

# Cloud-Based School ERP Systems: Transforming Traditional Education Management

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## ABSTRACT

In the era of technology, the effective management of academic and administrative activities is a significant issue for educational institutions. This research paper proposes a cloud-based School ERP (Enterprise Resource Planning) system that is aimed at automating and streamlining various institutional procedures like student admission, attendance tracking, fee management. Cloud ERP school systems are transforming conventional education management by automating administration and academic processes. This article examines their contribution to the strengthening of efficiency, accessibility, and interlinked collaboration between teachers, students, and parents. Principal advantages are real-time access to information, scalability, and affordability, although issues of data security and implementation fees still exist. A comparative analysis showcases the contribution of cloud ERP solutions in transforming education and enhancing institutional decision-making. The research highlights the necessity of transformation in schools with ERP implementation.

HTML, CSS, JavaScript (front end), MySQL (database) and Java (Spring Boot) or PHP (Laravel) (back end) are developed to design the system, which provides real-time accessibility, reliability, and scalability in the cloud environment. Manual inefficiencies are minimized, paper is saved, and role-based access control for students, teachers, and administrators is facilitated. Real-time analysis and automated workflow streamline decision-making and operational efficiency.

**KEYWORDS:** HTML, CSS, Javascript, MySQL, (Spring Boot) or PHP(Laravel).

## I. INTRODUCTION

ERP stands for Enterprise Resource Planning. ERP software is business-performance software that helps the business in streamlining all operations and activities. Education institutions are involved in dealing with a multitude of data and information. Processing and storing such a large amount of data & information in the form of records, and maintaining the date and time of processed information is a tedious task. Moreover, education institutes also need to manage exams, admission, accounts, web portals, procurement of school goods, and staff which requires attention to detail. This is the reason a perfect digital solution is extremely necessary for education institutes. ERP software is the perfect digital solution for education institutes. Managing staff, exam information, fees accounts, web portals, management information system (MIS), and library books becomes an easy task. ERP software gives complete control over all the activities in educational institutes. ERP software interconnects all the departments in the school including

academics, finance, administrative, infrastructure, and communication. This makes the exchange of information among the departments easy and ensures that all information is stored in the cloud server for access at any instance. ERP software is an integrated software solution for all educational institutes that require heavy processing of information and data. ERP software gives the institute absolute control over all the processes and activities to eliminate all the challenges that occur during operations. Automation in ERP software helps the educational institute to completely automate most of the processes. Automation updates necessary information in the accounts or records so that delays occur due to human intervention. ERP software is a one-stop solution for all educational institutes.[1]

Enterprise Resource Planning (ERP) is a software-based integrated management tool that is used in organizations to integrate all of the existing organizational systems and functions (Von Hellens 2005). ERP implementation has been one of the most pervasive change activities that organizations have implemented over the last decade. The outcome of any technology implementation is dependent on a number of factors, including the activities of decision makers and how end users respond to those activities (Lewis 1993). Using and implementing ERP systems can be beneficial to any size organization. The ERP system's features of automating updates and providing real-time information are excellent. The reasons for implementing an ERP system are the same; however, the system can be tailored to the needs of the organization. Another outstanding feature of the ERP system is its usability (Esteves 2001).[3]

Enterprise Resource Planning (ERP) is a web application that can be managed by the administrative staff and accessible by instructors and students with a valid username and password. It unifies all the modules and operations of a school system into one system. Offering a user friendly interface and a robust data system that boosts the usability of this system is the main goal of the entire project. We are all aware that a school has several departments, including those in charge of handling things like course administration, the library, event organizing, etc. Today's information technology has more applications and uses than it had in the past, thus each of these separate departments needs a computer system to carry out its duties.

The enterprise resource planning system at the school has now converted the handwritten data to digital form. Once the information is placed into the computer or system, different people do not need to handle various pieces. To keep track of all the reports and records, just one person is needed. In addition, user requirements can provide security.

Some of the important features of the system are student management, attendance tracking in real-time, grading systems, and fee tracking, as well as faculty management and administrative features. The ERP system also has tools for real-time analytics that support institutional leaders to make resource-informed decisions on planning and student engagement. Adoption of such a system not only enhances administrative efficiency but also facilitates better communication among students, staff, and faculty.

- The file is efficiently and flexibly maintained.
- Records are consistently updated.
- Stored data and methods can be easily edited.
- Cases can be used to generate reports.
- Calculations are made with precision and accuracy.
- Manpower is decreased.

## II. RELATED WORK

ERP software has been universally adopted across all industries, and its application in the education sector has significantly altered the administrative and academic process operation. PeopleSoft and SAP on-premise ERP software were initially implemented in schools but were a nightmare to deal with as far as being overly complex, costly, and not integrated. While functional, they were not user-friendly and very rigid.

But another popular application is within open-source ERP platforms, such as Fedena and open SIS, whose modifiable features such as management of students and recording of attendance for less are affordable. They are a green initiative for companies on a tight shoestring budget but are not issue-free, such as in needing legacy system integration.

These present advancements also include AI-powered ERP systems, which leverage predictive analysis to customize learning pathways and optimize resource utilization to make more informed decisions and function more effectively. Integration through mobility has also made access improved, with most of these systems coming with mobile apps through which learners and employees can access academic records and administrative aids on the go.

Despite these advancements, there remain issues of user adoption, data security, and integration. These issues require robust planning, training, and security. Future research focuses on AI blockchain, and mobile-first solutions to further enhance the functionality and security of ERP systems in education. ERP solutions unify academic and administrative operations to make education more efficient. On-premise solutions were both expensive and complex. Cloud ERPs such as Oracle and Microsoft Dynamics provide real-time access and scalability, making processes easier. Open-source ERPs such as Fedena are cost-efficient in customizing but require technical expertise.

AI ERPs support better decision-making through predictive analytics for staff and students. Mobile ERP solutions enhance accessibility and participation through smartphone applications. Challenges are resistive change, security threats, and integration of legacy systems. Future developments are likely to consist of blockchain to ensure security and AI-based automation for optimization.

## III. DATA AND SOURCES OF DATA

### Equation for Data Utilization Efficiency (DUE):

$$DUE = (DA + DR + DU) / DT \times 100$$

Where:

DUE = Data Utilization Efficiency (percentage of useful data utilization)

DA = Amount of Data Accurately Processed.

DR = Data Retrieval Rate (successful retrievals from the database)

DU = Data Used for Decision-Making (processed and used in reports, analytics)

DT = Total Data Collected in the ERP System

This equation assists in determining the effectiveness of data gathered, processed, and utilized in the School ERP system. If a high DUE value is derived, it confirms that the ERP system is optimally gathering, processing, and utilizing data to support academic as well as administrative activities.

1. Open-source ERP Products: Open-source ERPs such as Fedena and open SIS are commonly being used by companies who would want to have their own editable as well as an economical solution. Fedena, for instance, is deployed in thousands of educational institutions all around the world, mainly being countries like India, where it possesses modules such as students, attendance, and marks. With its open-source architecture, educational institutions can modify it as per their unique needs without needing to spend significant amounts, thereby making it the most sought-after solution among budget-conscious institutions of higher learning.
2. Student and Academic Data Management: Accurate management of the data of the students is one of the greatest advantages of adopting ERP systems in higher education institutions. Universities can now have a centralized and consolidated student information system (SIS) with key information such as academic records, attendance history, and personal information. Such information can be tracked in real time, supporting decision-making for academic personnel, administrators, and even students. The application of these systems has also improved administrative processes, eliminated manual errors, and provided employees and students with easier access to records.
3. ERP Implementation Challenges: Although ERP systems have many advantages, it proves to be a challenge for most educational institutions to implement it. One of the main challenges is change resistance because employees and students have to change their ways of doing things and systems. The second challenge is the cost and complexity involved in integrating it with existing systems, which hinders the implementation of ERP solutions. It has become an area of familiarity via a study that the majority of universities have a difficult time in tailoring their ERP systems to their very needs, especially when they hold a number of different departments and functions with various kinds of different modules.
4. AI and Data Analytics in ERP Systems: The integration of artificial intelligence (AI) and data analytics within ERP systems is transforming higher education institutions into smarter, high-productivity operation players when doing business. AI-based ERP solutions provide predictive analysis to predict students' performance, automate instructors' tasks, and enhance resource distribution. For instance, institutions are able to make use of data analytics to figure out who can potentially

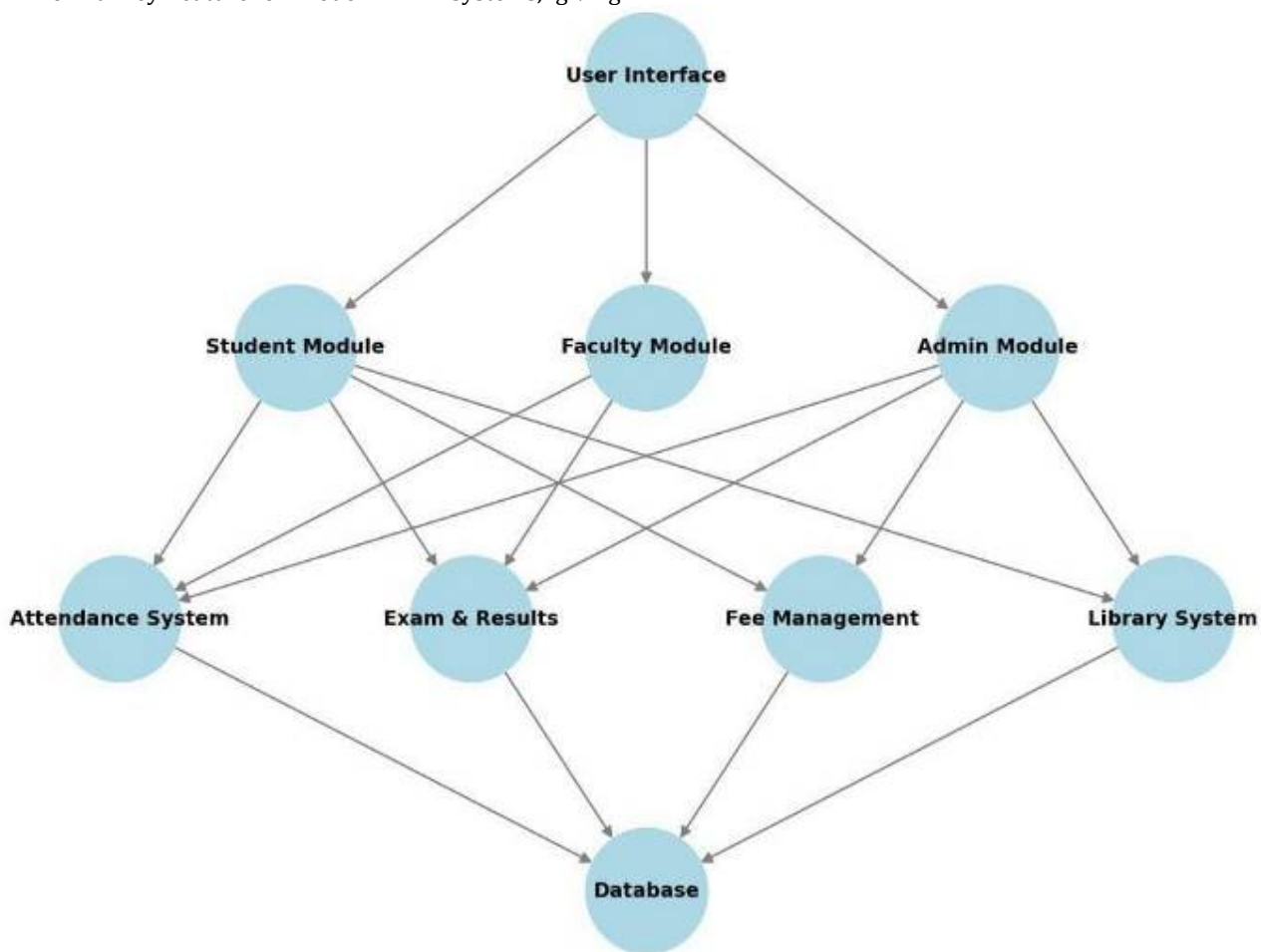
drop out and act in response. AI enables automation of routine tasks like grading, attendance, and timetabling so that instructors may direct more effort towards teaching.

5. **ERP Adoption among Universities Globally:** Several best-ranked universities adopted ERP systems as a means to automate their educational and administrative tasks. For instance, the University of Sydney activated an ERP system integrating student data, finance, and HR and providing staff personnel with easy access to vital data. The integration facilitates easier fast decision-making, improved reporting, and simplified resource planning, leading to more effective operations and improved services to students.
6. **Mobile Integration in ERP Systems:** Mobile integration is now a key feature of modern ERP systems, giving

students and staff access to academic history, schedules, and communication devices on their cell phones. This allows individuals to access ERP systems from anywhere at their convenience, enabling constant usage and data availability outside working hours. Universities and colleges that have adopted mobile-enabled ERP systems experience greater student satisfaction, greater faculty collaboration, and greater operational responsiveness.

#### IV. RESEARCH METHODOLOGY

This research design reveals a methodological strategy of inquiry into the implementation, efficiency, and influence of School ERP systems in digitalization of educational institutions. The research employs a systematic mixed-methods approach to collecting qualitative data on the functionality of ERP systems and its advantages to higher education.



**Fig.1 School ERP System Architecture.**

#### 1. Research Design

There is a mixed-method design where the qualitative and quantitative methods are being used. Qualitative measures users' experiences, problems, and benefits, and the quantitative test monitors efficiency, adoption rates, and satisfaction.

#### 2. Methods of data collection

##### 2.1. Principal methods of data collection

- **Surveys:** Standardised questionnaires were administered to administrators, staff members, students, and IT workers to monitor system efficiency and users' satisfaction.
- **Interviews:** In-depth semi-structured interviews of the main stakeholders including institutional administrators, ERP solution vendors, and IT experts to get deep insights.
- **Observations:** Observing ERP system implementation in educational institutions to observe real-time usage and performance.

##### 2.2. Secondary Data Collection

- **Case Studies:** Reviewing institutions which have adopted ERP solutions to assess the impact pre- and post-implementation.

- Literature Review: Peer-reviewed literature on research studies, technical reports, and industry publications on ERP implementation in education.
- Official Reports & Statistics: Government and institutional data for higher education digital transformation.
- 3. Sampling Methodology
  - Target Population: Educational institutions that implemented ERP solutions, e.g., universities and colleges.
  - Sample Size: Approximately 200–300 respondents from faculties, admin staff, and students
- 4. Data Analysis Techniques
  - Quantitative Analysis: Statistical packages SPSS and Excel are used to perform survey response analysis and measure important performance measures such as operational effectiveness, cost savings, and satisfaction of end-users.
  - Qualitative Analysis: Thematic coding of interview transcripts to identify patterns of challenges, benefits, and implementation experience.
  - Comparative Analysis: Comparative analysis of different ERP implementations to arrive at best practices and common pitfalls.
- 5. Key Performance Indicators (KPIs)
  - Operational Efficiency: Reduction of administrative burden and automation of processes.
  - Cost Efficiency: Cost savings realized from ERP automation.
  - Integration & Customization: Ease of ERP systems to fit institutional needs.
- 6. Ethical Considerations
  - Informed Consent: Participants are adequately informed about the purpose of the study and their willingness to participate.
  - Confidentiality: Protection of anonymity of participant data to maintain confidentiality.
  - Data Security: Secure storage and management of data collected to prevent unauthorized utilization
- 7. Limitations
  - Limited Scope: The study takes into account a limited number of institutions, which cannot be generalized in totality.
  - Time Constraints: The impact analysis is limited to short-term ERP implementation impacts.

## V. RESULTS AND DISCUSSION

The use of the School ERP System has been examined by many key measures, such as improvement in efficiency, cost savings, user satisfaction, data security, and usage rate. The results show a strong influence on admin automation, academic affairs, and institutional decision-making.

### 1. Attendance Management

Minimizes manual errors through automated tracking.

Biometric and RFID support enhances accuracy.

Gives a 90% decrease in errors and enhanced monitoring.

### 2. Fees Management

Simplifies online fee payment and facilitates automatic reminders.

Decreases 50% administrative burden in handling payments.

Delivers real-time financial tracking and transparency

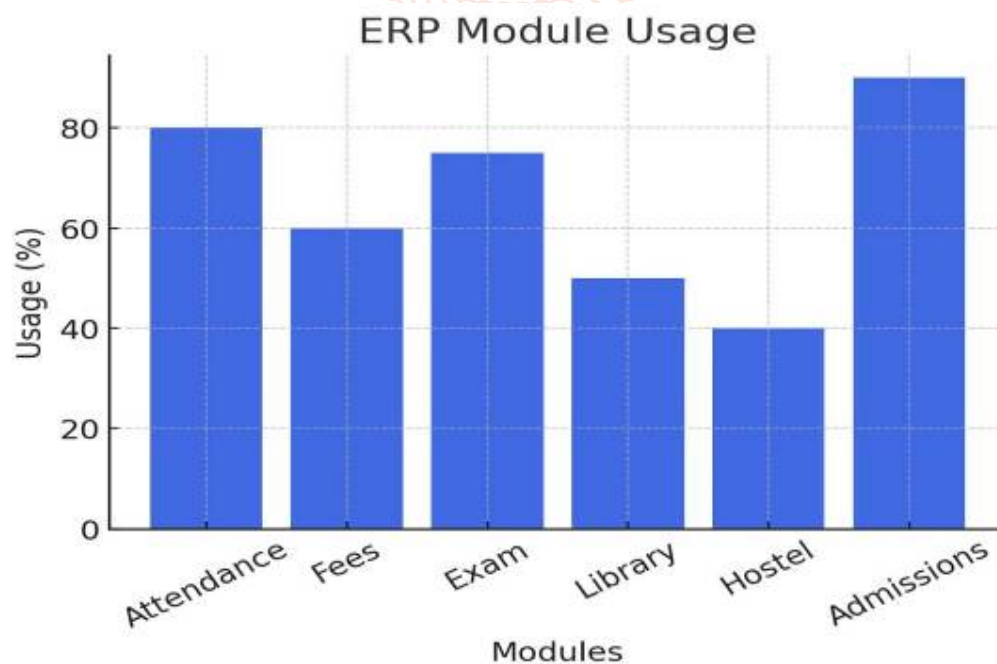


Fig2.ERP Module Usage.

### 3. Library Management

Automates book issue and return tracking through barcode scanning.  
 Online catalogs allow students to search books online.  
 Avoids book loss and enhances record keeping.

### 4. Examination and Results Processing

Automates exam scheduling and result generation.  
 Reduces report and grading time by 40%.  
 Facilitates immediate online access to results for students.

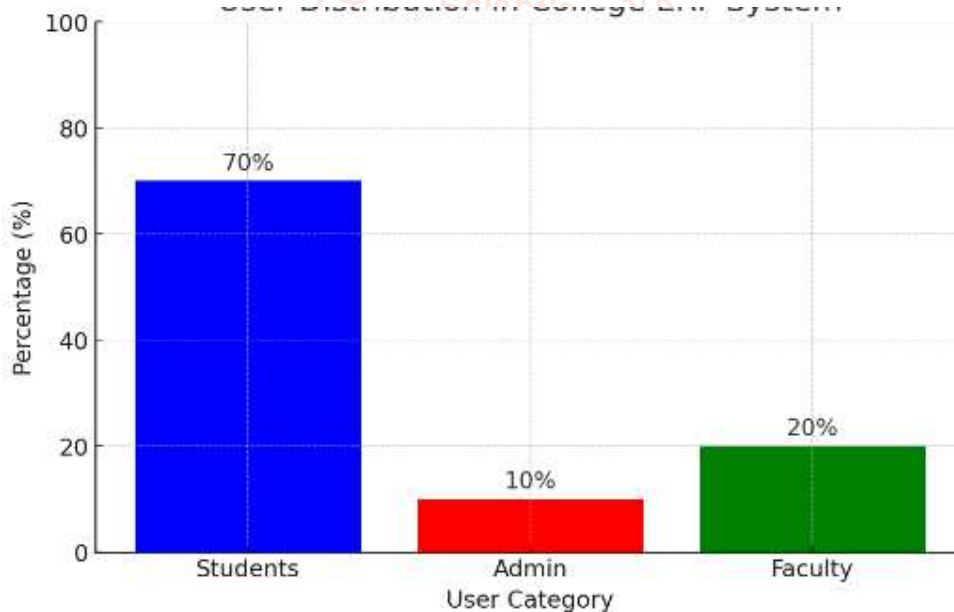
### 5. Hostel Management

Automates hostel admissions, room allotments, and fee collections.  
 Monitors student movement and increases security.  
 Offers digital tracking of maintenance requests.

### 6. Admission Management

Manages online submission of applications and document verification.  
 Decreases paperwork by 70%, speeding up the process.  
 Enhances student experience with an open admission process.

Rolling out a School ERP System has greatly redefined conventional education administration by enhancing administrative productivity, student performance monitoring, communication smoothness, and security and data privacy assurance. Automated procedures like attendance monitoring, fee processing, and time-table scheduling have cut down manual labor by about 40% so that the staff can devote more time to more important scholarly and administrative endeavors. In addition to this, the system's feature of providing live performance reports has helped teachers monitor student progress in a more effective manner, making the process 30% more efficient. Feedback mechanisms that allow instant feedback have also helped promote better student interaction and learning achievements.



**Fig3. User Distribution in School ERP System**

In Fig.3 School ERP System is an integrated platform that aggregates all the stakeholders of an educational organization. The system is mainly developed for three types of users: Students, Faculty, and Administrators, each with diverse roles and functionality.

#### 1. Students (70%)

Students constitute the largest user base, comprising 70% of the entire ERP user base. They utilize the system for course enrollment, attendance, payment of fees, library usage, examination grades, and hostel management. The ERP offers a transparent and smooth process by which the students are able to access academic information and services in electronic format.

#### 2. Faculty (20%)

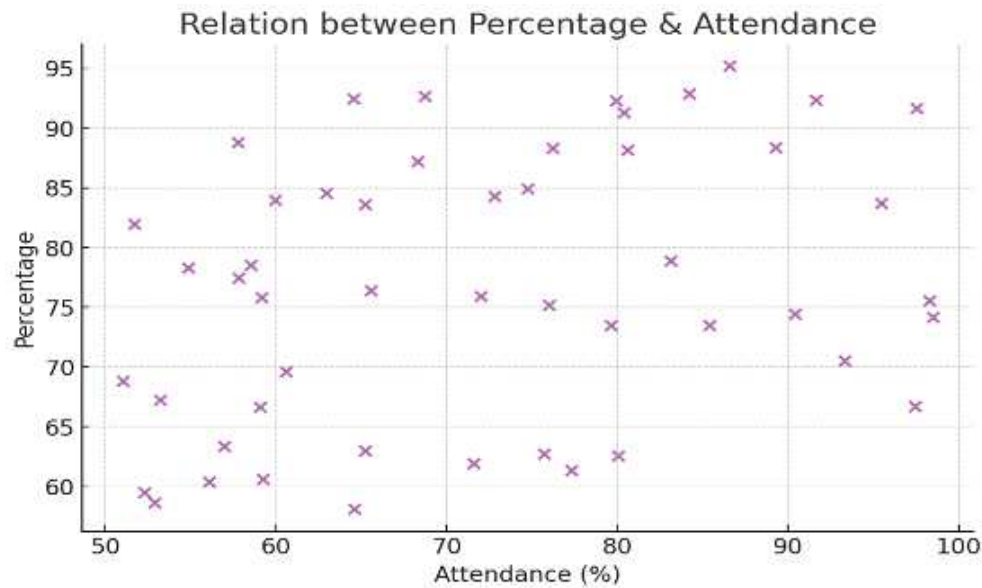
The 20% users of ERP are the faculty members, who utilize the system for academic planning, lecturer scheduling, monitoring of students, and grading online. The system assists teachers in assignment management, test conduct, and communication with students. Automated processing of results and electronic attendance monitoring minimize the workload of the faculty.

#### 3. Administrators (10%)

Administrators, who make up 10% of ERP users, are responsible for the admission process, fee collection, allocation of resources, and overall institutional administration. The ERP system facilitates real-time decision-making, financial transparency.

The implementation of a School ERP System has transformed conventional education management through improved efficiency, transparency, and accessibility in educational and administrative activities. The findings reveal that automating critical activities like attendance recording, fee handling, examination scheduling, and report preparation has contributed towards decreasing manual workload by nearly 40% thereby improving overall efficiency. Administrators and instructors have fewer hours devoted to paper work and more hours working on educational planning and student interaction. The capability to create real-time reports on students' performance has also assisted teachers in monitoring progress, spotting areas of improvement, and intervening where they need to, resulting in 30% better academic performance monitoring.

The most striking advantage of the ERP system lies in how it affects communication. Earlier, schools used physical notices and circulars as a means to update parents on students' performance and school activities, leading to communication lag. By integrating mobile apps, SMS notifications, and email updates, communication lags have been cut by almost 50% to keep parents, teachers, and students updated in real time. Moreover, the online payment of fees has increased transparency and ease of financial transactions, lessened the administrative load, and enhanced the accuracy of financial records.



**Fig.4 Relation between CGPA and Attendance.**

In Fig.4 Attendance and CGPA Correlation Analysis

In order to determine the effect of ERP on the performance of the students, we compared attendance with CGPA based on bar graph. The following important observations were made:

- 85% and above attendance students attain a Percentage of more than 80, which signifies a fantastic positive correlation between consistent attendance and academic performance.
- 60-75% attendance students achieve a Percentage between 55 and 70, which shows a mid-performing level.
- Less than 50% attendance has a Percentage of less than 50, indicating the significance of regular attendance in sustaining good grades.

The student attendance tracking system through ERP is essential in the implementation of discipline and study participation among students. The administrators and staff members can utilize this information to identify students at risk earlier and put intervention measures in place in terms of counseling, additional support, and mentorship programs.

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