruitment recommendation

A challenge-based survey examined 123 papers and notes that recommendations depend on the suitability of job seekers for positions and on the preferences of both job seekers and recruiters, and that such systems can strongly affect careers [12]. It distinguishes job recommendation, job-seeker recommendation and reciprocal recommendation [12]. PMIS needs the reciprocal form, since candidate preferences and company requirements both matter, and a wrong recommendation affects a young person's first work experience.

VI. FINDINGS, CHALLENGES AND DESIGN IMPLICATIONS

Four implications follow from the sources, each marked as inference where the sources do not state it. First, the large gap between offers and acceptances [4] suggests that allocation should account for the likelihood that an offer is accepted, not only for fit; the Indian engineering admissions process was designed specifically to reduce vacancies from students who accept and then withdraw [9]. Second, the scheme's priority rules [1] require quota-aware allocation, which deferred

acceptance extensions have handled in India [9]. Third, the preference cap of five, later three, internships [1], [3] limits the information given to any allocation method, which makes strategy-proofness and the quality of fit estimates more important [8]. Fourth, because companies choose among the shortlisted candidates [1], an engine can support but not replace company decisions, and its shortlists should be explainable. Challenges include data quality, equity across districts and qualification levels, privacy of candidate data, and the lack of public evaluation of the portal's current method.

VII. COMPARATIVE ANALYSIS

Table I summarises representative sources and Table II the reported pilot figures. The scheme sources [1]–[5] define the problem and its scale, the matching sources [6]–[10] supply mechanisms, and the recommender surveys [11], [12] describe prediction methods. No row evaluates an AI allocation engine for internships, which defines the main gap addressed in Sections VIII and IX.

Table 1: Comparison of Representative Sources Relevant to an AI Smart Allocation Engine for Pmis

Source	Objective	Method / type	Major reported findings	Limitations
MCA, 2024 [1]	Describe the PMIS pilot	Official overview document	12-month internships; up to five applications; portal shortlisting by preferences, company needs and priority groups; 2–3 times shortlisting	Method not specified; pilot rules
MCA, 2025 [2]	Report pilot progress	Official document	Round II: 1.18 lakh+ internships, 735 districts, 327 companies; mobile app; up to three applications	No outcome analysis
Careers360, 2025 [4]	Report Parliament reply on offers	News report of ministry data	Round I: 82,077 offers, over 28,000 accepted, over 8,700 joined; 33% acceptance over two rounds	Second-hand; no reasons for declines
Business Today, 2026 [5]	Report revised eligibility	News report	Final-year students aged 18–25 can apply	Scheme still evolving
Gale and Shapley, 1962 [6]	Stable college admissions	Mathematical analysis	Deferred acceptance always gives a stable matching	Idealised; no reservations
Roth, 1984 [7]	Study medical intern market	Analysis of a clearinghouse	Stability linked to success of the clearinghouse	US medical market
Abdulkadiroglu and Sonmez, 2003 [8]	School choice design	Mechanism design	Some mechanisms reward misstating preferences; deferred acceptance for students does not	School setting
Baswana et al., 2019 [9]	Joint seat allocation in India	Deferred acceptance with reservations	Over 500 programmes, 80 institutions; live since 2015; 70% fewer IIT vacancies reported	Admissions, not internships

Source	Objective	Method / type	Major reported findings	Limitations
Kuhn, 1955 [10]	Optimal assignment	Hungarian method	Optimal one-to-one assignment in polynomial time	No preferences or quotas
Freire and de Castro, 2021 [11]	Review e-recruitment recommenders	Systematic review of 63 papers	Hybrid trend; ML metrics most used for assessment	Papers up to 2020
Mashayekhi et al., 2024 [12]	Challenges in e-recruitment	Survey of 123 papers	Distinguishes job, job-seeker and reciprocal recommendation	No PMIS evidence

Reported values are not directly comparable because purposes, settings and designs differ. Study details are as reported by the cited sources.

Table 2: Reported Pmis Pilot Figures

Measure	Round I	Round II
Opportunities	More than 1.27 lakh posted [4]	1.18 lakh+; 735 districts; 327 companies [2]
Applications	More than six lakh [3]	Not given in the sources used
Offers made	82,077, to over 60,000 candidates [4]	71,458 [4]
Offers accepted	More than 28,000 [4]	Over 22,500, as on 17 July 2025 [4]
Candidates who joined	Over 8,700 [4]	Not given in the sources used
Overall acceptance	33% across the first two rounds combined [4]	(combined with Round I)

Figures are as reported in [2]–[4]; the outcome figures are second-hand reports of a ministry reply and were not independently verified.

VIII. PROPOSED CONCEPTUAL ENGINE ARCHITECTURE

Fig. 1 presents a proposed conceptual seven-layer allocation engine derived from the reviewed sources; it is conceptual and has not been experimentally validated. Governance comes first, encoding the scheme's eligibility rules, priority groups and privacy requirements (layer 1) [1]. Verified candidate profiles and company postings with location, sector, role and qualification are taken in (layer 2) [1]. A modelling layer estimates fit and, as a design proposal, the likelihood that an offer is accepted, using hybrid

recommendation methods (layer 3) [11], [12]. A constrained matching layer assigns candidates to slots with capacities and quotas, using deferred acceptance or an assignment method, with the Indian reservation precedent in mind (layer 4) [6], [9], [10].

Shortlists are explained and audited for fairness across priority groups and districts (layer 5) [1]. Companies make the final choice, offers are managed and unfilled slots are refilled from a waitlist (layer 6) [1], [9]. Acceptance, joining and dropout are monitored, and the engine is updated only after independent review (layer 7), keeping people in control of the final decision.

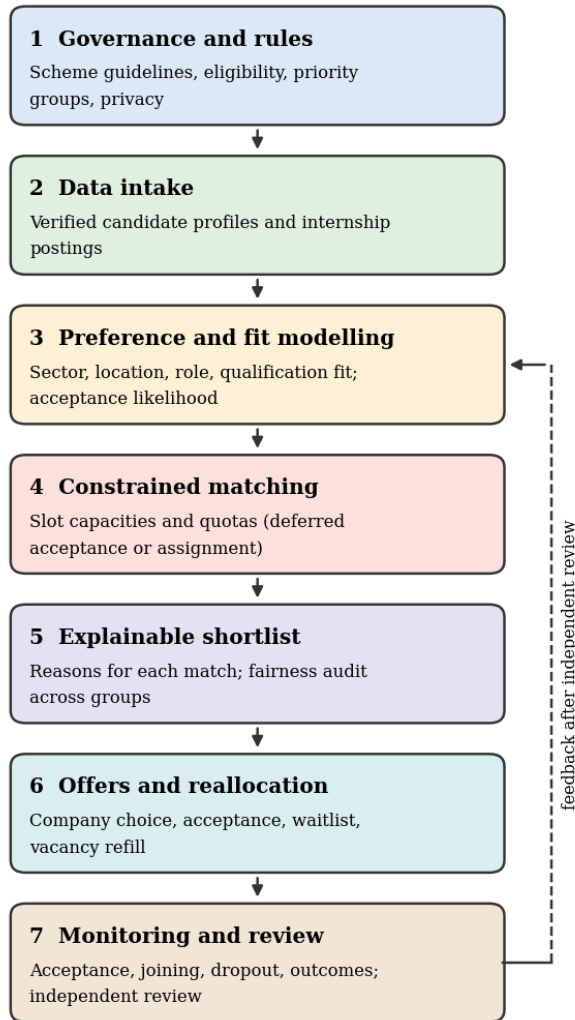


Fig. 1. Proposed conceptual architecture for an AI smart allocation engine for PMIS (conceptual, not experimentally validated).

IX. RESEARCH GAPS AND FUTURE DIRECTIONS

Gaps supported by the reviewed evidence. (i) The portal's shortlisting method is not specified publicly beyond a general description [1]. (ii) Evidence on outcomes consists of counts of offers, acceptances and joiners; reasons for declining or leaving are not evidenced [4]. (iii) The matching and recommender sources come from other settings such as admissions, medical markets and job platforms, with India's engineering admissions the closest precedent [6]–[9]. (iv) E-recruitment recommenders are mostly assessed with machine learning metrics, which say

little about real outcomes [11]. (v) How priority for several groups should combine with preferences and company choice is stated as a principle but not specified [1]. (vi) The scheme is changing, with revised eligibility reported in 2026 [5]. (vii) Limited coverage: outcome figures are second-hand and no academic evaluation of PMIS allocation was found.

Directions requiring investigation. Priorities include simulation studies with synthetic or anonymised data comparing deferred acceptance, assignment methods and the current shortlisting approach; models of offer acceptance and joining that use location, sector and role fit; fairness audits across priority groups, districts and qualification levels; explainable shortlists for candidates and companies; strategy-proof handling of limited preference lists; privacy-preserving use of candidate data; and evaluation with ministry data through proper approval. Findings should be compared with outcomes such as completion and later employment, not only with matching scores.

X. CONCLUSION

PMIS poses a large two-sided allocation problem with capacities, preferences and priority groups, and the reported pilot figures show a wide gap between offers and acceptances. Matching theory provides stable and optimal allocation mechanisms, Indian engineering admissions show that reservation-aware deferred acceptance can work at scale, and e-recruitment recommender research offers methods for estimating fit. However, the portal's method is not public, reasons for declined offers are not documented, and no source evaluates an AI allocation engine for internships. A layered engine combining governance, preference and acceptance modelling, constrained matching, explainable shortlists and independent review, as outlined here, is a reasonable design direction but requires empirical validation.

REFERENCES

1. Ministry of Corporate Affairs, Government of India, "Prime Minister's Internship Scheme: Overview," Press Information Bureau, Oct. 12,

2024. [Online]. Available: <https://static.pib.gov.in/WriteReadData/specific docs/documents/2024/oct/doc20241012415201.pdf>
2. Ministry of Corporate Affairs, Government of India, "Prime Minister's Internship Scheme – Empowering youth, enabling careers," Press Information Bureau, Mar. 21, 2025. [Online]. Available: <https://static.pib.gov.in/WriteReadData/specific docs/documents/2025/mar/doc2025321524001.pdf>
3. All India Radio News, "PM Internship Scheme opens Round 2: 1 lakh paid internships in top companies," Feb. 20, 2025. [Online]. Available: <https://www.newsonair.gov.in/pm-internship-scheme-opens-round-2-1-lakh-paid-internships-in-top-companies>
4. Careers360, "33% of applicants accepted offers under PM Internship Scheme, government tells Lok Sabha," 2025. [Online]. Available: <https://news.careers360.com/33-percent-of-candidates-accepted-offers-under-pm-internship-scheme-over-8700-joined-government-tells-lok-sabha/amp>
5. Business Today, "Eligibility expanded in PM Internship Scheme. Read all about new criteria," Apr. 22, 2026. [Online]. Available: <https://www.businesstoday.in/amp/latest/economy/story/eligibility-expanded-in-pm-internship-scheme-read-all-about-new-criteria-526943-2026-04-22>
6. D. Gale and L. S. Shapley, "College admissions and the stability of marriage," *Amer. Math. Monthly*, vol. 69, no. 1, pp. 9–15, 1962.
7. A. E. Roth, "The evolution of the labor market for medical interns and residents: A case study in game theory," *J. Political Econ.*, vol. 92, no. 6, pp. 991–1016, 1984.
8. A. Abdulkadiroglu and T. Sonmez, "School choice: A mechanism design approach," *Amer. Econ. Rev.*, vol. 93, no. 3, pp. 729–747, 2003.
9. S. Baswana, P. P. Chakrabarti, S. Chandran, Y. Kanoria, and U. Patange, "Centralized admissions for engineering colleges in India," *INFORMS J. Appl. Anal.*, vol. 49, 2019.
10. H. W. Kuhn, "The Hungarian method for the assignment problem," *Naval Res. Logistics Quart.*, vol. 2, nos. 1–2, pp. 83–97, 1955.
11. M. N. Freire and L. N. de Castro, "e-Recruitment recommender systems: A systematic review," *Knowl. Inf. Syst.*, vol. 63, 2021.
12. Y. Mashayekhi, N. Li, B. Kang, J. Lijffijt, and T. De Bie, "A challenge-based survey of e-recruitment recommendation systems," *ACM Comput. Surv.*, 2024, doi: 10.1145/3659942.