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ERP based School Management System

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Abstract

The majority of academic institutions have trouble keeping track of student records, attendance, accounts, admissions, etc and they still rely on paperwork and manual procedures which leads to a troublesome situation when some particular records or documents are required by the parents or official for immediate use. By implementing centralized software with numerous loosely coupled services that interact with one another to address the aforementioned issues, a web-based school management system will lessen the manual work and enhance communication between management and the student/guardian through notifications via email, SMS, and push messages. It is developed to support almost all kind of desktop and laptop browsers, mobile browsers, and native mobile applications as it is a server-side enterprise application. The software is fully responsive which provide friendly feel to all the user whether they are using laptop, smart phones or PC in the office. Loosely connected web services are simple to design and implement. This study used the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) paradigm of research and development. The outcome demonstrates how very less useful and inefficient manual school management is. Using the ERP-Based School Management System, this research led to the creation of a digitalized school management system (ERPBSMS). This system has undergone waste rang of testing with one of the reputed NCR based educational organization where more than 2000 students and 150+ educators are successfully using ERPBSMS for teaching, learning and evaluations purpose. The result proved that ERPBSMS is the demand and future requirement of the students, parents, staffs and the management of the educational organization. It can be implemented in other schools, colleges and educational institution with the backing of suitable infrastructure and finance.

Introduction

A time was there when educational organizations were helpless to keep the records of their students, employees either on the registers or in the computer by using traditional software like MS Word for different typed of long reports and papers, MS Excel for keeping records of marks and even accountants were using it for fee and salary management. Software companies were running their whole business in offering several desktop based software as per the business need of the organization, which required a sizable staff to launch and maintain. Companies had to maintain numerous versions of deployment packages and codes. Centralized deployment and maintenance resulted from the emergence of web applications. All users share web applications that have been deployed in a web container. In the field of web application development trends, some of the most recent web technologies are popular. Single-page web applications are one such

technique. Advantages of this single page web application are that these are developed in such a way that it works like desktop application and can be used on any portable devices with very limited resources.

All buttons are available for different a feature which doesn't require to visit any other webpage. Numerous advantages include lower costs for website design, development, and hosting.

In the term of internet uses, the application are hosted on remote server which can be access any time anywhere with given credential. It uses very normal bandwidth and runs smoothly on HTTP protocol.

Greater, more complicated applications that are best built and managed as a collection of smaller services that operate well together for larger, application-wide capabilities are known as micro-services in the area of web application development.

Need of ERPBSMS

It's always difficult to run an academic institution and bring together all of the organizations connected to it to carry out the objective. It will be simpler to complete the purpose if these institutions are transformed using technology-enabled automation solutions to streamline academic and administrative tasks. Education must be modernized with cloud, mobile, and digital technologies to manage institutional activities on a daily basis, improve operational efficiency, and effectively manage the institution.

Students and parents are no longer required to wait in line for entrance for hours on end. Parents and students were reminded either by phone calls or by handing over the due fee letter each month which was not a good feeling for either class teacher of the educational organization or parents. The procedure is made simpler by the use of online forms for registration and fee collecting as well as the option to send notifications and reminders by email, SMS, and push notifications.

It is crucial to create a course curriculum that can be modified to meet the changing requirements of the academic institution. Institutions will be able to accomplish a lot with less funding if they have a course management system. creating and keeping track of course materials, homework, and exam papers in a classroom setting to support students' graduation goals

It is essential to monitor teachers' advancement and gauge their work's efficacy. The input from the pupils can be used to assess the performance of the teachers. Students' learning abilities, success, and achievement are all improved by automated evaluation processes.

Due to a communication gap between students and teachers, student discipline occurrences are rising. It is necessary to have a platform that enables smooth communication between professors, staff, and students.

A web-based management solution that uses push, email, SMS, and notifications increases communication.

To monitor and maintain student records, such as attendance, leave, punishment, assignments, etc., teachers must put up a lot of effort. Institutions can efficiently manage things and keep student records by using an automated student management system that provides real-time updates on student activity status.

Academic institutions struggle to keep track of fee collections and manage their finances. A web-based management system for administration may monitor all financial activity.

The academic institution's workload is significantly reduced by a web-based management system, which also helps them concentrate and devote time to their

real objective.

Objective of ERPBSMS

The main objective the ERPBMS is to make school operation very easier and to centralize all the records and data at one place to be processed in the form of various reports as and when required. Another very significant purpose behind ERPBMS is to develop a comprehensive operation software system that ensures the smooth functioning of diurnal operations at a reasonable price.

Students Records Management: Storing all data of each individual student's in a single database and converting those raw data into information for confirmation, modification , academics analysis and personal growth check, keeping attendance and various exam related purposes.

***Attendance Management*:** The school group event management module monitors student attendance. RFID based auto attendance of student and Biometrics based attendance of staffs helps in quick time and tracking which reduces errors in group action calculation.

Fee Management: Collection of fee using various online portals and maintaining records of individuals fee payment is now an easy task by using SMS. The application an generate various fee related reports and auto set to sent fee reminder by email, sms or direct message in the login.

Schedule Management: Also maintains and updates the timetable for students and lecturers. It also sets daily classroom schedules, future events, and vacation announcements.

Report Management: The Reports and Grades module creates a student test analysis report that works between students, teachers, and parents. The grading system also helps the parents as well as the teachers to assess the progress of the students and then follow up with the necessary mentoring and guidance.

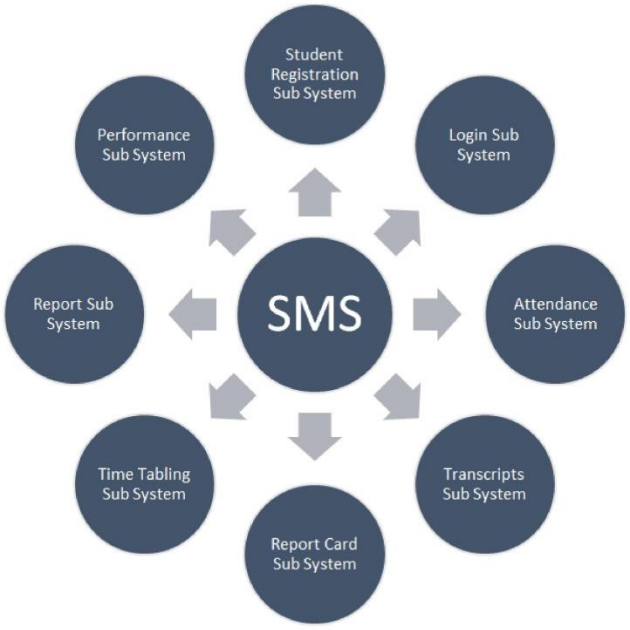

Figure: A-1

Library Management: The application is capable to keep the records of unlimited number of books in the system and can easily provide the details of book availability. Its also shows records of issued books to the students and staffs and sends auto reminder for returning the book on the return date. Fine amount is automatically calculated if the book is not return on the due date.

Various others features are listed below:-

Teachers Records Management: Using the application, teachers, admin staffs can maintain all kinds of records on daily basis. One of the advantage of the online application is to have access of all information at fingertip 24x7.

Transport Management: The application provide full functionality to manage transport related information. Students, parents and staffs can get the details of

transport routes and information about the driver, conductors, GPS , CCTV etc. for easy navigation. Each vehicle is equipped with RFID scanner which scans and sends data to the centralized server and an email/sms are sent to the parents about the boarding and de-boarding of the vehicle.

Events Management: The application also provides features to manage different types of events/activities conducted in the organization. Event in charges need to enter a brief report in the system and all can see reports of any event or activity at any time.

Achievements Management: One of major concern of all educational organization is to maintain and highlight the records of achievers. Our application is capable enough to keep records in proper format and displays on the web portal.

Teacher's Leave Records Management: Teachers can apply leave online in very simple and few steps. After filling online leave application, the application will be sending notification to the higher authority for approval. In case of approval or rejection, concern teacher will be intimated by the application.

Admission Management: Online admission enquiry and new admission entry can be managed by the application in very easy way. After the admission entry, a new id and password is generated by the system for the students and parents to have complete access of digital classrooms.

The Timetabling Problem

School timetabling is a major administrative activity in any school. A number of subjects taught by the corresponding teachers are allocated into a number of available classrooms and a number of timeslots, subject to constraints.

The tasks that are considered in constructing the timetable are:

I. Assigning periods to classes. There is a need to spread out lessons across the teaching cycle as much as possible, e.g. to avoid having 3 lessons on the sameday.

II. Some classes need 'double periods' (preferably 2 consecutive periods). This happens currently for Mathematics and English since each of the subjects have 6 lessons per week

(for five days) and therefore on one of the days these subjects should have two lessons for each class of students.

The Genetic Algorithm is one the famous algorithm which has been introduced long back. A genetic algorithm is a search heuristic that is inspired by Charles Darwin's theory of natural evolution. This algorithm reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation. But unfortunately this algorithm does not cater needs of an educational organization where some slot are not in same number for each teacher as per the given subjects.

Proposed Algorithm in our application for Time Tabling

```
Loop until all the teachers in the database are visited
  Select a teacher from the Teacher table
    Retrieve the Subject-Teacher code, Grade-Level, Number of lessons of the subject and
      all the classes assigned to the teacher
    Calculate load of the teacher
    If load is greater than maxLoad
      Display Error Message
      Exit Application
    While load of the teacher not zero
      Select a Day uniquely and randomly from the school days based on the number of
        lessons of the subject
      For Each Day of the week selected
        For Each class assigned to the teacher
          If allocatedLesson of the subject to the class is greater than zero
            If timeslot is not '#', move to the next slot
              If teacher is assigned in the period, move to the next slot
                If appropriate slot is not found swap previously assigned classes
                  Assign lesson to the slot
                  Decrease allocatedLesson of the subject
                  Decrease load of the teacher
        End For
      End For
    End While
End Loop
```

Figure A-2

Literature Review

There are numerous academic institutes in India. However, relatively few organisations are up to date and employ software to coordinate daily operations. There are over 1000 schools, more than 100 pre-university colleges, and degree-granting institutions in a city like New Delhi. The majority of these academic institutions still rely on a traditional management style that is primarily paper-based and labor-intensive.

The students who are accepted into institutions that rely on the old-fashioned system of running things must work very hard only to obtain a certificate or any other documentation. Additionally, the administrations have trouble keeping track of all the records and quickly retrieving the ones that pertain to them.

The students who are accepted into institutions that rely on the old-fashioned system of running things must work very hard only to obtain a certificate or any other documentation. Additionally, the administrations have trouble keeping track of all the records and quickly retrieving the ones that pertain to them. The administrations of those institutions must also hire a lot of staff members only to keep the documents necessary to oversee and assist with their daily tasks.

To address the aforementioned problems, certain universities, like Delhi University, Guru Gobind Singh Indraprastha University in Delhi, and DCRUST in Sonipat, Haryana, have their own web applications.

Research Lapses

In the research period, It was found that the previous system used for generating official transcripts and report card for various grades were not settled properly. Record officers was storing the spreadsheet and pdf format of all the transcripts in a folder which was taking enormous time in finding instantly. It was also a challenging task for another record officer to find the same, if previous record officer gets transferred or leave the job. In such a situation, a centralized record keeping system was very much required to overcome with all such problems. The previous system was also not so capable to provide the reports of the performance of students to their parents at the right time so that they can take any decision for future preparation of their wards. Some time students used to hide the manual reports and transcripts from parents which show leads to a negative impact on their future. It was not sufficiently producing the required reports to allow parents to view status of their children and reports for officials of DPS Society to help them participate in decision making.

Proposed Methodology

Micro-service architecture is being used as the development and deployment strategy for the application. Spring-boot, a quick application development platform and an opinionated version of spring application, is used to create the micro-service architecture. The five stages of the suggested technique are requirement collecting, design, development and implementation, testing, and maintenance.

Gathering Information

Before beginning any projects, the requirements must be gathered and their viability assessed. If the requirements are doable, the project can continue. Stakeholders gather all the requirements needed to develop and implement the project during this phase and communicate them to the project's developer and designer. The project's requirements are broken down into six categories, including Student Management

Service, Course Management Service, Attendance Management Service, Administration Management Service, Document Management Service, and Employee Management Service. The project's final product will be a web application.

Application Design

The needs must be given a suitable structure after being gathered and examined. Based on the requirements gathered in the previous phase, the project architecture will be designed in this phase.Many architectural diagrams, including ER diagrams, DFDs (data flow diagrams), use case diagrams, and others, are designed during this phase. The relationship and interdependence between the entities are explained by the ER diagram.

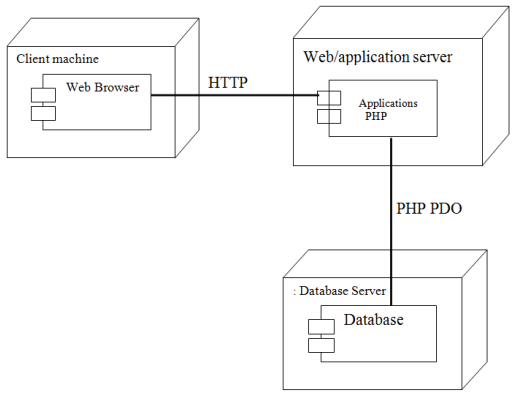

Figure A-3

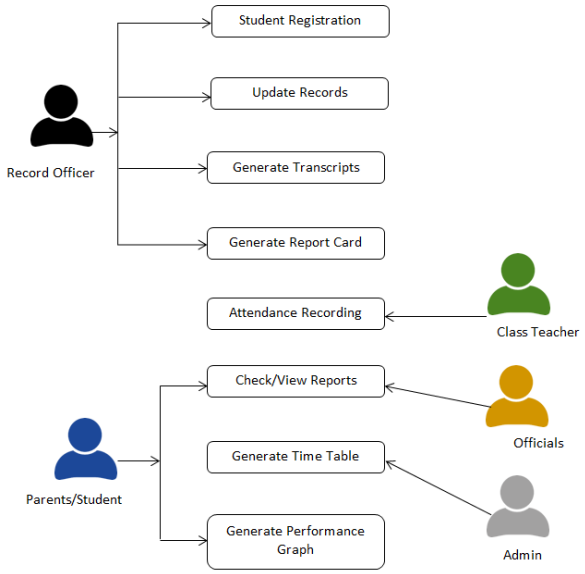

Figure A-4

Development and Implementation

Spring-boot is used to create applications with a microservices architecture. To communicate with the database, Java frameworks like Hibernate and Spring-Data-JPA are utilised. Additionally, the Spring-MVC architecture is used. Six spring-boot apps are bootstrapped and hosted individually in accordance with the specifications and design, resulting in almost complete independence and loose coupling between all applications. The directory structure for each application will be the same to preserve consistency throughout the development process. The front end of the programme is created using Angular 2 to turn it into a single page web application. The cloud computing service provider AWS is where the application is hosted and delivered.

Testing

Any project must be tested to make sure it operates as expected before being made available to users. In this project, the application is put to the test by receiving various sorts of input to see if it is validating them and if it is acting in accordance with expectations or not.

Maintenance

The application must be maintained to adhere to the numerous restrictions, such as availability, reliability, etc., once it has been tested and deployed. Depending on the user's success or input, future versions of the programmes may be created.

Performance Criteria

The piece of the framework to be utilized for the record office ought to have a quick reaction time (ongoing) with most extreme throughput. Moreover, the framework ought not be occupying a lot of room in memory. The record official has picked quick reaction time over throughput and consequently the

framework ought to attempt to be more intuitive. On account of the timetabling subsystem, the framework ought to be more solid to fulfill the imperatives than quick reaction time.

Dependability

The school needs the framework to be exceptionally reliable as it is normal to be utilized by non-IT experts. The framework ought to be hearty and shortcoming lenient. Moreover, as the framework is taking care of delicate information of the schools, high accentuation ought to be given concerning security, as there are subsystems to be gotten to through web.

End User Criteria

Convenience: Usability is the degree to which an item can be utilized by determined clients to accomplish indicated objectives with viability, effectiveness and fulfillment in a predefined setting of purpose. From the end clients' point of view the framework ought to be planned so that it is not difficult to learn and utilize, productive and having not many blunders if any.

Compromise is unavoidable in attempting to accomplish a specific plan objective. One best case is the issue of safety versus reaction time. Checking User-Id and Password before a part can enter to the SMS makes reaction time issue/above. The other case is the issue of reaction time versus quality. There is some measure of time taken by the framework to create the schedule. So the client needs to stand by a short while subsequent to advising the framework to create the plan and come by the outcome to get a quality schedule.

Hardware/Software Mapping

One of the significant errands in framework configuration manages equipment/programming planning which manages what parts would be part in which equipment, etc. The SMS is an expansive framework that carries out numerous roles as portrayed in section 4. It comprises of electronic framework utilized by homeroom educators to record participation. The electronic framework likewise helps guardians and authorities to get or see status and report on understudies' accomplishment and progress. The framework helps the record official to produce record and report cards. So the electronic part is supposed to run on - 32 - an organized climate on various Operating System stages.

Programming Tool

The framework has two different applications utilizing the same database. These are the Online Application for PC and Online App for Mobile, tablets etc. which is sometimes known as slim client application. Both applicationsare developed utilizing PHP which is one of best and secure server sided scripting languages web based application. PHP is a server-side scripting language planned specifically for the web. Inside an HTML page, it can insert PHP code that will be executed each time the page is visited. PHP code is interpreted at the web server and generates HTML or other output that the visitor can see. Current Web application is developed utilizing Hypertext Preprocessor (PHP 7.0).

The SMS Prototype

Here, the implemented framework is described. How the client interacts with the framework and some of the outcomes of interaction with the framework along with the screen shots are described.

As the application is completely planned to be operated over LAN, MAN and WAN, any

official or teacher has to login at https://dpssonepat.in/ when a client visit the URL https://dpssonepat.in/, a login screen is displayed to authenticate the client. In the event that the client has typed the correct client id and password to the login screen, the framework displays a splash screen for 3 seconds and then a Home Page containing the main menus of the framework. The main window displays menus and sub menus based on the role of the client that has logged in.

Test Results and Experiments

Here are a few of the application's outcomes. The user interface for the application's screen, as well as its features and functionalities, are depicted in the figures below. In a nutshell, the project's output is a collection of web pages that the web and application server has generated.

Conclusion, Recommendations and Future Scope
Conclusion

In this project, we developed an automated school management framework that facilitates the various activities taking place at schools.

The framework developed in the project consists of Teacher, Student and Parents web applications and mobile app. These are two different applications on the same database. The windows application takes most of the activities such as online understudy enlisting, transcript and report card generation and producing the timetable. The also application facilitates attendance recording by the classroom teachers and to view reports, to view status of understudies by understudies, teachers and parents.

Our solution of the timetabling problem is very simple. Data structures are utilized to implement the timetable planned. The scheduler selects a subject-teacher from the database, recovers all the classes assigned to the teacher, calculates the load of the teacher which cannot be greater than the maximum load and selects one of the days randomly based on the number of lessons of the subject, searches a free appropriate time slot and assigns the slot to the lesson. The scheduler repeats the process until the load of the teacher becomes zero and all the teachers in the database are visited. Finally the outcome generated is stored in a database.

The prototype has been tried with data from Delhi Public School, Sonepat. It has been shown that the framework effectively registers understudies along with parental information, easily recovers information about a understudy and generates the required reports such as transcript, report card and timetable. In addition to generating a feasible master timetable it produces a timetable for each teacher. Further more it has been shown that the web application of the framework helps attendance recording by the Class Teacher and parents can view the status of their children utilizing the Internet or Intranet of the school.

Future Scope

An ERP programming framework is frequently one of the most significant ventures an educational organization will make. Not only is it an important financial decision, yet it's also a practical one that can affect all parts of the business, such as human resources, accounting, manufacturing, marketing, and more. The approach which has been implemented in this research, can be expanded as per the future demands of parents, understudies, teachers and authorities. This project will integrated with

Online E-Library Management System, Cloud based Transport Management System, School's Eatopia/canteen management framework, Fee Management System, Visitor Management App, Inventory Management System, online class allocation system, class strength management system and RFID Card based attendance framework. After combining this whole module under a single head ERP based School Management System, school will not search for any third party software to cater its daily necessity. As research person and being software engineer, any other future necessity of any other educational organization can be taken into consideration and will be implemented inside given deadline.

References

[1]. E. Burke and W. Erben. Practice and Theory of Automated Timetabling, Third International Conference, Germany, Springer Private Limited, August 2000

[2]. J. G. Hedberget. al. (1992). Educational information systems: Problems of the small educational organisation. Australian Journal of Educational Technology, 8(2), 132-160. http://www.ascilite.org.au/ajet/ajet8/hedberg.html

[3]. M. Marte. Models and Algorithms for School Timetabling, A Constraint-Programming Approach, Ph.D dissertation, an der Fakult¨atf¨urMathematik, Informatik und Statistik der Ludwig-Maximilians-Universit ¨at M¨unchen, July, 2002

[4] R.J. Willemen. School Timetable Construction: Algorithms and Complexity, Thesis, Faculty of Mathematics and Computer Science, Technische Universiteit Eindhoven, 2002.

[5]. S. Petrovic and E. Burke. University Timetabling, School of Computer Science and Information Technology, University of Nottingham, 2002, pp. 1-4

[6] . T. Willis and B. Newsome. Beginning Visual Basic 2005, Wiley Publishing, Inc., 2006.

[7]. Aladwani, A.M. (2001), 'Change management strategies for successful ERP Implementation', Business Process Management Journal.

[8]. Al-Mudimigh A., Zairi M., Al-Mashiri M. (2001), 'ERP software implementation: an integrative framework', European Journal of Information Systems, 10, 216-26.

[9]. Argyris, C. (1991), 'Management information systems: the challenge to rationality and emotionality', Management Science, 291.

[10]. Bingi, P., Sharma, M.K. and Godla, J. (1999), 'Critical issues affecting an ERP implementation', Information Systems Management, 7-14.

[11]. Cooper, K 2008, 'ERPs are no simple fix', Graphic Arts Monthly, vol. 80.

[12]. Davenport, T. (2000), Mission Critical - Realizing the Promise of Enterprise Systems (Boston, MA: Harvard Business School Publishing).

[13]. Davis G.B. and Olson M.H. (1985), Management Information Systems - conceptual foundations, structure and development.

[14]. Dong, L. (2001), 'Modeling top management influence on ES implementation', Business Process Management Journal

[15]. Eisenhardt, K. (1989), 'Building Theories from Case Study Research', The Academy of Management Review, 14:4, 532-50.

[16]. Falkowski, G., Pedigo, P., Smith, B. and Swanson, D. (1998), 'A recipe for ERP success', Beyond Computing, 44-5.

[17]. Fitzgerald, G. (1998), 'Evaluating

information systems projects: a multi-dimensional approach, Journal of Information Technology, 13, 15-27.

[18]. Gargeya, V. B. and Brady, C. (2005), Success and failure factors of adopting SAP in ERP system implementation, Business Process Management Journal, 11 (9).

[19]. Gillooly, C. (1998), 'Disillusionment', Information Week.

[20]. Guamer, R 1996, 'Beyond ERP and MRP II', IIE Solutions, vol. 28, no. 9

[21]. Hammer, M 1999, 'How Process Enterprises Really Work', Harvard Business Review,

Citation: [1] Kenge, Rohit, and Zafar Khan. "A Research Study on the ERP System Implementation and Current Trends in ERP." Shanlax International Journal of Management, vol. 8, no. 2

[2] Mr. Sangamesh K, Mr.Akash Samanekar,Mr.Ningappa T Pujar " School Management System", Volume 6, Issue 15, International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181

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