A Web-Based Unified School Management System for Academic and Administrative Operations with Role-Based Access

Final Year Design Project Proposal

by

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Abstract of Proposal

This project proposes a full-stack, **web-based School Management System (SMS)** developed to support the administrative and academic operations of Pakistani schools. The system provides separate role-based modules for **Admins, Teachers, Students, and Parents**, offering a unified platform to manage attendance, academic records, marks entry, fee tracking, communication, and overall school operations. By integrating both administrative and academic workflows, the SMS aims to improve transparency, streamline processes, and enhance collaboration among stakeholders. Additional functionalities include **student portfolio management, parent–teacher communication, centralized notifications, behaviour and complaint tracking, and risk monitoring**, contributing to a comprehensive and efficient school management environment. The system will be implemented using **ASP.NET Core Web API, EF Core, and SQL Server** on the backend, with a responsive frontend developed in React. Its architecture emphasizes secure, role-based access, maintainability, and scalability, making it suitable for deployment in typical school settings while ensuring effective management and engagement across all user roles.

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1. Introduction

1.1 Background

Schools in Pakistan frequently rely on fragmented administrative channels such as paper records, spreadsheets, and informal messaging platforms (e.g., WhatsApp) to manage attendance, grades, student achievements, and parent communication. This disjointed approach often results in inconsistent record-keeping, delayed information flow, privacy concerns, and limited transparency in student progress tracking. Teachers and administrators face challenges in maintaining accurate records and ensuring effective communication, while parents lack a centralized view of their child's academic and behavioral history. A web-based School Management System (SMS) addresses these challenges by providing a centralized, role-based platform for students, parents, teachers, and administrators. The system enables streamlined management of **academic records, behavior tracking, communication, and notifications, reducing errors and administrative overhead while enhancing transparency, coordination, and accountability.** By consolidating essential school operations into a maintainable and practical digital solution, the SMS offers immediate institutional value and supports informed decision-making across all stakeholders.

1.2 Problem Statement

Schools in Pakistan still rely on paper-based records, informal communication channels, and disconnected processes for managing academic and administrative tasks. As a result, attendance, results, fee tracking, and communication often become inaccurate, delayed, or difficult to monitor. Most schools also lack:

1. A **centralized student portfolio** containing grades, attendance, achievements, and certificates.
2. A secure, auditable **parent–teacher communication** platform instead of WhatsApp groups.
3. A unified **digital noticeboard** for official announcements.
4. A structured **complaint/behavior management** workflow with proper tracking.

A centralized, secure, and scalable School Management System is needed to streamline school operations, enhance communication, ensure accurate record-keeping, and improve transparency and efficiency for students, teachers, parents, and administrators.

1.3 Stakeholders & Interests

Stakeholder Type	Interest in the Solution	Potential Market S ize
Students	Access their attendance, results, fee status, digital portfolio, and complaint status through a secure dashboard; submit complaints; ensure privacy of academic and behavioral records.	25–30 million school students in Pakistan
Teachers / Tutors	Mark student attendance, enter exam marks, upload achievements/certificates for portfolios, post announcements/homework, provide remarks, and respond to parent messages and student complaints..	1.5–2 million school teachers nationwide
Parents	View their child's attendance, results, portfolio, and fee status; communicate privately with teachers; receive official school notices and updates.	Approx. 40–50 million parents/guardians
School Management / Administration / PTA	Oversee overall school performance by managing classes, subjects, students, teachers, teacher–subject mappings, fees, and exam records; monitor reports, notices, complaint summaries, and student portfolios; post school-wide announcements; maintain system data; and ensure transparency while improving academic and administrative oversight.	Approx. 300,000 administrative staff

1.4 Objectives

Following is a list of the main objectives of the system to be designed:

- Build a **secure, role-based School Management System** for Students, Parents, Teachers, and Admin with proper authentication and data privacy.
- Develop a **Student Portfolio Generator** compiling academic performance, attendance, achievements, and activities.

- Create a **Parent–Teacher Communication Hub** for private messaging, announcements, and dashboard notifications.
- Implement a **Digital Noticeboard** for school-wide announcements with optional email/SMS alerts.
- Design a **Behaviour / Complaint Management module** for submitting, tracking, and resolving student complaints.
- Analyze and address **risks related to students' attendance and academic performance.**
- Deploy a **functional prototype with sample data, testing, and documentation**.

1.5 Scope

- **Inclusions:** The School Management System provides role-based dashboards for Students, Parents, Teachers, and Admin, focusing on practical and essential school operations. It features a Student Portfolio Generator that aggregates grades, attendance, achievements, and activities, a Parent–Teacher Communication Hub for announcements and private messaging, and a Digital Noticeboard for school-wide notifications such as exams, holidays, PTA meetings, and fee reminders. The Behaviour and Complaint Management module allows students to submit concerns, teachers to add remarks, and admins to resolve and track cases. Teachers handle attendance and marks entry, while students and parents can access academic progress and fee status, ensuring transparency, effective communication, and streamlined school management.
- **Exclusions/Limitations:** The system does not include automated timetable generation or schedule optimization algorithms, nor AI-based predictions, analytics, or machine learning modules. Advanced fee accounting or comprehensive financial management features are excluded, with only fee status updates and reminders provided. Large-scale third-party integrations, such as ERP systems or full SMS gateways, are not implemented, although optional email or SMS notifications may be supported if feasible. Additionally, the system will not have dedicated native mobile applications, relying instead on a fully responsive web interface accessible via browsers on desktops and mobile devices.

2. Literature Review

2.1 Related Work:

- **Lack of Integrated School Management Platforms:** Existing studies show that many schools in Pakistan use partial or fragmented digital systems that focus mainly on administrative efficiency, while academic workflows such as student portfolios, behavior tracking, and performance monitoring remain poorly integrated (Ahmed et al., 2022; Urooj et al., 2025).
- **Limited Secure Parent–Teacher Communication:** Research highlights the growing use of digital platforms for parent–teacher communication; however, most solutions rely on informal tools that lack secure, role-based access, auditability, and school-level control (Muslim et al., 2025).
- **Absence of Unified Digital Noticeboards:** Prior work identifies that announcements and notifications are often shared through multiple disconnected channels, resulting in inconsistent communication, missed updates, and lack of centralized record-keeping (Khan et al., 2024).
- **Weak Behavior and Complaint Management Mechanisms:** Literature indicates that while digital record-keeping has improved, structured workflows for managing student behavior and complaints—with tracking, remarks, and resolution history—are still missing in most school systems (Ahmed et al., 2023).
- **Insufficient Academic Transparency for Stakeholders:** Studies consistently report that parents and students lack real-time access to consolidated academic data, including attendance, marks, achievements, and performance trends, limiting effective academic monitoring and decision-making (Ahmed et al., 2022; Urooj et al., 2025).

Existing research in Pakistan emphasizes the importance of web-based school management systems, centralized data handling, secure role-based access, and digital communication tools to improve transparency and administrative efficiency (Ahmed et al., 2022; Muslim et al., 2025). However, most solutions address these components in isolation rather than as a unified, role-based platform that integrates academic records, communication, notifications, portfolios, and behavior management into a single system.

2.2 Gap Analysis

This project addresses several gaps identified in existing school systems and literature:

Competitive Gap (Core Features): Current school management systems do not offer integrated modules such as portfolio generation, structured complaint workflows, centralized noticeboards, and secure parent–teacher messaging—all of which are essential for modern school operations.

Usability Gap: Most existing systems prioritize administrative features but lack user-friendly dashboards for parents and students. There is limited research on intuitive, easy-to-use school portals designed for non-technical users.

Communication Gap: No widely-used system provides a secure, auditable, school-controlled communication hub to replace informal WhatsApp groups, leaving privacy concerns unaddressed.

Implementation Gap (Record-Keeping & Transparency): Schools lack proper digital history of announcements, complaints, behavior remarks, and achievements. This system fills that gap through structured modules with complete audit trails.

Data Integration Gap: Student data is often scattered across registers, files, and separate apps. This project provides a unified platform integrating attendance, marks, fees, complaints, portfolios, and communication.

3. FYDP Overview

FYDP Title: A Web-Based Unified School Management System for Academic and Administrative Operations with Role-Based Access

Sr. No	Roll Numbers	Name	Signatures
1.	BCS22007	Saiha Atiq	
2.	BCS22015	Malaika Ashraf	
3.	BCS22043	Khadija Mustafa	
4.	BCS22047	Zainab Khawaja	

Table 1 Project Proposal Summary

FYDP Goals

1. Develop a centralized platform to manage school activities like classes, subjects, fees, attendance, and exam marks efficiently.
2. Provide students, teachers, and parents with real-time access to attendance, marks, and risk analysis for better academic monitoring.
3. Implement a communication hub and digital noticeboard to centralize announcements, messages, and feedback between teachers and parents.
4. Create automated student portfolios and a complaint/behavior management system to track achievements and support student development.Build a modular web system connecting students, teachers, and HODs.

FYDP Objectives

1. Digitize and streamline school administrative tasks for accuracy and efficiency.
2. Enable real-time tracking of student performance, attendance, and risk factors.
3. Facilitate effective communication between teachers, students, and parents.
4. Generate digital student portfolios and manage complaints/behavior systematically.

FYDP Success Criteria

5. All school data (students, teachers, classes, subjects, fees, attendance, marks) can be managed digitally without errors.
6. Students, teachers, and parents can access real-time information on performance, attendance, and notifications.
7. Communication between teachers, students, and parents is centralized, timely, and reliable.
8. Student portfolios are automatically generated, and complaints/behavior records are tracked and resolved efficiently.

Assumptions:

1. **Data Access:** Sample school data, including student attendance, marks, and basic records, will be available or generated for testing and demonstration purposes.
2. **Pilot Access:** A single school or class can be used to conduct a pilot study and gather feedback on usability and functionality.
3. **User Engagement:** Teachers, students, and parents will actively participate in testing, providing feedback to refine the system.

Risks & Obstacles

1. **Limited Technical Expertise:** Some users may have minimal experience with web-based systems, potentially affecting adoption.
2. **Data Privacy & Trust:** Parents and school staff may have concerns regarding the security and confidentiality of student data.
3. **Integration Challenges:** Incorporating the system alongside existing school records or processes may face compatibility issues.
4. **Infrastructure Limitations:** Slow internet connections or older devices in some schools could hinder system performance and responsiveness

Organization Address: University of the Punjab, Gujranwala Campus, Pakistan

Target End Users: **Students, Teachers, Parents, Administrators**

Suggested Project Supervisor: Sir Salman Naseer

Approved By:

Date: November 10 , 2025

4. Tools, Libraries and Technologies with Reasoning

Table 2 Tools Technologies and Libraries

	Tools	Version	Rationale
Tools, Libraries, And Technologies	Visual Studio 2022 / VS Code	Latest	**Version Control:** IDE for debuging, development, and Code Management.
	GitHub	Latest	**IDE:** Widely used integrated Development environment supporting JavaScript, Node.js, and React with extensions for debugging and productivity
	Figma	Latest	**UI/UX Design:** Used to design wireframes and user interfaces for responsive dashboards and layout planning.
	Libraries	**Version**	**Rationale**
	React.js	v18+	**Front-End Library:** Provides a component-based structure (Virtual DOM) for efficient, dynamic, and scalable UI development
	ASP.NET Core	7.0+	**Backend Framework:** Handles RESTful API creation, authentication and server side logic.
	Entity Framework (EF) Core	7.0+	ORM for database interactions and Schema management with with SQL Server
	Bootstrap / Tailwind CSS	Latest	For responsive/mobile friendly UI styling
	SignalR	Latest	For Real time notifications in Parent-Teacher communication Hub and digital noticeboard.
	Technology	**Version**	**Rationale**

	SQL Server	2019+	**Relational database** for storing student, teacher, parent, and admin records.
	.NET Runtime	7.0+	Executes ASP.NET Core applications with high performance and cross-platform support.

5. Work Division

Table 3 Project Team Members Work Division

Sr. No	Roll Number	Name	Role Assignment & Work Division
1.	BCS22007	Saiha Atiq	**Project Lead:** Designs ASP.NET Core Web APIs, creates the SQL Server database using EF Core, implements role-based authentication, and handles business logic for portfolios, notifications, and risk analysis.
2.	BCS22015	Malaika Ashraf	**Front-End Developer:** Develops React.js dashboards for all users, ensures responsiveness and interactivity, and integrates the frontend with the ASP.NET Core API.
3.	BCS22043	Khadija Mustafa	**UI/UX Designer:**Designs user-friendly interfaces, creates wireframes and prototypes, and ensures consistent, accessible UI implementation with the frontend team.
4.	BCS22049	Zainab Khawaja	**Quality Assurance / Documentation Specialist:** Gathers requirements, updates SRS/SDS, conducts system testing, maintains documentation, and ensures all requirements are met.

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