

SIS: A Framework for Distributed Information Management System for School Branches

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Abstract Information and Communication Technology brought a revolution in managing information especially business related information. The era has been changed from managing information manually to computerized information management. It becomes vital when accuracy, less cost and time are the constraints. Schools and learning management systems have got great importance everywhere nowadays with the hype of ICT as it facilitates with ease of management. Many developments in school management systems have been seen during last few years but managing information of schools with distributed branches in remote areas got less attention than required. In this paper, we propose a novel framework for distributed information management system termed as School Information System (SIS) for schools having branches.

Keywords: *information management, school management system, distributed information management, ICT*

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1. Introduction

Academic management software tools like Learning Management System (LMS), Course Management Systems, are very common and widely used by academic institutions and schools for instructional delivery. Such type of applications contribute and provide immense help in various ways, including student management, course selection, course discussions, assignment announcements and submission, online testing, and grading etc. [1,2]. However each institute usually is catered for and implements a customized version of Course Management Solution (CMS) according to their specific needs and requirements. Whereas the more generalized systems are also available which can be further customized to suite the specific needs of an institute or school like one developed by [3]. Two most commonly used systems are, Moodle [4,5] which is also an open source system and Blackboard [6] which is proprietary and the institution needs to purchase license to use this system.

School management system is an information system to manage school related data and transactions. School system may consist of several branches within territory or round the globe. It contains various actors for example students, staff, teachers, student's parents, managerial staff etc. Maintaining school information is a big challenge especially when it comes to branch network and various approaches are used to effectively manage such school systems [7,8]. This paper describes the requirements specification and an application to manage school branches online as well as offline.

The purpose of our proposed solution and product is to design a generalized solution for an education system that is applicable on chain of schools. The propose product will support administrative staff by generating quick summaries for decision making and facilitate end-use and middle-use so that they can communicate in automated way.

Rest of the paper will discuss about related work, School Information System (SIS), System Framework, Data Modeling and System processes for example, admission, academic, examination, co-curricular activities, fee and expense management, staff activities and community activities.

2. Related Work

School and Classroom management systems are quite popular and very common throughout the world. In their book, Emmer et al. have discussed various principles and guidelines for classroom management systems especially for secondary school teachers [9]. The book highlights various plans for teachers to implement and use, for smoothly running a classroom and maintaining the school system. Whereas the role of ICT and its effect in schools, has been addressed by Hoque et al., by emphasising the involvement and participation of parents in some sort of academic decision making in case of Maldives [10]. Similarly, Hutchings, N. implements a Learning Management System (LMS) called Moodle, in secondary schools, elaborating the principles and process of successfully implement such a management system [11]. Whereas a model for web based school management

system is discussed by Martins et al., highlighting various issues regarding the adaptation of online course management system by students [12]. However Bhatti et al. implements an online academic portal for Sindhi speaking students in an academic environment [13]. Recently Dutta et al. proposes a stingy bi-dimensional classification and representation of Content Management system (CMS), depending on scale and complexity of usage [14]. Several management systems have been developed and used for various applications for example traffic management systems [15] and Museum Management systems [16].

3. School Information System

The purpose of our proposed solution and product is to design a generalized solution for an education system that is applicable on chain of schools. The propose product School Information System (SIS) will support administrative staff by generating quick summaries for decision making and facilitate end-use and middle-use so that they can communicate in automated way. Figure 1 gives the overall description of proposed school management system. The schools are divided into different zones based on different parameter depending on the policies. Every school is managed by school principal that is responsible for all school functions. Every zone contains some number of schools and these schools are managed by zonal manager called Field Education Officer who is responsible for all functions of zone. All zones are managed by the Education Manger who is responsible to design, implement and monitor polices with consultation of Board of Directors (BOD).

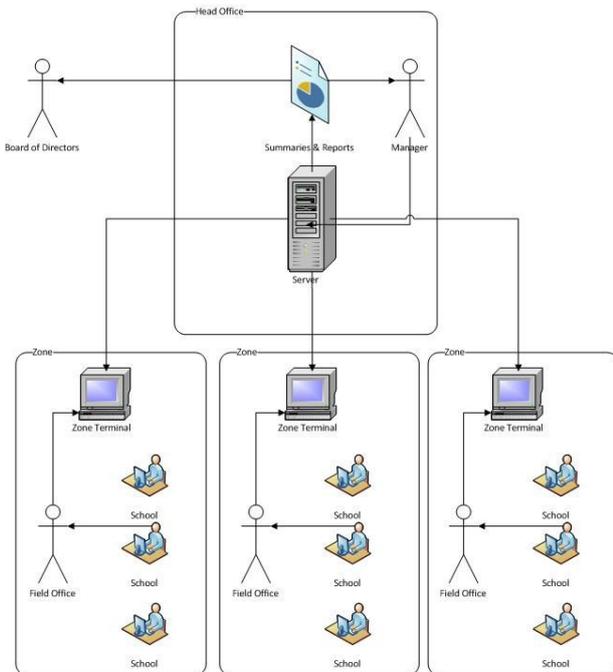


Figure 1. Overall Description of School Management System

4. System Framework

Proposed framework will cover an area of education sector, mainly primary and secondary schools that will provide the features including.

- Availability of functions on School level, Zonal/Managerial level and Administrative level.
- Support for migration of data in general formats.
- Product gives administrative control over users and their roles.

Proposed School Information System (SIS) is distributed in different modules, mainly setting up and administration, Definition and Master Information including Schools, Students, Zones, Staff and Officers, Transactions, Accounts, Summaries and Reports, Teachers' Training System and Co-curricular activities management. Figure 2 shows the primary use case diagram of the complete system.

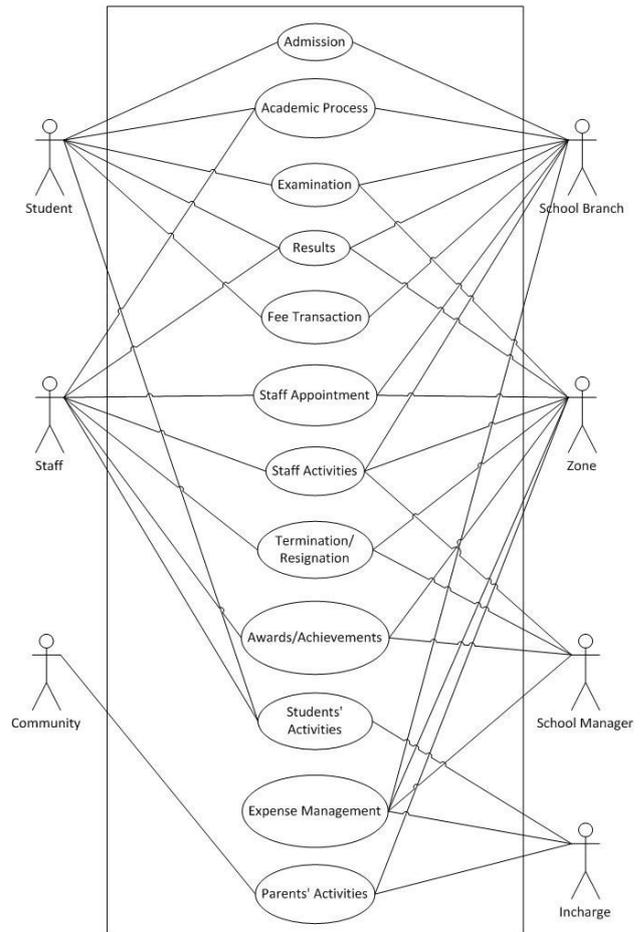


Figure 2. Primary Use Case Diagram

There are seven actors in the system that have different roles and can perform different tasks. From top to bottom the actors are School Manager, Incharge, Zone, School Branch, Staff, Student and Community. The School Manager can monitor staff activities including appointment and termination, awarding staff with benefits on their achievements and overall expenses management. The actor Incharge have specific task to interact with community by monitoring and organizing activities for parents. It further monitors and arranges activities for students and manages the expense of these activities. The Zone actor has a set of activities that spans over student's activities, staff activities and community activities. It has to monitor and manage student's examination and result process, staff activities and parent's activities. School branch actor actually implements the policies received from school manager and zonal incharge. It is directly

responsible for school and all related activities to be functional. Another important actor in school system is the donor who donates money to school in using any mean. Donation may be in form of money and services and donor may be the parents and some other persons.

The proposed framework for school information management system follows the object oriented approach and there are many objects that are linked with each other.

Figure 3 depicts the class diagram for the objects and relationships among those objects. The relationship between objects is one-to-one, one-to-many and many-to-many. It also describes aggregation and composition between objects. This class diagram represents only the relationships between objects. It does not contain attributes and behaviors of the classes.

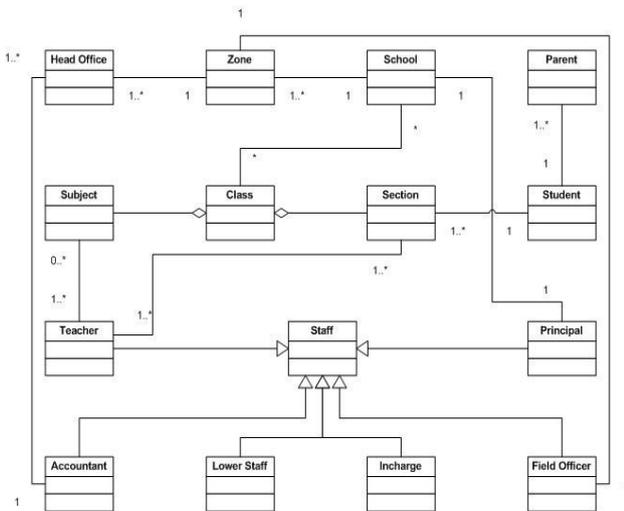


Figure 3. Class Diagram

5. Data Model

There are four basic entities in our proposed school management system that includes student, staff member, school and donor. Every entity has its own distinctive attributes and functionalities. Following is the summary of main entities, their types, attributes and functions.

1. Student:

- a. Has:
 - i. Personal Information.
 - ii. Parent’s Information.
 - iii. Contacts Information.
 - iv. Admission Information.
 - v. Academic Record.
- b. Is:
 - i. Admission Candidate.
 - ii. Enrolled Student.
 - iii. Ex-Student.
- c. Does:
 - i. Apply for Admission.
 - ii. Fee Submission.
 - iii. Attend Classes.
 - iv. Attempt Exams.

2. Staff Member:

- a. Has:
 - i. Personal Information.
 - ii. Contacts Information.
 - iii. Appointment Information.

- iv. Qualification Information.
- v. Work Experience.
- b. Is:
 - i. Job Applicant.
 - ii. Present Staff Member.
 - iii. Ex-Staff Member.
- c. Does:
 - i. Visit Branches.
 - ii. Appoint Staff.
 - iii. Terminate Staff.
 - iv. Generate Requisition.
 - v. Create Academic Calendar.
 - 1. Time Table.
 - 2. Exam Time Table.
 - vi. Class/Section Formation.
 - vii. Grant Admission.
 - viii. Cancel Admission.
 - ix. Assign Classes to Teachers.
 - x. Mark Attendance.
 - 1. Student’s Attendance.
 - 2. Staff Attendance.
 - 3. Exam Attendance.
 - xi. Request Expense.
 - xii. Attend Training Program.
 - xiii. Announce Exam Results.
 - xiv. Attend Meeting.
 - 1. Staff Meeting.
 - 2. FEO Meeting.
 - 3. Principal’s Session.
 - 4. Parent’s Meeting.
 - 5. Inter-Department Meeting.

3. Donor:

- a. Has:
 - i. Personal Information.
 - ii. Contacts Information.
 - iii. Donation History.
- b. Is:
 - i. Regular Donor.
 - ii. Irregular Donor.
- c. Does:
 - i. Donate Money.
 - ii. Visit Branches.

4. School:

- a. Has:
 - i. Primary Information.
 - ii. Contacts Information.
- b. Is:
 - i. Functioning.
 - ii. Closed.
- c. Does:
 - i. Everything.

There are few sub entities in the system. The student entity has sub entities that include Admission Candidate, Enrolled Student and Ex Student. For Staff Member entity, Job Applicant, Present Staff Member (Teacher, Zonal Incharge, Principal, System User, and Supportive Staff) and Ex Staff Member are sub entities. The Donor entity may have Regular Donor and Irregular Donor as sub entities.

Figure 4 shows the Entity Relationship Diagram (ERD) of the system that demonstrates the key attributes, relationships and behavior of data and entities. It gives an abstract of database used in this system to manage data.

The system users who interact with database includes Administrator, School Admin, Zone Admin, Accounts Admin, Exam Admin, Local User, School User (users in branches), Accounts User and Exam User who have different roles according to the policy of organization.

6. System Processes

School has lots of different processes including academic and co-curricular activities, staff and employees' management and community services etc. We will now explain the model, design and functionality of different components of School Information System.

6.1. Admission Process

The admission process is initiated by student. A student submits admission form and admission processing fee to school. School reviews the admission form and conducts the entry test of students. Students who have paid admission processing fee will only be allowed to appear in entry test. School announces the test results and assigns Registration No. to students. At the end, school submits the summary of admitted students to zonal incharge. [Figure 5](#) depicts the admission process.

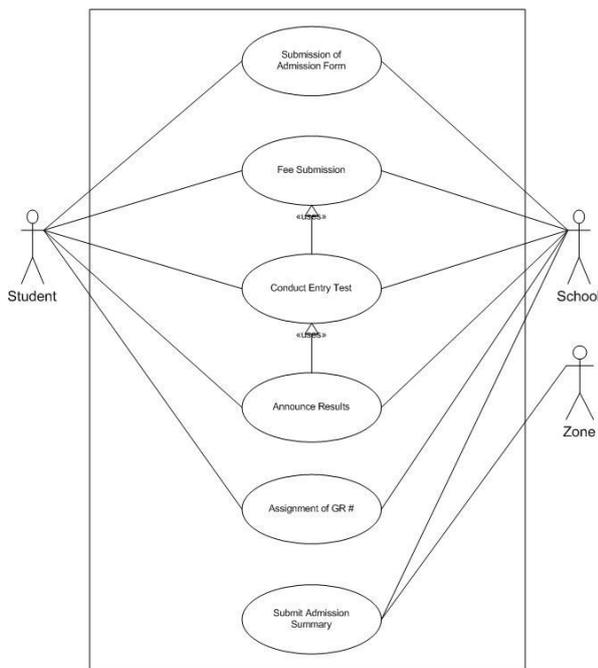


Figure 5. Admission Process

6.2. Academic Process

The academic process involves four actors that include School Manager, School Branch (Principal), Teacher and Student. First of all curriculum will be selected for all classes by school and teachers. The curriculum will be approved by the school manager to streamline it with vision and mission of organization. Classes and sections will be created and assigned to teachers and students. School will assign roll no. to students for identification. Time table for school will be designed on the basis of classes and sections and will be notified to all students and teachers. Students will take classes and teachers will conduct classes and will mark attendance of students in online or offline manner. If it is offline, then it will be uploaded to system in batch form. Teacher will assign

homework to students and will check it accordingly. This will be updated in system so that parents can have access to what have been assigned to their children. Teacher will also conduct quizzes and monthly tests of students and evaluate the results. Results will be uploaded to the system. [Figure 6](#) shows the academic process.



Figure 6. Academic Process

6.3. Examination Process

Examination process involves five actors including Student, School Branch, Teacher, Accounts and Zone. Teacher submits question paper to Branch and Branch approves question papers. School prepares examination time table and assigns duties to Teachers. Accounts generate dues report of students. Admit cards are issued to Students. Sitting arrangement in exam hall is managed by Teachers. Examination is conducted. Teacher marks exam attendance. Answer sheets are collected by Teacher.

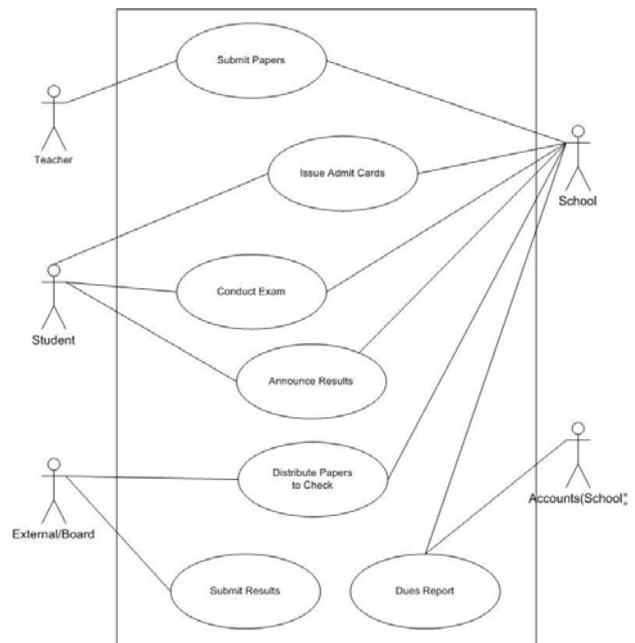


Figure 7. Examination Process

Teacher submits checked answer sheets to School and School distributes answer sheets among Teachers for rechecking process. Teachers submit rechecked copies to School. Teacher prepares award list of his subject. Class Teacher prepares tabulation sheet for all courses. Academic Incharge verifies tabulation sheets of all classes. Teachers fill students' report cards and report cards are signed by School (Principal). School Branch announces results officially. Tabulation sheets are submitted to respective zonal Incharge. Figure 7 shows the examination process in the system.

6.4. Co-Curricular Activities Management

School Manager prepares the student's co-curricular activities calendar and details of activities in compliance with school policies and mission. School organizes activities according to schedule. School selects Incharge for Event from Staff members. School prepares the event report and submits to Zone after completion of event. Figure 8 describes the co-curricular activities management in the system.

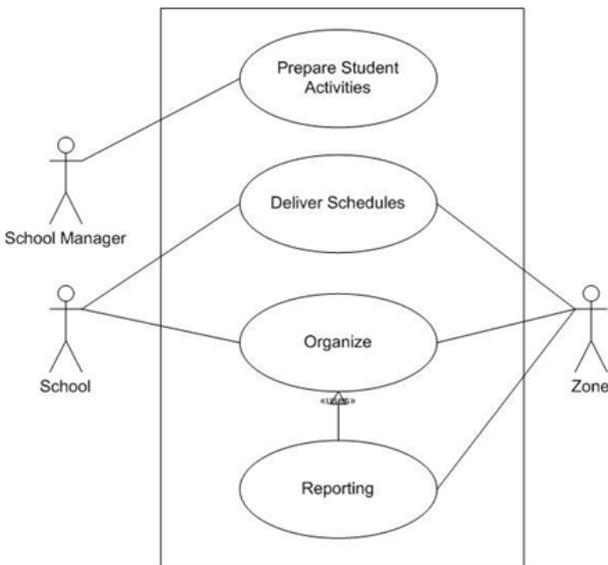


Figure 8. Co-curricular Activities

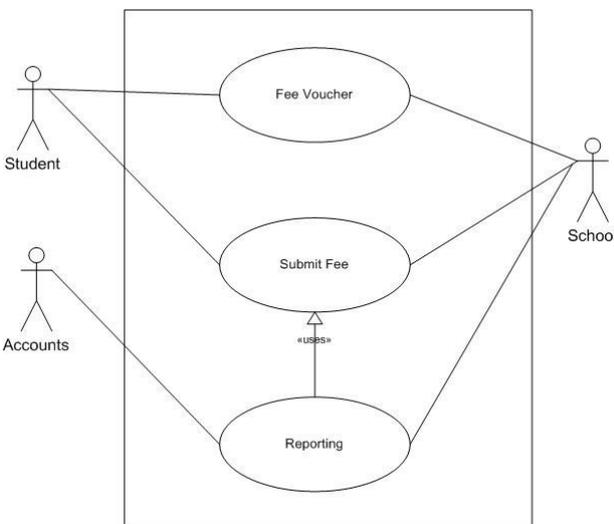


Figure 9. Fee Submission Process

6.5. Fee Submission Process

As shown in Figure 9, Fee Submission Process involves three actors Student, School and Accounts. Every School Branch may have same or different fee structure according to their ground realities as the system has been designed for schools in remote areas. School Branch is responsible to apply fees on Student. Student submit fee to school and School fills Fee slip and attaches to fees card. Fees card is returned to Student after entries. Branch updates fees register either manually or online. If updating fee register manually, then School will update in system online later as batch process. School generates summary of fees transaction and submits to Zone. Zone collects received amount, verifies and submits to Accounts.

6.6. Staff Activities Management

There are four actors involved in Staff activities that are School Branch, Candidate, Zone and School Manager.

6.6.1. Staff Appointment Process

School submits Staff requisition to Zone and Zone investigates the need and forwards requisition to School Manager. School Manager approves requisition based on necessary enquiry. School announces vacancies according to their need after approval of requisition. Candidates submit Application to School that it forwards recommended application to Zone. Zone calls Candidate for preliminary interview and conducts test and demo. School Manager conducts final interview and issues appointment letter. School allocates Staff ID and assigns tasks to appointed staff member. Figure 10 shows the process of staff appointment.



Figure 10. Staff Appointment Process

6.6.2. Staff Activities

School assigns staff their courses and sections and conducts Staff attendance. Staff conducts Classes according to assigned schedule. Before examination process, staff submits question papers of their classes to

School and Schools assigns Invigilation duties to Staff. Staff inspects classes during exam according to schedule and submits exam results to School. Staff also submits progress reports of their respective classes to School.

6.6.3. Resignation / Termination Process

Resignation: Staff member submits resignation to School according to policy. School forwards resignation to Zone. Accounts clear all liabilities of Staff member and Staff member submits/collects documents to School and Quits job. School submits staff report to zone.

Termination: School initiates the termination process by reporting complaints against staff to Zone. Zone investigates the complaints and issues warning to staff if complaints are true. In case of serious concern, Zone reports to School Manager. With approval of School Manager, Zone releases termination letter/order.

6.6.4. Staff Awards for Achievements

School evaluates Staff performance and submits report of qualifying candidates to Zone. Zone finalizes the report of qualifying staff and arranges Awards ceremony for distributing Awards/Certificates among staff. Zone submits event report to School Manager.

6.7. Community Activities Management

Community activities have great importance for the existence of school because one of the objectives of school is to bring change in community. Our proposed system manages the community activities related to school in form of Parents Sessions. Zone proposes the schedule of parents meetings and training sessions to School. School organizes and manages events according to schedule and send invitation to parents and other community members according the nature of event. School prepares the event report and submits it to Zone either online or manual. Figure 11 depicts the community activities process.

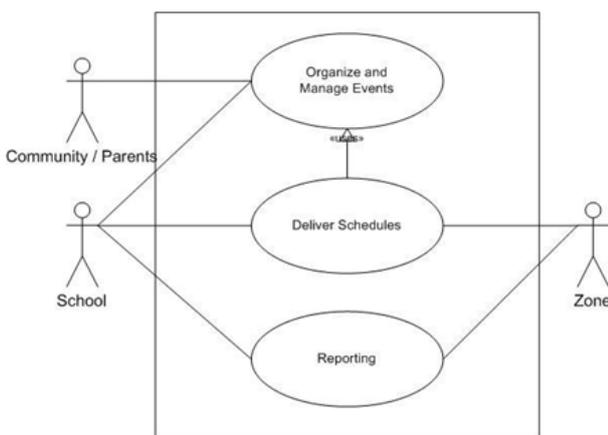


Figure 11. Community Activities

6.8. Expense Management

Four actors i.e. School, Zone, School Manager and Accounts are involved in process of expense management as shown in Figure 12. School generate request for expenses and forward it to Zone who is responsible for investigating actual need of expenses. Zone then forwards

expense requisition to School Manager who takes decision either approval or rejection. If expense requisition is approved, then School generates the expense sheet stating the expenses details and submits it to Zone. Accounts section will then deliver payment to School through Zone after necessary approval.

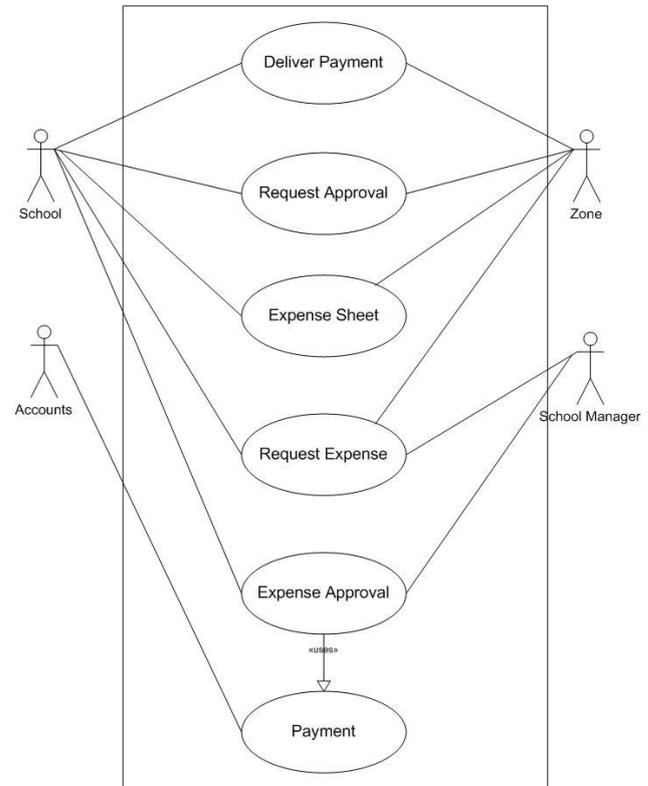


Figure 12. Expense Management

7. Conclusion

Management systems are now integrated part of modern businesses ranging from small scale organization like general stores to large enterprises that have chain of branches. It helps to organize and retrieve information in effective and efficient manner. Technology has changed the daily life processes from manual to computerized processes. School is one of the most important elements of community that prepares the next generation. Managing school information is very important to cope with mission and vision of school and nation. We have proposed a novel framework for distributed information management system for school branches and streamline school processes and to facilitate School, Staff, Students and Community. The main focus of SIS is towards schools in remote areas where resources are limited. SIS is capable of both online and offline process and information management.

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