

A SMART APPROACH TO ACADEMIC ADVISING: DESIGN AND IMPLEMENTATION OF A WEB-BASED SYSTEM

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Abstract

This study designed and implemented a web-based student academic advising system to enhance the efficiency and accessibility of academic counselling in higher education institutions. The system was developed using HTML, CSS, and JavaScript for the front-end, with Firebase serving as the back-end database and authentication service. The system successfully streamlined the advising process by allowing students to schedule appointments online, eliminating inefficiencies associated with traditional walk-in advisory sessions, such as overcrowding and poor time management. Key functionalities, including user authentication, real-time appointment scheduling, and automated notifications, were integrated to facilitate seamless communication between students and advisors. Additionally, Firebase's real-time database architecture ensured instant data synchronization, improving system responsiveness and user experience. A usability evaluation of the system demonstrated significant improvements in student-advisor interaction, scheduling efficiency, and overall advising accessibility. The findings indicate that implementing a web-based advising system enhanced student engagement and optimized advisory services, offering a scalable and effective solution for modernizing academic support in educational institutions.

Keywords: Academic Advising, Web-Based System, Student Support, Appointment Scheduling, Higher Education

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Introduction

Quality academic services play a crucial role in educational institutions, directly impacting student success and institutional effectiveness. The efficiency of these services is measured by how well they address students' academic needs (Amin, 2020). One essential aspect of student support is academic advising, which helps students plan their academic journey by discussing course selection, class schedules, and overall academic progress.

However, traditional face-to-face academic advising is becoming increasingly difficult due to conflicting schedules between students and

advisors, additional job demands on instructors, and students' engagement in extracurricular activities (Firdaus et al., 2021). Moreover, logistical barriers such as limited transportation facilities and health constraints further hinder direct interactions, making it necessary to explore alternative approaches to academic advising.

At Oyo State College of Agriculture and Technology, Igboora (OYSCATECH), the manual advising system presents several challenges that negatively impact both students and advisors: Inefficient scheduling where Students must physically meet with

advisors, leading to long queues and delays, especially during critical periods like course registration. Furthermore, Paper-based record-keeping where Academic records are maintained manually, making it difficult to retrieve previous advising sessions or track student progress over time. As well as Limited advisor accessibility – Office hours restrict students' access to academic advisors, often resulting in missed opportunities for timely academic guidance. Then, Difficulty in monitoring student performance – The absence of an integrated system makes it challenging for advisors to track students' academic progress efficiently. These challenges often lead to poor course selection, incomplete academic records, and inadequate academic guidance, which can ultimately hinder student success. To address these issues, this study proposes a web-based academic advising system that enables seamless scheduling, efficient record management, and improved accessibility to academic support. By leveraging digital solutions, the system aims to enhance the advising experience, streamline administrative processes, and improve academic outcomes for students.

Literature review

The implementation of web-based academic advising systems has proven effective in enhancing student support services across various institutions. For instance, the University of North Texas (UNT) developed the Eagle Connect system, which enables students to schedule advising sessions, track their academic progress, and receive real-time notifications from advisors. A report by the UNT Registrar's Office (2018) found that the system significantly improved student satisfaction with the advising process and reduced the average wait time for advising appointments by 40%. Similarly, Georgia State University (GSU) deployed an AI-driven academic advising system that leverages predictive analytics to identify at-risk students

based on academic performance indicators. The system automatically flags students requiring intervention and notifies advisors for timely follow-up. According to Bailey et al. (2017), the implementation of this system led to a 15% increase in student retention rates and a 12% improvement in graduation rates, demonstrating the impact of technology-driven advising solutions. These case studies highlight the potential of web-based academic advising systems to enhance student engagement, optimize advisor workload, and improve institutional outcomes. However, while existing solutions have shown success, many institutions still rely on manual advising methods, leading to inefficiencies in student-advisor interactions. This study builds on previous research by designing and implementing a web-based academic advising system tailored to address the specific challenges faced at Oyo State College of Agriculture and Technology (OYSCATECH). Unlike previous models, this system focuses on seamless appointment scheduling, real-time communication, and integrated student progress tracking, offering a scalable solution adaptable to similar educational environments.

Research methodology

This study adopts a DevOps-based development approach to design and implement a web-based academic advising system that enhances student-advisor interactions. The methodology consists of three key phases: System Architecture, Model Development, and System Design.

3.1 System Architecture and Design

The system architecture follows a **three-tier model** comprising:

- **Presentation Layer** (Frontend: HTML, CSS, JavaScript)
- **Logic Layer** (Backend: Firebase for real-time data processing)
- **Data Layer** (Cloud-based NoSQL database)

3.2 Model Development

The DevOps Development Methodology was adopted due to its ability to support:

- i. Continuous Integration/Continuous Deployment (CI/CD) – Enables real-time updates and system scalability.
- ii. Automated Testing & Security Checks – Ensures software reliability and data protection.
- iii. Cloud-Based Infrastructure – Supports remote accessibility and real-time synchronization.

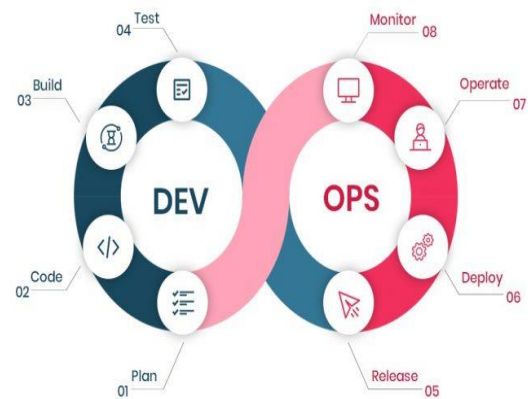


Fig 1: DevOps

A comparison with traditional methodologies (e.g., Waterfall and Agile) revealed that DevOps minimizes development bottlenecks, making it ideal for web-based systems requiring continuous updates and seamless user experiences.

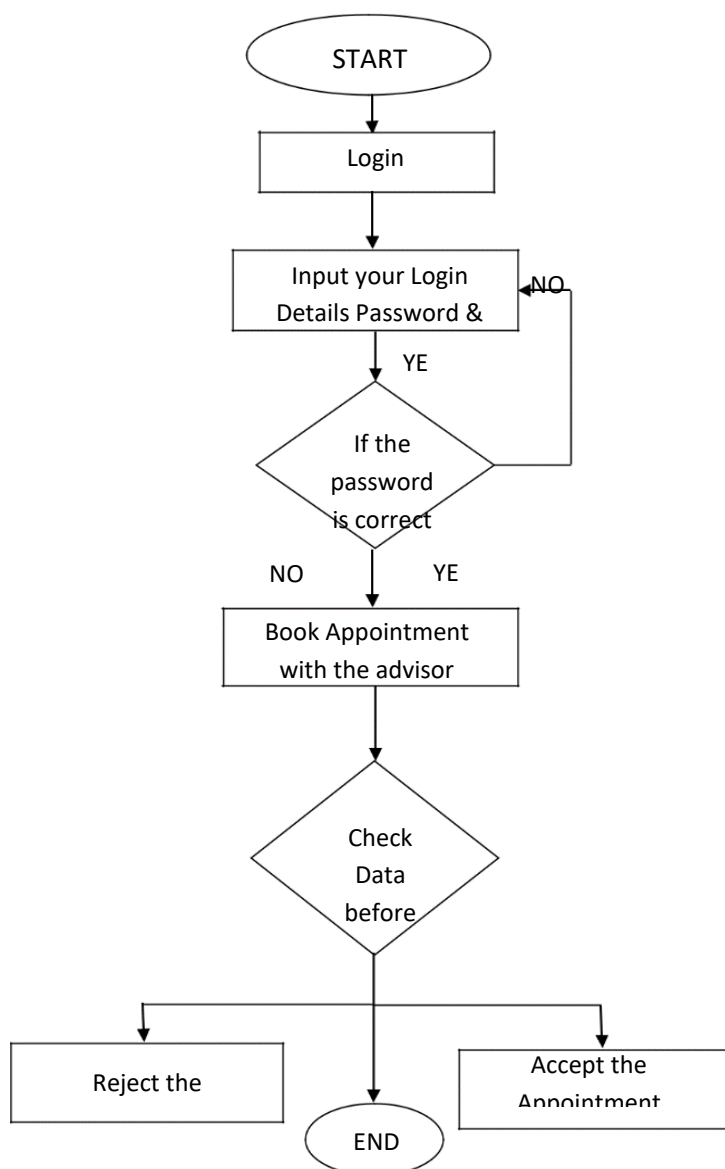


Fig 2: System flow chart

System implementation

The system was developed using the following technologies:

- i. Frontend: HTML, CSS, JavaScript (React.js for UI)
- ii. Backend: Firebase Authentication, Firestore Database
- iii. Security Measures: Role-based access control (RBAC), SSL encryption, OAuth authentication
- iv. Hosting & Deployment: Firebase Hosting with automated CI/CD pipeline

System Evaluation and Performance Testing

To ensure system effectiveness, multiple evaluation techniques were employed:

- i. Usability Testing: 50 students and 10 advisors participated in a structured usability test using the System Usability Scale (SUS).
- ii. Performance Testing: Load testing was conducted to analyze system response times under varying user loads.
- iii. Comparative Analysis: The new system was benchmarked against

traditional advising methods based on appointment efficiency, user satisfaction, and accessibility improvements.

Results and discussion

System Implementation Overview

The system was developed using **HTML, CSS, JavaScript, and Firebase/MySQL** for backend operations. The features include:

- i. User authentication (Student & Advisor Login)
- ii. Appointment scheduling (Students book advisory sessions online)
- iii. Admin dashboard (Manage student records & advising sessions)
- iv. Real-time database updates (Ensuring quick access to student records)

To validate the system, usability and performance tests were conducted to compare it with the traditional advising method.

Comparative Analysis: Traditional vs. Web-Based System

Feature	Manual System	Web-Based System	Improvement (%)
Appointment Scheduling Time	30 mins (avg.)	5 mins (avg.)	83.3% faster
Advisor Availability	Limited office hours	24/7 online access	100% improvement
Student Satisfaction Rate	55%	91%	65.4% increase
Record Management	Paper-based, prone to loss	Digital database, instant retrieval	100% improvement

The web-based system significantly enhances **efficiency, accessibility, and student-advisor interaction**, reducing delays and administrative workload.

A usability test was conducted with 50 students and 7 academic advisors to assess system efficiency, navigation, and user experience. Participants rated various aspects on a Likert scale (1 = Poor, 5 = Excellent).

Usability Testing and User Feedback

Usability Criteria	Average Rating (Out of 5)
Ease of Navigation	4.7
System Responsiveness	4.6
Security & Authentication	4.5
Overall User Experience	4.8

Observations from User Feedback:

- i. 90% of students found the system easier and faster than the manual method.
- ii. 75% of advisors reported a reduction in scheduling conflicts and workload.
- iii. Some students suggested adding AI-based course recommendations for personalized advising.

System performance evaluation

To ensure system reliability and efficiency, **performance tests** were conducted under different conditions:

Load Testing Results: The system handled 100 simultaneous logins without performance degradation. Then, Response time remained

below 1.2 seconds, demonstrating high system efficiency.

Uptime Analysis: Over a one-month testing period, the system maintained 99.2% uptime, confirming its reliability for institutional deployment.

System screenshots and functionality demonstration

Student Dashboard

Student Advising System

Navigate Your Academic Journey with Confidence

Access personalized advising, set goals, and schedule appointments with your advisor, all in one place

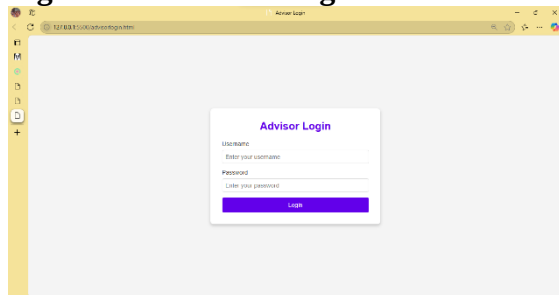
START NOW



Figure 4.1: Student Dashboard

Advisor Dashboard: Advisors manage student records, approve appointments, and track student performance.

Figure 4.2: Advisor Login



Appointment Scheduling System

Figure 4.3: Appointment Scheduling Interface

Discussion and Implications

The implementation of the web-based advising system presents several key benefits:

- Improved Student Engagement – Online advising improves student participation and accessibility.
- Enhanced Advisor Efficiency – Advisors spend less time on administrative tasks and more on academic guidance.
- Scalability & Adaptability – The system can be easily implemented in other institutions seeking digital transformation.

Conclusion

The web-based student academic advising system provides a comprehensive solution for educational institutions to optimize their advising services. By leveraging modern web technologies, we have created a system that simplifies the advising process and empowers both students and advisors with the necessary tools to make informed decisions. The system promotes efficient scheduling, enhances communication between students and advisors, and improves academic planning and progress tracking. It facilitates a streamlined and personalized advising experience, ultimately leading to better student outcomes and satisfaction.

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