FACULTY OF COMPUTING
SEMESTER 1, SESSION I 2023/2024

SECD 2523 - DATABASE
PHASE 1
PROJECT PROPOSAL AND DATABASE REQUIREMENT

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Table of Contents

1 Introduction

The library management system is a database system for the school's library to replace its current manual file system. The database will store and manage information related to students, staff and books, as well as handling the borrowing and returning of books.

The purpose of this project is automate and streamline library operations, making it more efficient and less prone to errors. One of its functionalities is the recording of borrowing and return dates, ensuring the organization of the library's collection. In cases where students fail to adhere to designated return dates, the system allows librarians to issue fines. In addition, librarians can navigate through the system to identify any misplaced books, using the book information stored in the database. Lastly, the system enables librarians to issue emails to all registered students, providing information on events, book return due dates, fine payments and other relevant details.

In conclusion, the implementation of this system would make it easier for librarians and students to search through thousands of books in the library. It also helps to automate the process of borrowing and returning books by giving pre-calculated borrowing periods and fines for late returns. This would ensure timely returns, allowing books to be accessible to students at any given moment.

2 Background Study

A school wants to design a database system to replace its file system for managing their library. The library is experiencing problems such as data redundancy and inconsistency, difficulty in retrieving information, inefficient book tracking, lack of automation, inability to generate reports and difficulty in user management. The purpose of the database is to automate the library operations such as keeping and managing borrowers' information, maintaining book details, tracking borrowing records, etc. The library basic operations are as follows:

Each student attending the school is eligible to use the library services. A student has student ID, name, course, part, phone number, password and gender. The operations of the library are handled by the staffs. A staff has staff ID, name, position, phone number, admin status, password and gender. A staff handles more than one books.

The books in the library are available for all students to borrow. A book has book ID, title, publisher, publication year and language. Each book has a location that includes location number, floor, shelf, row and category. There are more than one books in a location. A student can borrow more than one books while a book can only be borrowed by one student. The borrowing of book includes loan ID, start borrowing date, end borrowing date, return date, fine and borrowing time.

All these operations are crucial for the library to run smoothly as a small problem can affect the library's daily operations.

3 Problem Statement

3.1 Problem definition

A school is experiencing problems with managing its library operations through a manual file system. The current system used by the library makes it difficult to manage the information of books, students, staff, loans and locations of the books. The manual file system results in data redundancy, inconsistency and difficulties in retrieval. The lack of a centralized system leads to potential errors, inefficiencies and hindering book tracking, user management and generation of reports. To address these issues, the school aims to design and implement a database system to automate the library operations and improve its overall efficiency.

3.2 Problems

- Data redundancy and inconsistency
    - Without a centralized database, librarians might face issues with redundant and inconsistent data. For instance, a student's information could be duplicated or inconsistent across multiple files, leading to confusion and errors.

- Difficulty in retrieving information
    - Locating specific information about a student, staff, or book in a file-based system can be time-consuming and prone to errors. This inefficiency can affect the speed of library operations.

- Inefficient book tracking
    - Managing the location and availability of books without a systematic database can lead to difficulties in tracking book movements. Librarians may struggle to identify the status and location of each book.

- Lack of automation
    - Manual handling of library operations such as calculating fines, updating borrowing records and managing book availability can be time-consuming. Hence, automation is crucial for streamlining these processes and reducing the chances of human error.

- Inability to generate reports
    - Librarians may find it challenging to generate comprehensive reports on various aspects of library operations, such as overdue books, popular titles, or staff activities. A database system can facilitate the creation of meaningful reports to aid decision-making.

- Difficulty in user management
    - Without a centralized system, managing user accounts manually can introduce data redundancy and inconsistency. A centralized database would address this issue by providing a systematic means of managing user accounts to ensure accurate and up-to-date records for both students and staff.

4 Proposed Solutions

4.1 Solutions

- Implement a centralized relational database
    - Implement a centralized relational database that ensures data normalization to eliminate data redundancy by organizing data efficiently and maintaining data integrity through relationships between tables.

- Develop a user-friendly interface for librarians
    - Develop a user-friendly interface for librarians to query and retrieve information easily by implementing a search functionality to enable a quick and accurate retrieval of student, staff and book information.

- Utilize a barcode for book tracking
    - Integrate a barcode system with the database to update the location and status of books in real-time through a dedicated user interface for librarians to maintain the efficiency of book tracking.

- Integrate automation features into the database system
    - Integrate automation features into the database system such as calculation of fines, notifications for overdue books and updates to book availability to reduce manual workload and minimize the chances of human error.

- Design the database to support report generation
    - Implement reporting tools or queries within the database application to allow librarians to easily generate reports on various aspects of library operations allowing them to make informed decisions.

- Implement a comprehensive user management system
    - Implement a user management system that can handle user account creation, role assignments and permission management by implementing an interface for librarians to control access rights for different users in the system.

4.2 Economic Feasibility Study

COST BENEFIT ANALYSIS (CBA) FOR LIBRARY MANAGEMENT SYSTEM												
CRITERIA	YEAR											
	0		1		2		3		4		5	
1. COST	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL
A. DEVELOPMENT												
Development												
Hardware	10000	11000										
Software	10000	11000										
TOTAL DEVELOPMENT COST	20000	22000										
B. PRODUCTION												
Production												
Server Hosting			2100	2310	2310	2472	2472	2645	2645	2830	2830	3028
Maintenance			2500	2750	2750	2943	2943	3148	3148	3369	3369	3605
ANNUAL PRODUCTION COST				5060		5414		5793		6199		6633
PRESENT VALUE (PV)				4600		4475		4353		4234		4118
ACCUMULATED COST				26600		31075		35427		39661		43779
2. BENEFIT												
Benefit												
Income generated			400	18720	18720	19656	19656	20639	20639	21671	21671	22754
ANNUAL BENEFIT				18720		19656		20639		21671		22754
PRESENT VALUE (PV)				17018		16245		15506		14801		14129
ACCUMULATED BENEFIT				17018		33263		48769		63570		77699
GAIN/LOSS				-9582		2188		13342		23910		33920
PROFITABILITY INDEX (PI)				1.54								

Figure 1 Cost–benefit analysis

https://drive.google.com/file/d/1NGRcM4sEX320rB2Y2sCQx9WxSzVAXYDZ/view?usp=drive_link

Based on Figure 1, it shows that the profitability index is 1.54, indicating a good investment because the index is greater than 1.

5 Objectives

- Implement a centralized database system to eliminate data redundancy and inconsistency.
- Create a user-friendly interface for librarians to improve operational efficiency, allowing them to navigate the system and perform their tasks more effectively.
- Use barcode technology with the database for book management and tracking.
- Integrate automation tools to simplify the processes of borrowing and returning books and reduce the margin of errors in transactional activities.
- Implement a report generation feature to produce insightful and detailed reports to provide decision-makers with valuable information for informed decision-making.
- Implement a user management system that includes account creation, role assignments, permission management, access control and data security.

6 Scope

The design and implementation of the suggested solutions in the context of the school library will be the main goals of the project. A web-based system's development, database creation, user interface design, barcode system integration, automation capabilities and user administration functionalities are all included. With the aim of optimizing library operations and improving user experience, the scope includes every step of the processes, from student registration to book borrowing, tracking and reporting.

6.1 System boundary

6.1.1 What will be included?

- Student information
    - The system encompasses the management of student data, including student ID, name, course, part, phone number, password and gender. It allows for eligibility verification and facilitates the borrowing of books by students.

- Staff information
    - The system includes the details of staff members responsible for library operations, incorporating staff ID, name, position, phone number, admin status, password and gender. It facilitates efficient book handling by staff.

- Book information
    - The system manages book details, such as book ID, title, publisher, publication year and language. It also considers the physical location of each book, including location number, floor, shelf, row and category.

- Borrowing records
    - The system records and tracks borrowing activities, encompassing loan ID, start borrowing date, end borrowing date, return date, fines and the time of borrowing. This ensures the smooth operation of the borrowing and returning processes.

6.1.2 What will not be included?

- Non-library operations
    - Operations unrelated to the library, such as general school administration or academic management, are beyond the scope of this database system.

- Non-book materials
    - The system is designed specifically for managing books. Any other materials or resources unrelated to the library's book collection are excluded.

- Financial transactions
    - While fines for late returns are recorded, detailed financial transactions, such as payments for fines, may be excluded and managed through a separate financial system.

- External communication systems
    - While the system allows for issuing emails to students, the detailed functionality of external communication systems (e.g., email servers) falls outside the scope of the database system.

7 Project Planning

7.1 Human Resource

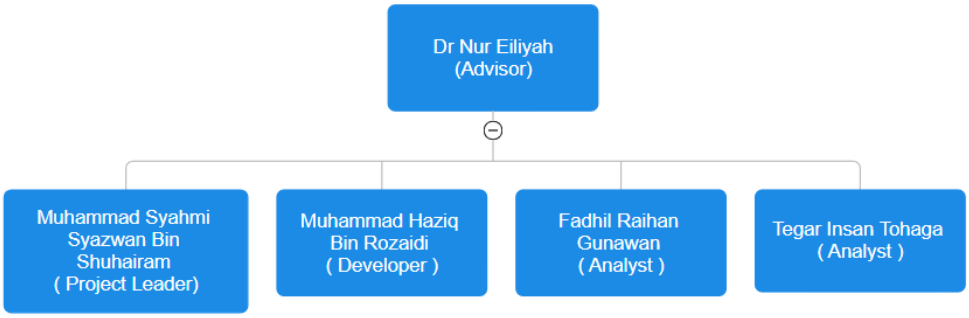

Figure 2 Organisational chart

7.2 Work Breakdown Structure (WBS)

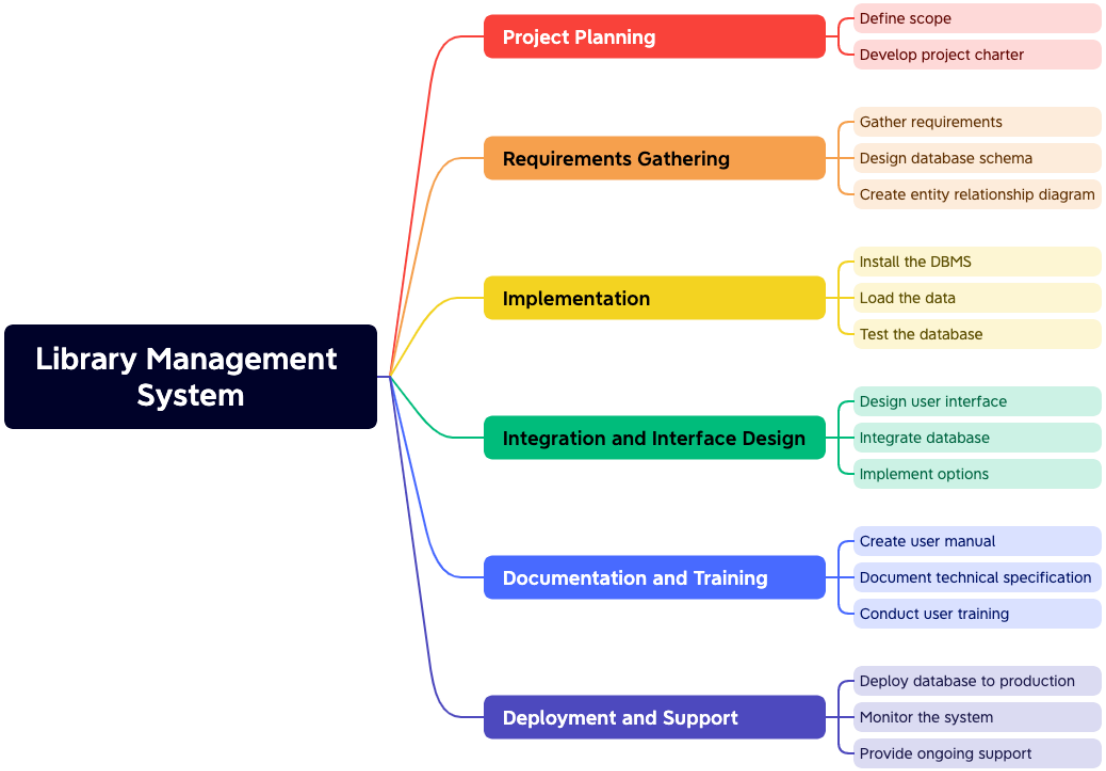

Figure 3 Work Breakdown Structure

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7.3 Gantt Chart

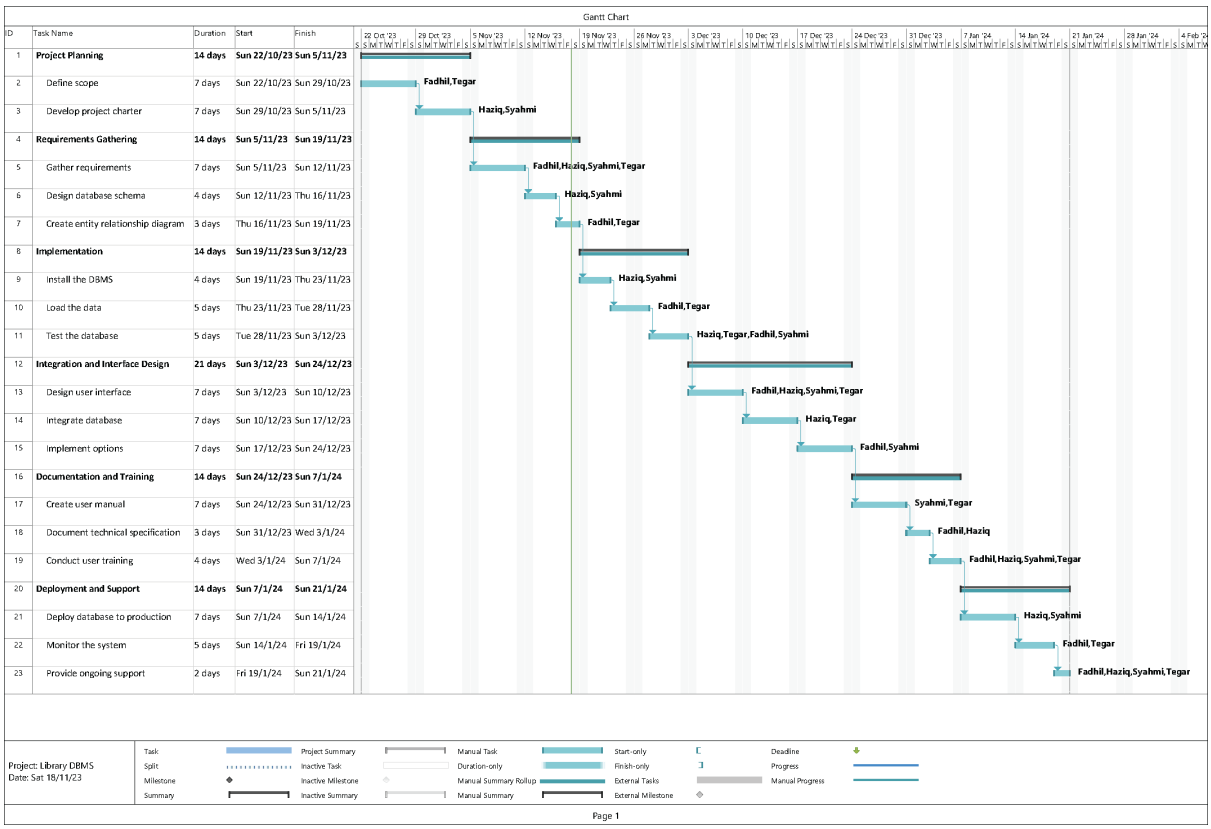

Figure 4 Gantt Chart

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8 Requirement Analysis

8.1 Current Business Process

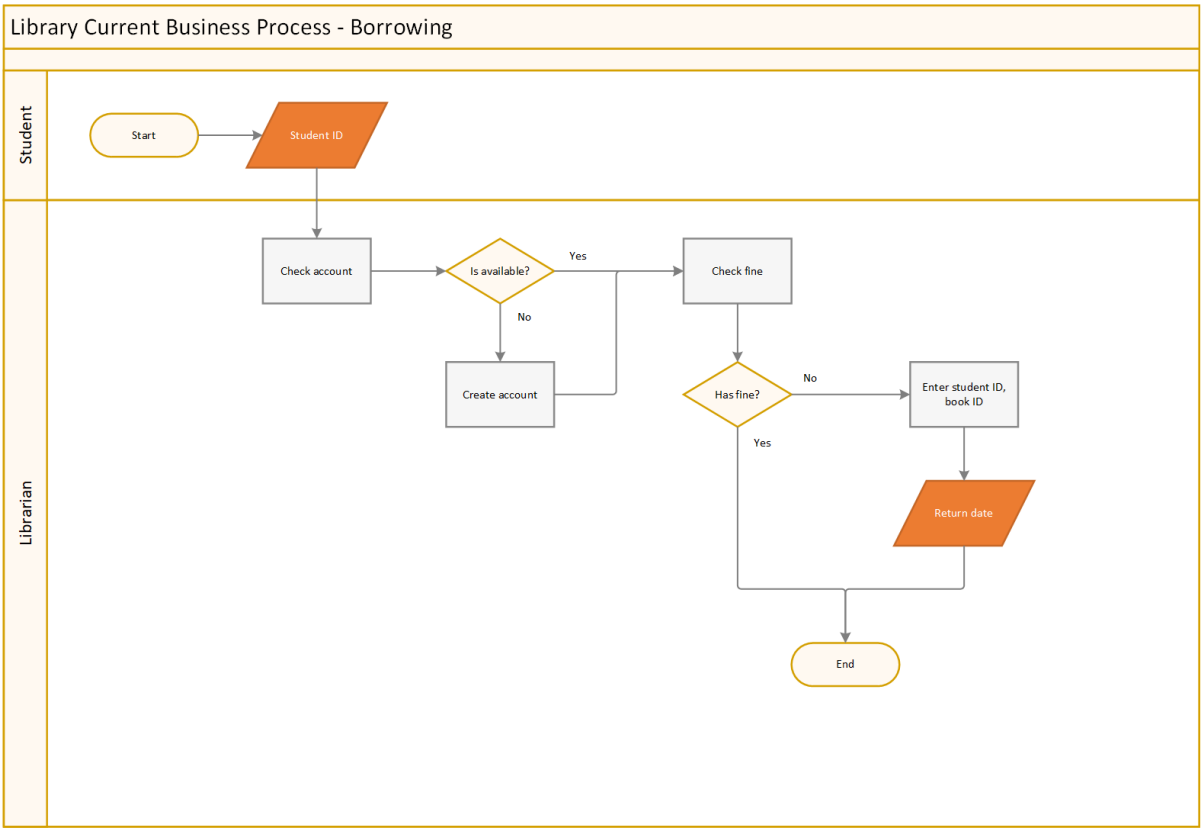

Figure 5 Borrowing process flowchart

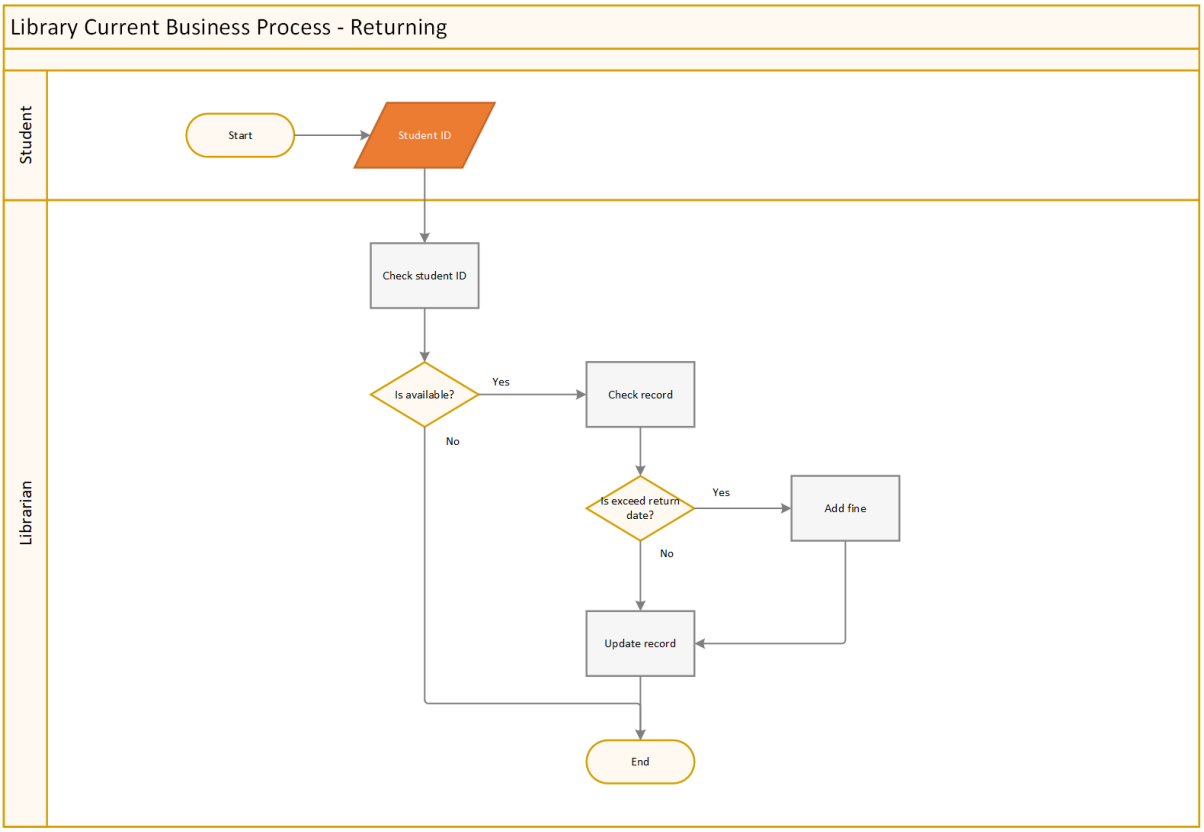

Figure 6 Returning process flowchart

9 Transaction Requirement

Entity	Data	Entry	Update	Delete	Query
Staff	Staff ID Staff Name Staff Password Staff Position Staff Phone No Staff Admin Status Staff Gender	Account registration by system admin	Update account details by staff or admin	Account deletion by system admin	Query on book loan, location and student details
Student	Student ID Student Name Student Password Student Course Student Part Student Phone No Student Gender	Account registration by student, staff or admin	Update account details by student, staff or admin	Account deletion by admin and staff if inactive for a period of time	Query on book, loan and location details
Book	Book ID Book Title Book Publisher Book Publication Year Book Language Location No Staff ID	Enter book details by staff	Update book details by staff	Delete book details by staff	Query on book details by staff and student
Book_Borrow	Book ID Student ID Loan ID Borrow Time	Enter borrowing details by staff	Update borrowing details by staff	Delete borrowing details by staff	Query borrowing details by staff and student
Loan	Loan ID Loan Start Date Loan End Date Loan Return Date Loan Fine	Enter loan details by staff	Update loan details by staff	Delete loan details by staff	Query loan details by student and staff
Location	Location No Location Floor Location Shelf Location Row Location Category	Enter location details by staff	Update location details by staff	Delete location details by staff	Query location details by student and staff

10 Benefit and Summary of Proposed System

- This new system will automate tasks like cataloguing and reporting, enabling staff to focus on helping students to discover the services of the library, ensuring efficient operations and providing student-centric environment.
- The system will generate reports, enabling informed decision-making by providing valuable insights into library operations, book circulation and user engagement.
- Automation of library operations, including user management, data maintenance and tracking of borrowing records will reduce manual workload and streamlines processes to increase operational efficiency.
- The system will ensure the accuracy and centralization of information related to students, staff, loans and books reducing the risks of data redundancy and inconsistency, providing reliable and up-to-date records.
- The implementation of a strong user management system will ensure data security and access control, protecting sensitive information and providing authorized access to relevant users.

11 Summary

The school aims to implement a new database system to fully automate and modernize the management of the library's operations and services. The system will replace the current manual file system with a centralized database system, allowing staff to streamline tasks like cataloguing, book tracking and generating reports. Students will benefit from simplified self-service borrowing and account management tools that improves user experience. Detailed reporting will provide data-driven insights to inform management decisions and oversight. Security features will ensure data integrity and privacy. Overall, the proposed system automation, improved data access and usability, enhanced insights and security features makes library processes more efficient for staff and provide better services for students. Transitioning management and operations to this new database system will help the library make significant progress in modernization and fulfil the informational needs of the school community.