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SMART MONITORING AND MANAGEMENT SYSTEM FOR MID-DAYA MEALS IN GOVERNMENT SCHOOLS

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Abstract

The Mid-Day Meal Monitoring System in Government Schools is a web-based application developed to improve and simplify the management of mid-day meal activities in government schools. Traditional methods of maintaining student attendance, meal records, food stock, and menu details using paper-based registers can require considerable manual effort and may lead to errors and difficulty in accessing historical information. The proposed system provides a centralized platform for managing student information, attendance, daily meal distribution, food stock, and menu details. The system consists of modules such as Student Management, Attendance Management, Meal Management, Food Stock Management, Menu Management, and Report Generation. It uses HTML, CSS, JavaScript, Bootstrap, PHP, and MySQL to provide a structured and accessible system for school-level meal monitoring. By digitizing these activities, the system helps reduce manual workload, improve data organization, and support better transparency and monitoring of mid-day meal operations. The system can also be extended in the future with mobile support, automated notifications, advanced reporting, analytics, and integration with

government-level platforms.

Keywords: *Mid-Day Meal, Government Schools, Meal Monitoring System, Student Attendance, Food Stock Management, Menu Management, Web-Based Application, MySQL.*

INTRODUCTION

The Mid-Day Meal Scheme helps in maintaining the health and nutritional level of the students studying in government schools. The management of mid-day meal activities in schools involves maintaining a record of students, their attendance, daily meal consumption, food stock, and menu. The management process becomes complex in case of a large number of students as most of the activities are done manually by maintaining registers and ledgers. To make the process more efficient and accurate, the Mid-Day Meal Monitoring System in Government Schools project is designed. This project provides a centralized online system for maintaining and monitoring all school meal activities. It maintains all the student details, attendance, meal consumption records and manages the menu, food stock. It also provides facility to generate reports for the proper monitoring of the records. This system is developed using HTML, CSS, JavaScript, Bootstrap, PHP, and MySQL.

The Mid-Day Meal Monitoring System is divided into six modules namely, Student Management Module, Attendance Management Module, Meal Management Module, Food Stock Management Module, Menu Management Module, and Report Management Module. The system is designed considering the use of various features to manage and monitor all the activities related to the mid-day meal scheme of schools. It reduces the efforts of school admins and staff by digitizing the process and providing a centralized dashboard. All the activities are well organized to help the authorities track and monitor all the activities easily. It also helps in maintaining the proper

records of every student's attendance, meals taken, and food available. With this paper, authors also suggest various future enhancements that could be made to the system like developing it as mobile application provide notification facilities and analytics reports and connecting with government servers.

PROBLEM STATEMENT

The current manual process of managing mid-day meal activities at government schools has the following problems:

1. Manual record maintenance: Student details, attendance, meal, stock, menu details, etc., were maintained manually.
2. Inaccuracy in data entry: Manually maintaining and calculating data may lead to errors and omissions.
3. Difficulty in searching: Searching the required data from the manually maintained register or book was a time-consuming process.
4. Information not centralized: Information may be scattered and not easily accessible from a centralized location.
5. Monitoring process becomes difficult: Monitoring authorities may have to rely on manually generated reports or visit the school for inspection.
6. Food stock management: Manually maintaining the records of food received, issued, and available could lead to inaccuracies in calculating the stock of food items and difficulty in identifying the stock deficit.
7. Meal monitoring: Comparing the student attendance and meal count manually may lead to omissions and inaccuracies.
8. Report generation consumes more time: Generating reports from various registers and manually tallying the data may involve extra effort and result in calculation errors or omissions.

9. Increased workload for staff: The process of repeated data entry, search, calculation, and report generation for various levels increases the workload of the staff.
10. Thus, a centralized online system is required: To organize the student, attendance, meal, stock, and menu information and to manage it centrally and make its search and report generation easier.

Literature Review

Literature and references related to web applications, software engineering, database systems, and the PM POSHAN scheme can be leveraged to conceptualize a web-based Mid-Day Meal Monitoring System.

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The PHP Documentation (PHP, n.d.) covers the language's features and tools that enable developing dynamic web applications. PHP powers server-side processing involving database connectivity, integral to implementing modules for student management, attendance, meal records, food stock, and reports.

The MySQL Reference Manual (Oracle Corporation, n.d.) details the language's tools and features designed to support structured query language (SQL) operations. Features such as databases support data storage and management needs, storing student details, attendance, meal, stock, menu, and report data in a centralized system.

The Bootstrap Documentation (Bootstrap, n.d.) covers responsive web development concepts and tools that enable designing responsive and user-friendly interfaces. Using Bootstrap, forms, tables, dashboards, and navigation tools can be developed to display and manage the proposed system's information.

The W3Schools website (W3Schools, n.d.) covers tutorials, references, and interactive coding resources related to HTML, CSS, JavaScript, and PHP. HTML, CSS, and JavaScript can develop the system's user interface, while PHP can support the application's server-side processing features.

The MDN Web Docs (Mozilla Developer Network [MDN], n.d.) contains references and tutorials related to HTML, CSS, and JavaScript. The three technologies can be utilized to develop the system's user interface and support functionalities such as client-side validations and display interactivity.

The book Software Engineering: A Practitioner's Approach (Pressman & Maxim, n.d.) covers the fundamental principles and strategies involved in software development processes and maintenance. It will aid in developing and maintaining the Mid-Day Meal Monitoring Application in accordance with principles and practices of software development.

The book Software Engineering (Sommerville, 2015) covers concepts and components of software engineering, including requirements, design, implementation, testing, and maintenance. It will aid in designing and developing the system in accordance with software engineering principles.

The book Database Management Systems: An Introduction (Elmasri & Navathe, 2016) covers fundamental concepts related to databases, including data organization and management. The book will support the design of a reliable database system that stores data related to students, attendance, meals, stock, menu, and reports.

The book Database System Concepts (Silberschatz et al., n.d.) covers topics and techniques related to database organization and management. It will support the design and development of a reliable database system that will power the proposed Mid-Day Meal Monitoring Application.

The XAMPP Documentation (Apache Friends, n.d.) covers the tools and features of the XAMPP environment, a local server that utilizes Apache, MariaDB, PHP, and other components in supporting web application development. It will support the development and testing process of the proposed application.

The Government of India's PM POSHAN Scheme Guidelines (Ministry of Education, Government of India, n.d.-b) contain guidelines and requirements related to the implementation and management of the school mid-day meal scheme. They will support the development of an application that meets the requirements of the scheme and covers features related to food management and student monitoring.

The Ministry of Education's PM POSHAN Resources (Ministry of Education, Government of India, n.d.-a) contain guidelines related to the government's mid-day meal programme. They will aid in understanding the context and requirements involved in implementing the proposed solution.

The GeeksforGeeks website (GeeksforGeeks, n.d.) covers tutorials, references, and interactive coding resources related to web technologies and databases. It will supplement the development of the application's database and web technologies.

The TutorialsPoint website (TutorialsPoint, n.d.) contains references, tutorials, and interactive coding resources related to PHP, MySQL, HTML, CSS, and JavaScript. They will support the development of the application's features and database components.

The MDN Web Docs (MDN, n.d.) contains references and tutorials related to web development and client-side technologies. They will support the development of client-side application features that involve interactivity and display manipulation.

Overall, the reviewed resources and references can be utilized to develop a comprehensive understanding of web application development, software development

processes and maintenance, database management, tools and technologies, and the context of the PM POSHAN scheme. Together, they will support the development of a centralized Mid-Day Meal Monitoring System that centralizes and manages information related to students, attendance, meals, stock, menu, and reports in a digital environment.

PROPOSED SYSTEM ARCHITECTURE

The proposed Mid-Day Meal Monitoring system is a web application that can provide a centralized platform for managing mid-day meal activities in government schools. The application utilizes HTML, CSS, and JavaScript along with Bootstrap, PHP, and MySQL for development purposes while XAMPP has been used as a local server. The proposed system architecture involves multiple functional modules that are integrated with each other through a centralized database.

The key components of the proposed system were described as follows:

1. Login and Authentication
2. User Interface
3. Student Management Module
4. Attendance Management Modul
5. Meal Management Module
6. Food Stock Management Module
7. Menu Management Module
8. MySQL Database
9. Report Generation
10. Overall System Flow

The proposed system architecture is explained in detail as follows:

- The user authentication process begins with the login and authentication

module where only authorized users are allowed access to the system after providing valid login credentials. The presence of this module provides security to sensitive information such as the student management system, attendance data, meal records, and food stock details.

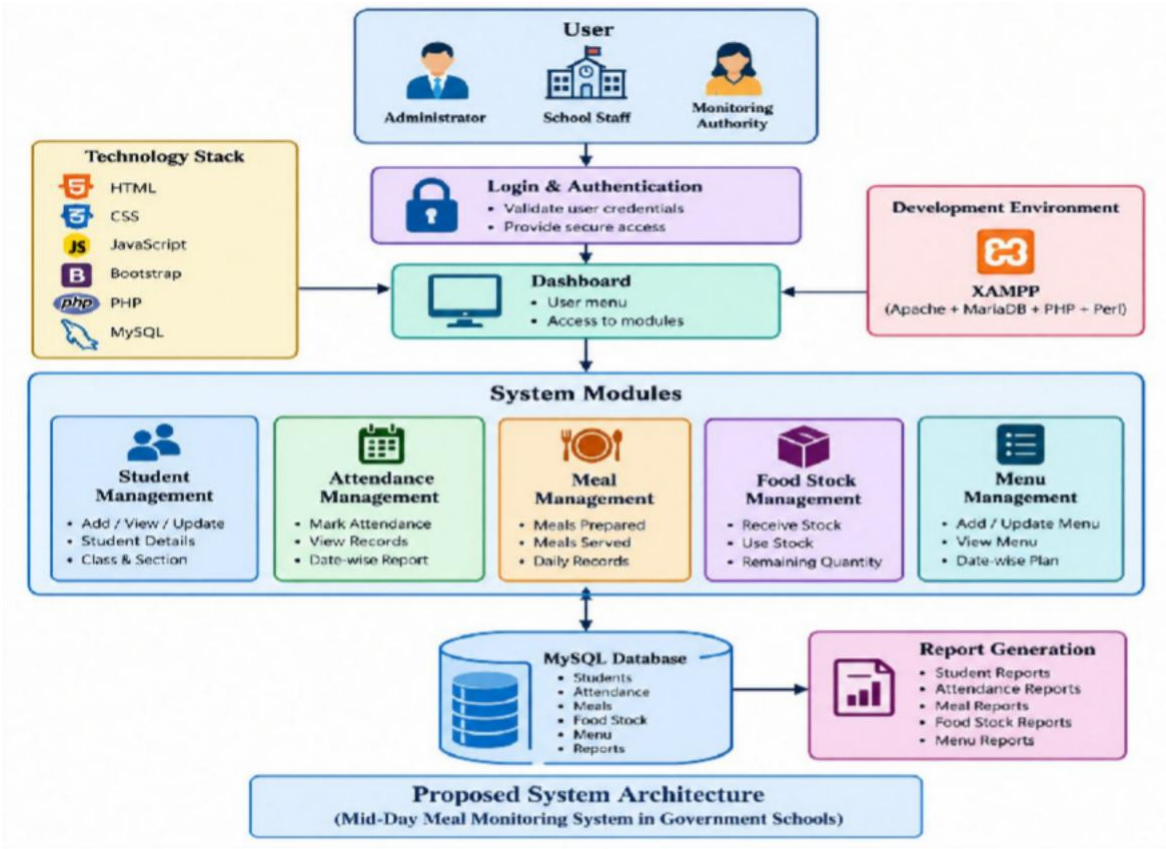
- The user interface has been designed by employing HTML, CSS, JavaScript, and Bootstrap. The interface provides forms, tables, dashboards, and menu options for authorized users to manage school information.
- The Student Management Module is used to store and manage the student body information. The authorized users can view, edit, delete, and update student records. The student's personal information is stored in a centralized MySQL database and can be accessed at any given time.
- The Attendance Management Module is used to record and store the student's attendance data. The attendance data for every student is cross-referenced against their student ID and the date. This report can also be utilized to track the number of children who receive meals.
- The Meal Management Module stores information related to the meals provided to the children. This component allows the users to record the date, number of meals prepared, and meals served. This information is later used to monitor mid-day meal activities and generate statistical reports.
- The Food Stock Management Module is crucial in storing information related to the food items available at the school. This module can be utilized to record the name of the item, quantity purchased, quantity used, and the remaining amount for each food commodity.

- The Menu Management Module is used to record and update the menu for a given day or period. The menus can be edited or deleted as appropriate. The menu options can also be used to record the type of meal consumed on a daily basis.

The MySQL database is the main component that powers the entire mid-day meal monitoring system. The database stores the core components of the system including: the administrator, school, student, attendance, meal, menu, food stock, and report management. The MySQL database management system makes use of primary and foreign keys to establish associations and linkages among the different fields and tables.

Finally, the Report Generation component can be used to produce school reports, student records, attendance data, meal statistics, and food stock information. The reports are generated using the information stored in the database thus eliminating the need for user input. In addition, report generation is faster when compared to the manual processes currently in use.

In summary, the overall flow of the proposed system architecture involves the login and authentication process of the users, registration and management of student records, and attendance data. Thereafter, the meal management and food stock modules can be used to record and monitor the meals provided and the food commodities. The MySQL database stores all the information related to the mid-day meal monitoring system. The Report Generation Module can then be utilized to analyze the stored data and produce hard copy or soft copy reports. It is evident that the proposed system architecture will enhance the monitoring of mid-day meal activities while also minimizing the time spent on manual data entry and report generation.



METHODOLOGY

The proposed Mid-Day Meal Monitoring System follows a systematic software development methodology to manage and monitor student attendance, meal distribution, food stock, menu information, and report generation in government schools. The system converts the traditional manual record-keeping process into a centralized web-based application.

The methodology begins with requirement analysis, where the requirements related to student management, attendance, meal records, food stock, menu management, user authentication, and report generation are identified. Based on these requirements, the system architecture, database structure, user interface, and different system modules are designed.

The system is implemented using HTML, CSS, JavaScript, Bootstrap, PHP, and

MySQL. XAMPP is used as the local development environment. PHP is responsible for server-side processing and communication with the MySQL database, while the database stores and manages student, attendance, meal, stock, and menu information. The system consists of several major modules, including Login and Authentication, Student Management, Attendance Management, Meal Management, Food Stock Management, Menu Management, and Report Generation. Authorized users can enter, update, view, and retrieve information through the web interface. The stored information is maintained in a centralized database, making record management and retrieval easier.

After implementation, the system is tested using unit testing, integration testing, system testing, and acceptance testing. Each module is tested individually, followed by testing the interaction between modules and the complete application. The generated reports are also compared with the stored database information to verify that the required information is retrieved and displayed correctly.

The overall methodology helps reduce dependence on paper-based records, organize school meal-related information, reduce manual effort, and provide faster access to records and reports.

DATASET / DATA USED

The Mid-Day Meal Monitoring System does not use a machine-learning dataset. Instead, the system uses operational school data required for managing and monitoring the mid-day meal program.

The data used by the system includes student information, student attendance, meal-related information, food stock details, menu information, and report-related records. These records are entered and maintained through the web application and stored in the MySQL database.

For system testing, different records were entered into the respective modules and were checked after insertion, updating, retrieval, and deletion operations. Attendance records were tested for different students and dates, meal information was entered and retrieved, food stock quantities were updated, and menu information was added and displayed. Generated reports were checked against the stored database information. Therefore, the dataset for this project can be described as a school operational dataset containing student, attendance, meal, food-stock, and menu records rather than an external machine-learning dataset.

EXISTING / MANUAL SYSTEM

In the existing system, information related to students, attendance, meals, food stock, and other school activities is mainly maintained using paper registers, notebooks, and physical records. Teachers or designated school staff manually record daily attendance, meal distribution, and food-stock information.

Preparing reports from multiple registers requires additional time and effort. Manual data entry and calculations may also result in errors in attendance records, meal information, or stock quantities. Searching for previous records can be difficult because staff may have to check several pages or registers.

Physical records may also be misplaced, damaged, duplicated, or difficult to retrieve when required. The manual system provides limited centralized management and does not provide an efficient method for accessing information quickly.

These limitations increase the administrative workload and make regular monitoring more difficult. Therefore, a computerized system is required to organize the information and reduce dependence on manual record keeping.

PROPOSED SYSTEM

The proposed Mid-Day Meal Monitoring System is a web-based application

developed to provide centralized management of school meal-related information. Authorized users can securely log into the system and manage student information, attendance, meal records, food stock, menu information, and reports.

The system stores information in a centralized MySQL database. This allows users to add, update, view, search, and retrieve records without depending on physical registers. Structured forms and database validation help reduce incomplete or incorrectly entered information.

The system also provides report generation using stored student, attendance, meal, and food-stock information. This reduces the manual effort required to prepare reports and provides faster access to important information for school-level monitoring.

Overall, the proposed system provides a systematic and organized approach for managing midday meal activities and reduces the dependence on paper-based record keeping.

PERFORMANCE AND ACCURACY EVALUATION

The performance of the proposed system was evaluated through functional testing of its major modules. Login and authentication, student management, attendance management, meal management, food stock management, menu management, database operations, and report generation were tested.

The testing confirmed that student records could be added, displayed, modified, and managed through the application. Attendance information could be recorded and retrieved correctly. Meal records could be stored and accessed, while food-stock information could be updated and displayed. Menu information could also be stored and retrieved correctly.

Database testing verified insert, update, delete, and retrieval operations between the

PHP application and MySQL database. Report generation was tested by comparing generated

Parameter	**Manual System**	**Proposed System**
Record Management	Paper registers and physical records	Centralized digital database
Attendance Management	Manually recorded	Digitally recorded a
Meal Records	Maintained in registers	Stored in the database
Food Stock	Manual entry and calculation	Digital stock management
Menu Management	Physical/manual records	Digital menu management
Record Retrieval	Time-consuming	Faster database retrieval
Report Generation	Prepared manually	Generated using stored data
Data Organization	Records may be scattered across registers	Centralized and organized
Risk of Physical Record Loss	Records may be damaged or misplaced	Digital records stored
Administrative Effort	Higher manual effort	Reduced manual effort
Monitoring	Limited real-time access	Easier access to centralized information

reports with the corresponding stored database information. The testing showed that the system could retrieve and present the stored information in an organized manner.

The project document does not provide a measured numerical accuracy percentage or a measured percentage reduction in processing time. Therefore, a specific value such as 90%, 95%, or 98% should not be claimed as the system accuracy without actual experimental measurements.

COMPARISON BETWEEN MANUAL AND PROPOSED SYSTEM

The proposed system improves the organization and accessibility of school meal-related information by replacing several manual record-keeping activities with a centralized computerized system. It reduces dependence on physical registers and makes record retrieval and report preparation more systematic.

RESULT

The implementation of the Mid-Day Meal Monitoring System resulted in a web-based application capable of managing student information, attendance, meal records, food stock, menu information, and reports through a centralized platform. The implemented modules were tested individually and together to verify their functionality.

The testing outcomes showed that the major functions of the system operated correctly. Database operations were successfully tested, and stored information could be retrieved when required. The system therefore provides a structured method for managing school meal-related information and reduces the dependence on manual registers.

The system is suitable for school-level use and can be further extended with features such as mobile application support, automated notifications, advanced reports, data analytics, online synchronization, and integration with larger government monitoring

platforms.

CHALLENGES

The development of the Mid-Day Meal Monitoring System involved several challenges related to replacing manual records with a computerized system. The major challenges and the solutions implemented are given below.

1. **Manual Record Management**

   Maintaining student, attendance, meal, and food-stock information using paper registers can be time-consuming and difficult to manage. Physical records may also be misplaced, damaged, or difficult to retrieve.

   Solution: The proposed system stores important information digitally in a centralized database. This reduces dependence on physical registers and makes records easier to access and manage.

2. **Data Accuracy**

   Manual data entry and calculations may result in incorrect attendance, meal quantities, or food-stock information.

   Solution:

   The system uses structured forms, database storage, and input validation to reduce incomplete or incorrect data entry.

3. **Attendance Management**

   Maintaining daily attendance records manually and finding previous attendance information can be difficult when the number of students and records increases.

   Solution:

   Attendance information is stored digitally with student and date details, allowing users to record and retrieve attendance more easily.

4. **Food Stock Monitoring**

Food stock changes regularly based on the quantity received and the quantity used for meal preparation. Manual calculations can lead to incorrect stock information.

Solution:

The food stock module provides a systematic method for recording food items and quantities and updating stock information whenever changes occur.

5. Report Generation

Preparing reports manually from different registers requires additional time and may result in calculation or copying errors.

Solution:

The system generates reports using information stored in the database, reducing manual effort and providing faster access to attendance, meal, student, and food-stock information.

6. Security and Unauthorized Access

Student and meal-related information should not be accessible to unauthorized users.

Solution:

A login and authentication mechanism is implemented. Users must provide valid credentials before accessing the application, and logout functionality is provided to terminate user sessions.

7. Ease of Use

School staff may have different levels of computer knowledge. A complicated application may make it difficult for staff to enter and manage information.

Solution:

A simple and user-friendly interface is developed using HTML, CSS,

JavaScript, and Bootstrap, with clear navigation and organized forms.

IMPLEMENTATION OUTCOMES

The implementation of the Mid-Day Meal Monitoring System produced the following outcomes:

- A centralized web-based platform was developed for managing mid-day meal activities.
- Student information can be added, updated, viewed, and managed digitally.
- Daily student attendance can be recorded and retrieved through the system.
- Meal-related information can be stored and accessed systematically.
- Food-stock information can be recorded, updated, and monitored digitally.
- Menu information can be added, modified, and retrieved when required.
- User login and authentication provide controlled access to the application.
- Database operations such as insertion, updating, deletion, and retrieval were tested successfully.
- Reports can be generated using stored student, attendance, meal, and food-stock information.
- The system reduces dependence on paper-based records and manual documentation.
- Centralized data storage makes information easier to organize and retrieve.
- The system provides a foundation for future expansion to support multiple schools and users.

FUTURE ENHANCEMENT

The proposed system can be further improved by adding advanced features to support larger-scale monitoring and improve accessibility.

1. **Mobile Application Support**

A mobile application can be developed so that authorized school staff and monitoring authorities can access and update information using smartphones.

2. **Automated Notifications**

Automated notifications can be introduced for important events such as low food stock, missing records, attendance-related information, and report submission reminders.

3. **Advanced Dashboards and Reports**

Graphical dashboards, charts, and advanced reports can be added to help administrators understand attendance, meal distribution, food stock, and other school-related information more easily.

4. **Data Analytics**

Data analytics can be integrated to identify trends and provide useful information from historical student, attendance, meal, and stock records.

5. **Online Synchronization**

The system can be connected to an online or cloud-based environment so that information can be synchronized and accessed from different locations.

6. **Government Monitoring Integration**

The system can be integrated with centralized government monitoring platforms to support wider monitoring and reporting across multiple schools.

7. **Automated Report Submission**

Future versions can provide automated submission of required reports to authorized monitoring authorities.

8. Cloud-Based Deployment

The current local development environment can be extended to a dedicated web server or cloud-based infrastructure. This can improve accessibility and support a larger number of schools and users.

CONCLUSION

The Mid-Day Meal Monitoring System in Government Schools was developed to provide an organized and computerized solution for managing and monitoring mid-day meal activities. The system addresses the difficulties associated with manual record keeping by providing a centralized platform for maintaining student information, attendance, meal records, food stock, menu information, and reports.

The traditional manual method requires school staff to maintain multiple registers and documents, which can consume time and make record retrieval difficult. The proposed system reduces these difficulties by storing information digitally in a centralized database. It also provides structured modules for managing different school activities and allows authorized users to access and update information efficiently.

The implemented system was tested using unit testing, integration testing, system testing, and acceptance testing. The testing verified the functioning of major modules, database operations, and report generation. The results demonstrate that the system provides a systematic approach to managing school meal-related information and reduces dependence on manual records.

The system currently provides a suitable foundation for school-level operations. Future enhancements such as mobile application support, automated notifications, advanced dashboards, data analytics, online synchronization, cloud deployment, and integration with centralized government monitoring platforms can further extend its functionality.

Overall, the Mid-Day Meal Monitoring System provides a reliable and user-friendly approach for improving the organization, accessibility, and management of mid-day meal records in government schools.

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