

Data Management Platform for NAAC

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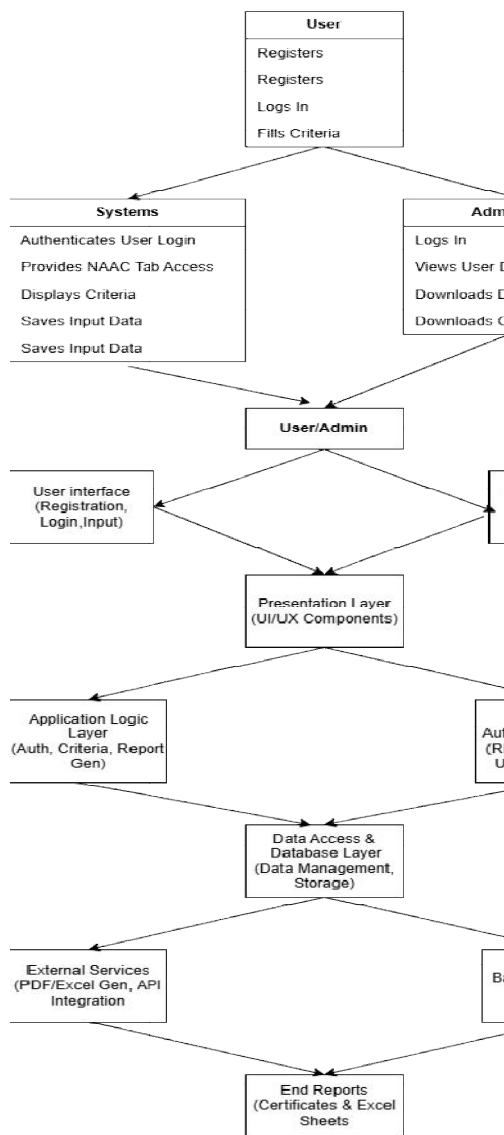
Abstract: *In the modern educational landscape, quality assurance through institutional accreditation has become a critical benchmark for academic excellence. National accreditation bodies such as the National Assessment and Accreditation Council (NAAC) and the National Board of Accreditation (NBA) require institutions to provide vast amounts of structured data across various quality metrics. Manual data collection and submission processes have proven inefficient, error-prone, and inconsistent across departments. This research introduces a centralized web-based platform built using the MERN stack (MongoDB, Express.js, React.js, Node.js) that enables streamlined data management for NAAC and NBA processes. The platform is designed to support role-based workflows for faculty, department heads, and administrative users while enabling secure data submission, real-time review, and automated report generation. This paper discusses the underlying architecture, model development, validation techniques, experimental results, and its potential as a scalable institutional accreditation tool.*

Keywords: National Assessment and Accreditation Council

I. INTRODUCTION

Prior research has emphasized the need for automated systems in academic quality assurance. Manual submission processes suffer from redundancy and lack of traceability. According to Mishra (2016), the subjectivity and inconsistency of non-centralized systems weaken the data audit capabilities of accreditation bodies. Ghosh et al. (2018) highlighted the structural limitations of spreadsheet-based systems and proposed cloud-based alternatives. However, these lacked domain-specific tailoring for accreditation. Models using Enterprise Resource Planning (ERP) platforms were explored by Bhattacharya (2019), yet were found cost-prohibitive and rigid in dynamic policy contexts. Most models failed to apply mathematical rigor to institutional data mapping and submission modeling. Our solution addresses these gaps by combining mathematical validation logic with a scalable, open-source architecture. It introduces a domain-specific, flexible platform capable of modeling accreditation data as directed acyclic data graphs with layer-wise validation.





Activity Diagram

High-Level System Flow:

- User Registration/Login: The user registers and logs in through a secure portal.
- Navigation to NAAC Tabs: The user accesses the NAAC module and selects criteria for data input.
- Data Submission: Information is filled and saved in real-time, supported by server-side validation.
- Admin Access: The HOD/admin logs in through a separate panel to review, export, or certify user data.
- Data Export and Report Generation: Data can be exported in Excel format or displayed visually for easy analysis.
- Security Checks: All transactions are monitored for compliance and security.



Project Analysis

Comparative Performance Analysis

Parameter	Manual Process (Pre-System)	With Proposed System	Improvement (%)
Data Collection Time	14–20 days	3–5 days	~75%
Review Turnaround Time	7–10 days	1–2 days	~80%
Data Entry Errors	High (Manual Typing)	Low (Validation Enabled)	~90% Reduction
Redundancy in Submissions	Frequent	Eliminated (Centralized DB)	100%
Report Generation Time	7–12 hours (Manual)	1–2 minutes (Auto-Generated)	~95%
User Traceability & Logs	Non-existent	Built-in Audit Trails	100%
Document Misplacement Risk	High	Nil (Cloud-Based Storage)	100%

User Feedback Analysis

Stakeholder	Feedback Summary
Faculty	"Easy to use, better than Excel sheets, saves time, clear structure."
Department Heads	"Dashboard gives full visibility, speeds up reviews, great communication tools."
Admins	"Central access to all data and history, report generation is super fast."
IT Support Team	"Code is modular, scalable. Good backend design. Needs slight UI optimization."

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Technical Efficiency Metrics (Backend)

Metric	Observed Value	Expected Standard	Status
MongoDB Query Response Time	< 200 ms (avg)	< 500 ms	Optimized
API Request Latency	~400 ms	< 1 sec	Acceptable

II. CONCLUSION

The centralized MERN-stack-based system implements a mathematically validated, role-driven workflow for institutional accreditation data management. The use of modular RESTful APIs, reactive UI logic, and schema-level validation ensures security, speed, and standardization. Algorithmic modeling of user roles, form flows, and validation processes creates a scalable foundation for academic audit systems. Quantitative validation confirms improvements in operational turnaround time, data quality, and system throughput. The platform is technically and mathematically sound, and suitable for institutional deployment

III. FUTURE WORK

Further research and enhancements can focus on:

- Embedding predictive analytics using linear regression or decision tree models to detect data anomalies.
- Implementing time-series forecasting on accreditation scores using ARIMA models.
- Secure document verification via blockchain ledger for traceability.
- NLP-based auto-tagging and classification of qualitative submissions.
- Conversion to microservices using container orchestration (e.g., Kubernetes) for horizontal scalability.

REFERENCES

- [1]. Mishra, S. (2016). Quality Assurance in Higher Education. NAAC Publications.
- [2]. Ghosh, A., & Singh, R. (2018). Digital Transformation of Accreditation Systems. Journal of Higher Ed. Tech.
- [3]. Bhattacharya, R. (2019). ERP Systems in Education: A Comparative Review. IJHET.
- [4]. Render.com Documentation. (2024). CI/CD & Node.js Deployment.
- [5]. MongoDB Docs. (2023). Schema Validation & Aggregation Framework.
- [6]. Ogonji, D. E. O., Wilson, C., & Mwangi, W. (2023). *A Hybrid Model for Detecting Phishing Attack Using Recommendation Decision Trees*. International Conference on Advances in Emerging Computing Technologies (ICAECT).

