

DBMS ASSIGNMENT

Library Management System

Roshni Pankajkumar Rana

22BCE305



Contents

1. Introduction
2. Background
3. About the Project
4. Tables
5. SQL Queries
6. ER Diagram
7. Data Dictionary
8. Normalization of Database



Introduction

In the dynamic landscape of the modern education system, marked by the advent of Industry 5.0, the integration of technology has become more pivotal than ever before. As educators and learners alike navigate through this era of unprecedented digital transformation, the role of libraries has undergone a profound evolution. Traditional brick-and-mortar libraries are making way for their digital counterparts, offering boundless access to information and resources at the click of a button.

In this digital age, digital libraries have emerged as indispensable assets, revolutionizing the way knowledge is accessed, disseminated, and utilized. With a vast array of academic journals, e-books, research papers, and multimedia materials readily available online, digital libraries transcend the limitations of physical space and time, democratizing information and fostering a culture of lifelong learning.

However, the efficacy of digital libraries hinges on robust management systems that can seamlessly organize, maintain, and optimize the vast reservoirs of digital content. This is where Library Management Systems (LMS) step in, serving as the backbone of digital libraries and streamlining various administrative and operational tasks. From cataloging and indexing resources to facilitating user access and tracking usage metrics, LMS plays a pivotal role in enhancing the efficiency and effectiveness of library services in the digital realm.

As technology continues to evolve at a breakneck pace, so do the trends and innovations within Library Management Systems. From the adoption of cloud-based architectures and artificial intelligence-driven analytics to the implementation of user-centric interfaces and mobile accessibility, LMS providers are constantly pushing the boundaries to meet the evolving needs and expectations of modern libraries and their patrons.

In this report, we delve into the intricacies of Library Management Systems, exploring their significance in the context of digital libraries and the broader educational landscape. We examine the current trends shaping the LMS domain, analyze their implications for library stakeholders, and offer insights into best practices and emerging technologies driving the future of library management. Join us on this journey as we unravel the multifaceted world of Library Management Systems and their transformative impact on education in the digital age.

Background

Background research on Library Management Systems (LMS) and Electronic Resource Management (ERM) reveals a multifaceted landscape of challenges and opportunities faced by libraries. The integration of ERM into LMS has become imperative for modern libraries striving to enhance information dissemination, streamline database management, and automate services.

The research done by Md Fazlul et al. [1] underscores the critical role of information dissemination services and database management systems in public university libraries of Bangladesh. It stresses the importance of raising user awareness, identifying challenges faced by both readers and library professionals, and aligning practices with international standards. Furthermore, it emphasizes the utilization of digital resources and consortium memberships to access online databases, while also acknowledging the challenges inherent in such endeavors.

As mentioned in the paper written by Jewell et al. [2] the need for a cohesive ERM strategy is evident in the identification of key features such as redacted licenses, centralized maintenance of bibliographic data, and support for institutional workflows through customized tools. Ensuring secure storage of administrative credentials and access to usage statistics are highlighted as essential components for effective ERM.

Infrastructure emerges as a crucial factor in enabling the effective use of electronic resources in university libraries, as highlighted by the provision of necessary resources like computers, internet access, and various digital materials by Okogwuet al. [3]. Strategies to overcome challenges in electronic resource collection development, including regular system upgrades and staff training, are recommended to keep pace with evolving technology.

Special libraries are not exempt from these challenges, as evidenced by the exploration of strategies for managing electronic resources and the assessment of librarian satisfaction with current methods by Prem et al. [4]. This underscores the need for tailored approaches to ERM that address the specific needs and constraints of different library types.

In addition, research from Tanzania and Nigeria by Cyprian et al. [5] identifies limitations in the utilization of electronic information resources (EIRs) due to factors such as inadequate skills and knowledge among users. Recommendations include the development of ICT infrastructures, role modeling by library staff, and strengthening information literacy programs. The focus on management functions performed by cataloguers and the identification of challenges such as planning, budgeting, and communication further emphasize the complexity of ERM. Policy

development emerges as a critical area, with barriers needing to be addressed to ensure effective management of electronic resources in libraries.

In order to determine if libraries that have adopted next-generation library systems can finish the electronic resource management processes completely within that system or if extra tools are still needed, Singley et al. [5] performed a research survey. The difficulties brought about by the introduction and overuse of electronic resources, as well as the shortcomings of current library management systems, were covered by Pradhan et al. [6].

In conclusion, the integration of ERM into LMS is essential for modern libraries to meet the evolving needs of users and effectively manage electronic resources. Addressing challenges and implementing recommended strategies will be crucial for libraries to maximize the potential of digital resources while ensuring equitable access and efficient management.

The table below summarizes the above information.

Paper	Year	Core Contributions
[1]	2015	<ul style="list-style-type: none">• The paper highlights the importance of information dissemination services, database management systems, and automated library services in selected public university libraries of Bangladesh.• It emphasizes the need to enhance user awareness about library services, identify problems faced by readers and library professionals, and adhere to international standards.• The study also focuses on the utilization of digital resources, consortium memberships for online databases, and the challenges faced by university libraries in Bangladesh.
[2]	2018	<ul style="list-style-type: none">• The paper identified the importance of a redacted license and a single point of maintenance for bibliographic and descriptive data.• It highlighted the need for facilitating electronic transfer of holdings and subscription data, as well as supporting institutional workflows through customized tools.• The paper emphasized the ability to store Administrative Ids, passwords, and access to usage statistics as essential features for E-Resource Management.

[3]	2020	<ul style="list-style-type: none"> • The paper highlights the importance of basic infrastructure in ensuring effective use of electronic resources in university libraries. • It emphasizes the need for libraries to provide resources like computers, VCDs/DVDs, internet access, full-text articles, online databases, e-journals, e-books, multimedia, CD-ROMs, and flash drives. • The study recommends strategies for overcoming challenges in electronic resource collection development, such as regular system upgrades and training of library staff in modern technology.
[4]	2017	<ul style="list-style-type: none"> • The paper explores the strategies employed by special libraries in managing electronic resources. • It identifies the challenges faced by librarians in managing e-resources effectively. • The study assesses the satisfaction level of library professionals with the current methods of managing electronic resources.
[5]	2013	<ul style="list-style-type: none"> • The paper identifies limitations such as lack of skills in searching the internet and inadequate knowledge affecting the proper utilization of electronic information resources (EIRs) in Tanzanian University libraries. • It recommends the development of ICT infrastructures, role modeling by librarians and teaching staff, adoption of active learning approaches, and strengthening information literacy programs to enhance students' skills in using EIRs. • The paper by Okoye and Ugwuanyi (2012) focuses on the management functions performed by cataloguers in Nigerian university libraries for the effective management of electronic information resources (EIRs). • It provides insights into the challenges faced in managing electronic resources in libraries, including planning, policies, workflow, staffing, budgeting, change management, communication, and management tools. • The paper highlights barriers to policy development in electronic resources management, emphasizing the importance of addressing issues related to planning, policies, and workflow for effective management of EIRs in libraries.

Let us see what the current trends are. Currently, the forecast for the Library Management Software Market from 2023 to 2027 anticipates significant expansion, with a projected compound annual growth rate (CAGR) of 3.23%, equating to USD 390.07 million by 2027. This growth trajectory is influenced by several factors highlighted in the background research. The increasing demand in the Asia-Pacific region, particularly in educational sectors like K–12 schools, underscores the global reach and applicability of library management systems [8]. Furthermore, the continual advancements in technology, coupled with mergers and acquisitions in the library services and automation market, are driving forces behind the industry's growth. These factors collectively contribute to the evolving landscape of library management systems, reinforcing the importance of integrating electronic resource management functionalities to meet the expanding needs of modern libraries.

The figure 1 [8] below shows the Fastest-Growing Segment in the Market of library management system software.

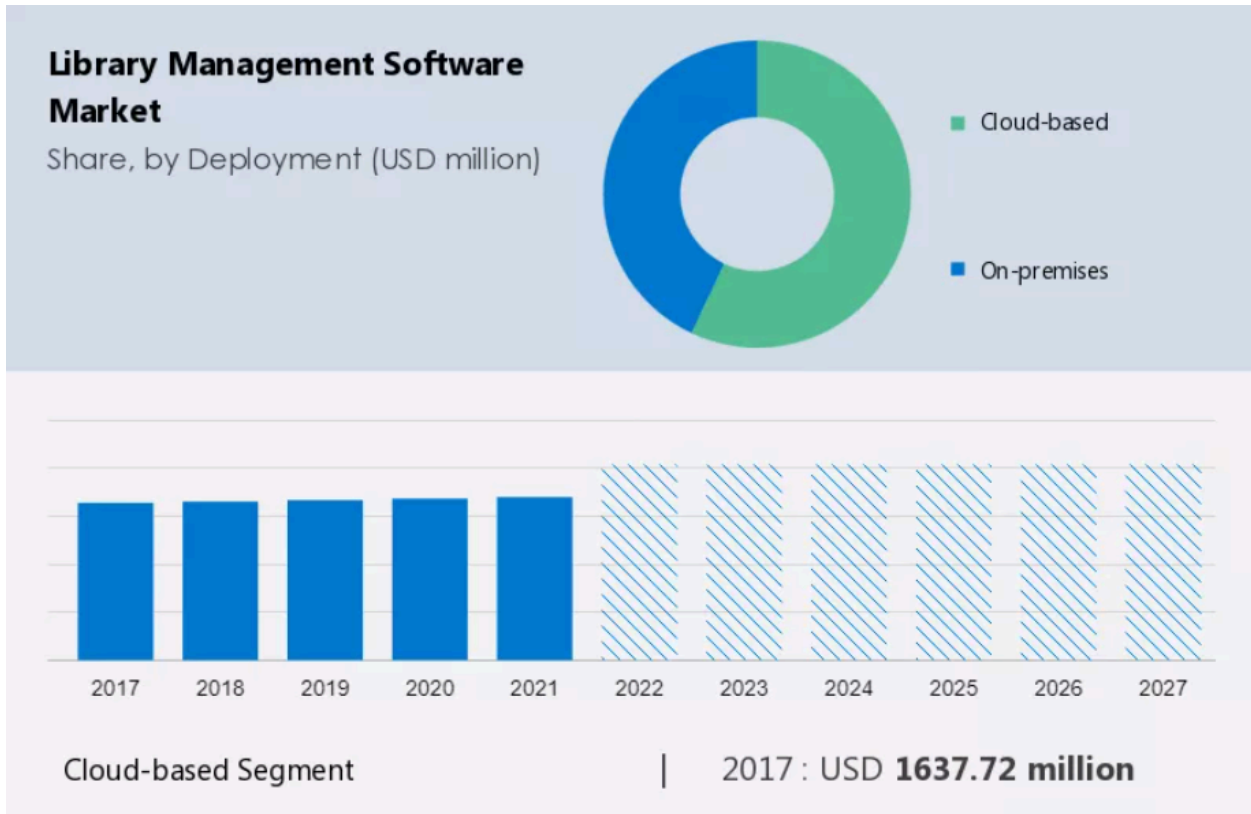


Figure 1 [8] : Fastest-Growing Segment in the Market of library management system software

About the Project

The following document has proposed a Library Management System (LMS). In this project, we aim to design and develop a comprehensive system for managing library operations efficiently. Our system comprises five core tables: LMS_MEMBERS, LMS_SUPPLIERS_DETAILS, LMS_FINE_DETAILS, LMS_BOOK_DETAILS, and LMS_BOOK_ISSUE. Each table plays a vital role in organizing and maintaining various aspects of library operations.

Table 1: LMS_MEMBERS stores information about library members, including their unique member ID, name, city, registration date, expiration date of membership, and membership status. This table helps in managing member registrations, renewals, and tracking membership statuses.

Table 2: LMS_SUPPLIERS_DETAILS contains details of book suppliers, such as their supplier ID, name, address, contact number, and email. It facilitates the management of supplier information and helps in tracking book procurement from different suppliers.

Table 3: LMS_FINE_DETAILS stores fine ranges and corresponding fine amounts. This table is crucial for managing fines imposed on late book returns and helps in calculating fine amounts based on predefined ranges.

Table 4: LMS_BOOK_DETAILS maintains information about library books, including book code, title, category, author, publication, publish date, edition, price, rack number, date of arrival, and supplier ID. It serves as a central repository for book-related data and supports efficient book inventory management.

Table 5: LMS_BOOK_ISSUE records book issuance transactions, including issuance number, member ID, book code, issue date, return date, returned date, and fine range. This table facilitates tracking of books issued to members, return dates, and fines imposed for late returns.

Throughout this project, we will perform various SQL queries on these tables to demonstrate the functionality of our library management system. Additionally, we will provide an Entity-Relationship (ER) diagram to visualize the relationships between these tables, followed by normalization to optimize the database structure for efficient data management and querying. Our goal is to create a robust and user-friendly library management system that meets the needs of librarians and patrons alike.




Creating the tables

```
CREATE TABLE LMS_MEMBERS (  
    MEMBER_ID VARCHAR(10),  
    MEMBER_NAME VARCHAR(30) NOT NULL,  
    CITY VARCHAR(20),  
    DATE_REGISTER DATE NOT NULL,  
    DATE_EXPIRE DATE ,  
    MEMBERSHIP_STATUS VARCHAR(15) NOT NULL,  
    CONSTRAINT LMS_cts1 PRIMARY KEY(MEMBER_ID)  
);
```


```
CREATE TABLE LMS_SUPPLIERS_DETAILS (  
    SUPPLIER_ID VARCHAR(3),  
    SUPPLIER_NAME VARCHAR(30) NOT NULL,  
    ADDRESS VARCHAR(50),  
    CONTACT_NUMBER(10) NOT NULL,  
    EMAIL VARCHAR(15) NOT NULL,  
    CONSTRAINT LMS_cts2 PRIMARY KEY(SUPPLIER_ID)  
);
```

```
CREATE TABLE LMS_FINE_DETAILS (  
    FINE_RANGE VARCHAR(3),  
    FINE_AMOUNT DECIMAL(10,2) NOT NULL,  
    CONSTRAINT LMS_cts3 PRIMARY KEY(FINE_RANGE)  
);
```



```
CREATE TABLE LMS_BOOK_DETAILS (  
    BOOK_CODE VARCHAR(10),  
    BOOK_TITLE VARCHAR(50) NOT NULL,  
    CATEGORY VARCHAR(15) NOT NULL,  
    AUTHOR VARCHAR(30) NOT NULL,  
    PUBLICATION VARCHAR(30),  
    PUBLISH_DATE DATE,  
    BOOK_EDITION INT,  
    PRICE DECIMAL(8,2) NOT NULL,  
    RACK_NUM VARCHAR(3),  
    DATE_ARRIVAL DATE NOT NULL,  
    SUPPLIER_ID VARCHAR(3) NOT NULL,  
    CONSTRAINT LMS_cts4 PRIMARY KEY(BOOK_CODE),  
    CONSTRAINT LMS_cts41 FOREIGN KEY(SUPPLIER_ID) REFERENCES  
LMS_SUPPLIERS_DETAILS(SUPPLIER_ID)  
);
```

```
CREATE TABLE LMS_BOOK_ISSUE (  
    BOOK_ISSUE_NO INT,  
    MEMBER_ID VARCHAR(10) NOT NULL,  
    BOOK_CODE VARCHAR(10) NOT NULL,  
    DATE_ISSUE DATE NOT NULL,  
    DATE_RETURN DATE NOT NULL,
```



```
DATE_RETURNED DATE,  
  
FINE_RANGE VARCHAR(3),  
  
CONSTRAINT LMS_cts5 PRIMARY KEY(BOOK_ISSUE_NO),  
  
CONSTRAINT LMS_Mem FOREIGN KEY(MEMBER_ID) REFERENCES  
LMS_MEMBERS(MEMBER_ID),  
  
CONSTRAINT LMS_BookDetail FOREIGN KEY(BOOK_CODE) REFERENCES  
LMS_BOOK_DETAILS(BOOK_CODE),  
  
CONSTRAINT LMS_FineDetail FOREIGN KEY(FINE_RANGE) REFERENCES  
LMS_FINE_DETAILS(FINE_RANGE)  
  
);
```

Tables

1. LMS_MEMBERS

```
SQL> desc LMS_MEMBERS;
```

Name	Null?	Type
MEMBER_ID	NOT NULL	VARCHAR2(10)
MEMBER_NAME	NOT NULL	VARCHAR2(30)
CITY		VARCHAR2(20)
DATE_REGISTER	NOT NULL	DATE
DATE_EXPIRE		DATE
MEMBERSHIP_STATUS	NOT NULL	VARCHAR2(15)

MEMBER_ID	MEMBER_NAME	CITY	DATE_REGI	DATE_EXPI	MEMBERSHIP_STAT
LM001	AMIT	CHENNAI	12-FEB-12	11-FEB-13	Temporary
LM002	ABDHUL	DELHI	10-APR-12	09-APR-13	Temporary
LM003	GAYAN	CHENNAI	13-MAY-12	12-MAY-13	Permanent
LM004	RADHA	CHENNAI	22-APR-12	21-APR-13	Temporary
LM005	GURU	BANGALORE	30-MAR-12	16-MAY-13	Temporary
LM006	MOHAN	CHENNAI	12-APR-12	16-MAY-13	Temporary
LM007	Sneha	Mumbai	17-APR-24	17-APR-25	Temporary
LM008	Rahul	Delhi	17-APR-24	17-APR-25	Permanent
LM009	Priya	Bangalore	17-APR-24	17-APR-25	Temporary
LM010	Arun	Hyderabad	17-APR-24	17-APR-25	Temporary
LM011	Neha	Kolkata	17-APR-24	17-APR-25	Permanent
LM012	Ravi	Chennai	17-APR-24	17-APR-25	Temporary
LM013	Meera	Pune	17-APR-24	17-APR-25	Temporary
LM014	Vikas	Jaipur	17-APR-24	17-APR-25	Permanent
LM015	Anjali	Chennai	17-APR-24	17-APR-25	Temporary
LM016	Sanjay	Delhi	17-APR-24	17-APR-25	Temporary
LM017	Shreya	Mumbai	17-APR-24	17-APR-25	Permanent
LM018	Ajay	Bangalore	17-APR-24	17-APR-25	Temporary
LM019	Pooja	Chennai	17-APR-24	17-APR-25	Temporary
LM020	Rohan	Kolkata	17-APR-24	17-APR-25	Permanent

2. LMS_BOOK_ISSUE

```
SQL> desc LMS_BOOK_ISSUE;
```

Name	Null?	Type
BOOK_ISSUE_NO	NOT NULL	NUMBER(38)
MEMBER_ID	NOT NULL	VARCHAR2(10)
BOOK_CODE	NOT NULL	VARCHAR2(10)
DATE_ISSUE	NOT NULL	DATE
DATE_RETURN	NOT NULL	DATE
DATE_RETURNED		DATE
FINE_RANGE		VARCHAR2(3)

BOOK_ISSUE_NO	MEMBER_ID	BOOK_CODE	DATE_ISSU	DATE_RETU	DATE_RETU	FIN
1	LM001	BL000010	01-MAY-12	16-MAY-12	16-MAY-12	R0
2	LM002	BL000002	01-MAY-12	06-MAY-12	16-MAY-12	R2
3	LM003	BL000007	01-APR-12	16-APR-12	20-APR-12	R1
4	LM004	BL000005	01-APR-12	16-APR-12	20-APR-12	R1
5	LM005	BL000008	30-MAR-12	15-APR-12	20-APR-12	R1
6	LM005	BL000008	20-APR-12	05-MAY-12	05-MAY-12	R0
7	LM003	BL000007	22-APR-12	07-MAY-12	25-MAY-12	R4
8	LM006	BL000003	17-APR-24	05-MAY-24	06-MAY-24	R2
9	LM007	BL000004	17-APR-24	10-MAY-24	11-MAY-24	R3
10	LM008	BL000005	17-APR-24	15-MAY-24	16-MAY-24	R1

3. LMS_BOOK_DETAILS

```
SQL> desc LMS_BOOK_DETAILS;
```

Name	Null?	Type
BOOK_CODE	NOT NULL	VARCHAR2(10)
BOOK_TITLE	NOT NULL	VARCHAR2(50)
CATEGORY	NOT NULL	VARCHAR2(15)
AUTHOR	NOT NULL	VARCHAR2(30)
PUBLICATION		VARCHAR2(30)
PUBLISH_DATE		DATE
BOOK_EDITION		NUMBER(38)
PRICE	NOT NULL	NUMBER(8,2)
RACK_NUM		VARCHAR2(3)
DATE_ARRIVAL	NOT NULL	DATE
SUPPLIER_ID	NOT NULL	VARCHAR2(3)

BOOK_CODE SUP	BOOK_TITLE	CATEG	AUTHOR	PUBLICATION	PUBLISH_DATE	BOOK_EDITION	PRICE	RAC	DATE_ARRIV

BL000010 S01	Java ForvDummies	JAVA	Paul J. Deitel	Prentice Hall	10-DEC-99	6	\$575	A1	10-MAY-11
BL000002 S03	Java: The Complete Reference	JAVA	Herbert Schildt	Tata Mcgraw Hill	10-OCT-11	5	\$750	A1	10-MAY-11
BL000003 S01	Java How To Do Program	JAVA	Paul J. Deitel	Prentice Hall	10-MAY-99	6	\$600	A1	10-MAY-12
BL000004 S01	Java: The Complete Reference	JAVA	Herbert Schildt	Tata Mcgraw Hill	10-OCT-11	5	\$750	A1	11-MAY-12
BL000005 S01	Java How To Do Program	JAVA	Paul J. Deitel	Prentice Hall	10-DEC-99	6	\$600	A1	11-MAY-12
BL000006 S03	Java: The Complete Reference	JAVA	Herbert Schildt	Tata Mcgraw Hill	10-OCT-11	5	\$750	A1	12-MAY-12
BL000007 S03	Let Us C	C	Yashavant Kanetkar	BPB Publications	11-DEC-10	9	\$500	A3	03-NOV-10
BL000008 S04	Let Us C	C	Yashavant Kanetkar	BPB Publications	12-MAY-10	9	\$500	A3	09-AUG-11
BL000009 S04	Let Us C#	C	Yashavant Kanetkar	BPB Publications	12-MAY-10	9	\$550	A3	09-AUG-11
BL000011 S04	Let Us C++	C	Yashavant Kanetkar	BPB Publications	12-MAY-10	9	\$650	A3	09-AUG-11

4. LMS_SUPPLIERS_DETAILS

```
SQL> desc LMS_SUPPLIERS_DETAILS;
```

Name	Null?	Type
SUPPLIER_ID	NOT NULL	VARCHAR2(3)
SUPPLIER_NAME	NOT NULL	VARCHAR2(30)
ADDRESS		
VARCHAR2(50)		
CONTACT	NOT NULL	NUMBER(10)
EMAIL	NOT NULL	VARCHAR2(15)

SUP	SUPPLIER_NAME	ADDRESS	CONTACT	EMAIL

S01	SINGAPORE SHOPPEE	CHENNAI	9894123555	sing@gmail.com
S02	JK Stores	MUMBAI	9940123450	jks@yahoo.com
S03	ROSE BOOK STORE	TRIVANDRUM	9444411222	rose@gmail.com
S04	KAVARI STORE	DELHI	8630001452	kavi@redif.com
S05	EINSTEN BOOK GALLERY	US	9542000001	eingal@aol.com
S06	AKBAR STORE	MUMBAI	7855623100	akbakst@aol.com

5. LMS_FINE_DETAILS

```
SQL> desc LMS_FINE_DETAILS;
```

Name	Null?	Type
-----	-----	-----
FINE_RANGE	NOT NULL	VARCHAR2(3)
FINE_AMOUNT	NOT NULL	NUMBER(10,2)

FIN	FINE_AMOUNT
-----	-------------

----	-----
R0	0
R1	20
R2	50
R3	75
R4	100
R5	150
R6	200

SQL Queries

1. Write a query to display the member id, member name, city and membership status who are all having life time membership.

```
SQL> select member_id,member_name,city,membership_status
2   from lms_members
3  where membership_status='Permanent';
```

MEMBER_ID	MEMBER_NAME	CITY	MEMBERSHIP_STAT
LM003	GAYAN	CHENNAI	Permanent
LM008	Rahul	Delhi	Permanent
LM011	Neha	Kolkata	Permanent
LM014	Vikas	Jaipur	Permanent
LM017	Shreya	Mumbai	Permanent
LM020	Rohan	Kolkata	Permanent

2. Write a query to display the average price of books which is belonging to 'JAVA' category with alias name "AVERAGEPRICE".

```
SQL> select avg(price) as averageprice from lms_book_details
2  where category='JAVA';
```

AVERAGEPRICE
670.833333

3. Write a query to display the member id, member name of the members, book code and book title of the books taken by them.

```
SQL> select m.member_id, m.member_name, b.book_code, bb.book_title from lms_members m, lms_book_issue b,
lms_book_details bb where m.member_id=b.member_id and b.book_code=bb.book_code;
```

MEMBER_ID	MEMBER_NAME	BOOK_CODE	BOOK_TITLE
LM001	AMIT	BL000010	Java ForvDummies
LM002	ABDHUL	BL000002	Java: The Complete Reference
LM003	GAYAN	BL000007	Let Us C
LM003	GAYAN	BL000007	Let Us C
LM004	RADHA	BL000005	Java How To Do Program
LM005	GURU	BL000008	Let Us C
LM005	GURU	BL000008	Let Us C
LM006	MOHAN	BL000003	Java How To Do Program
LM007	Sneha	BL000004	Java: The Complete Reference
LM008	Rahul	BL000005	Java How To Do Program

10 rows selected.

4. Write a query to display the supplier id, supplier name and email of the suppliers who are all having gmail accounts.

```
SQL> SELECT supplier_id, supplier_name, email
2 FROM lms_suppliers_details
3 WHERE email LIKE '%gmail%';
```

SUP	SUPPLIER_NAME	EMAIL
S01	SINGAPORE SHOPPEE	sing@gmail.com
S03	ROSE BOOK STORE	rose@gmail.com

5. Write a query to list the book title and supplier id for the books authored by “Herbert Schildt” and the book edition is 5 and supplied by supplier ‘S01’.

```
SQL> select book_title,supplier_id from lms_book_details where author like 'H%' and supplier_id='S01' and book_edition=5;
```

BOOK_TITLE	SUP
Java: The Complete Reference	S01

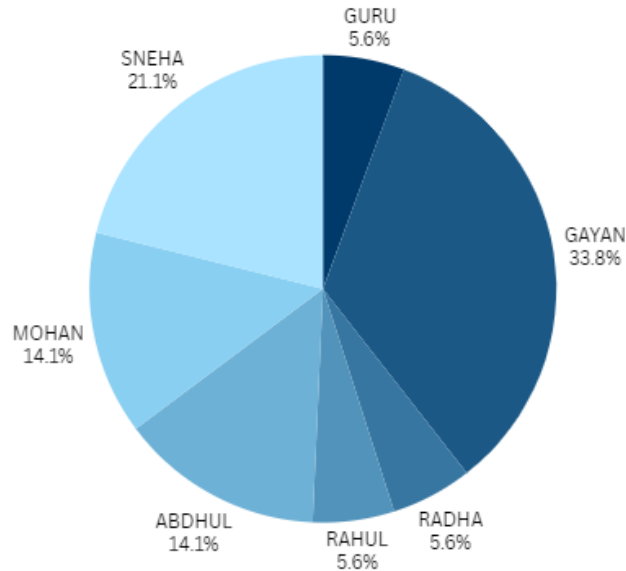
```
SQL>
```

6. Write a query to calculate the total fine amount for each member.

```
SQL> SELECT m.member_id, m.member_name, SUM(f.fine_amount) AS total_fine
2 FROM lms_members m
3 LEFT JOIN lms_book_issue bi ON m.member_id = bi.member_id
4 LEFT JOIN lms_fine_details f ON bi.fine_range = f.fine_range
5 GROUP BY m.member_id, m.member_name
6 HAVING SUM(f.fine_amount) > 0;
```

MEMBER_ID	MEMBER_NAME	TOTAL_FINE
LM005	GURU	20
LM003	GAYAN	120
LM004	RADHA	20
LM008	Rahul	20
LM002	ABDHUL	50
LM006	MOHAN	50
LM007	Sneha	75

7 rows selected.



7. Write a query to find the average number of days books are issued before being returned.

```
SQL> SELECT AVG((bi.date_return - bi.date_issue)) AS avg_issue_duration
2 FROM lms_book_issue bi;
```

```
AVG_ISSUE_DURATION
-----
16.5
```

8. Write a query to list members who have issued the most books.

```
SQL> SELECT m.member_id, m.member_name, COUNT(bi.book_issue_no) AS issuance_count
2 FROM lms_members m
3 JOIN lms_book_issue bi ON m.member_id = bi.member_id
4 GROUP BY m.member_id, m.member_name
5 ORDER BY issuance_count DESC;
```

MEMBER_ID	MEMBER_NAME	ISSUANCE_COUNT
LM005	GURU	2
LM003	GAYAN	2
LM008	Rahul	1
LM006	MOHAN	1
LM007	Sneha	1
LM002	ABDHUL	1
LM001	AMIT	1
LM004	RADHA	1

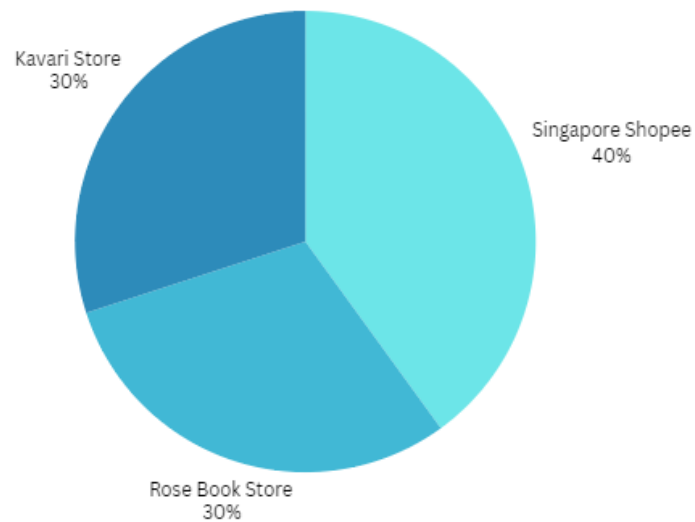
8 rows selected.

9. Write a query to find the total number of books issued by each supplier.

```
SQL> SELECT sd.supplier_id, sd.supplier_name, COUNT(bd.book_code) AS total_books_supplied
  2  FROM lms_suppliers_details sd
  3  JOIN lms_book_details bd ON sd.supplier_id = bd.supplier_id
  4  GROUP BY sd.supplier_id, sd.supplier_name;
```

SUP	SUPPLIER_NAME	TOTAL_BOOKS_SUPPLIED
S01	SINGAPORE SHOPPEE	4
S03	ROSE BOOK STORE	3
S04	KAVARI STORE	3

SQL>



10. Write a query to list books ordered by their publication date.

```
SQL> SELECT book_code, book_title, publication, publish_date
2 FROM lms_book_details
3 ORDER BY publish_date;
```

BOOK_CODE	BOOK_TITLE	PUBLICATION	PUBLISH_DATE
BL000003	Java How To Do Program	Prentice Hall	10-MAY-99
BL000010	Java ForvDummies	Prentice Hall	10-DEC-99
BL000005	Java How To Do Program	Prentice Hall	10-DEC-99
BL000011	Let Us C++	BPB Publications	12-MAY-10
BL000008	Let Us C	BPB Publications	12-MAY-10
BL000009	Let Us C#	BPB Publications	12-MAY-10
BL000007	Let Us C	BPB Publications	11-DEC-10
BL000004	Java: The Complete Reference	Tata Mcgraw Hill	10-OCT-11
BL000006	Java: The Complete Reference	Tata Mcgraw Hill	10-OCT-11
BL000002	Java: The Complete Reference	Tata Mcgraw Hill	10-OCT-11

10 rows selected.

11. Write a query to find the total fine amount for each book category.

```
SQL> SELECT bd.category, SUM(f.fine_amount) AS total_fine_amount
2 FROM lms_book_details bd
3 LEFT JOIN lms_book_issue bi ON bd.book_code = bi.book_code
4 LEFT JOIN lms_fine_details f ON bi.fine_range = f.fine_range
5 GROUP BY bd.category;
```

CATEG	TOTAL_FINE_AMOUNT
JAVA	215
C	140

12. Write a query to find the average price of books supplied by each supplier.

```
SQL> SELECT sd.supplier_id, sd.supplier_name, AVG(bd.price) AS avg_book_price
2 FROM lms_suppliers_details sd
3 JOIN lms_book_details bd ON sd.supplier_id = bd.supplier_id
4 GROUP BY sd.supplier_id, sd.supplier_name;
```

SUP	SUPPLIER_NAME	AVG_BOOK_PRICE
S01	SINGAPORE SHOPPEE	631.25
S03	ROSE BOOK STORE	666.666667
S04	KAVARI STORE	566.666667

SQL>

13. Write a query to list books along with their respective suppliers and the total number of times each book has been issued.

```
SQL> SELECT bd.book_code, bd.book_title, sd.supplier_name, COUNT(bi.book_issue_no) AS issuance_count
2 FROM lms_book_details bd
3 JOIN lms_suppliers_details sd ON bd.supplier_id = sd.supplier_id
4 LEFT JOIN lms_book_issue bi ON bd.book_code = bi.book_code
5 GROUP BY bd.book_code, bd.book_title, sd.supplier_name;
```

BOOK_CODE	BOOK_TITLE	SUPPLIER_NAME	ISSUANCE_COUNT
BL000010	Java ForvDummies	SINGAPORE SHOPPEE	1
BL000002	Java: The Complete Reference	ROSE BOOK STORE	1
BL000007	Let Us C	ROSE BOOK STORE	2
BL000005	Java How To Do Program	SINGAPORE SHOPPEE	2
BL000008	Let Us C	KAVARI STORE	2
BL000003	Java How To Do Program	SINGAPORE SHOPPEE	1
BL000004	Java: The Complete Reference	SINGAPORE SHOPPEE	1
BL000006	Java: The Complete Reference	ROSE BOOK STORE	0
BL000011	Let Us C++	KAVARI STORE	0
BL000009	Let Us C#	KAVARI STORE	0

14. Write a query to find the average number of books issued per member, excluding members with no issued books.

```
SQL> SELECT m.member_id, m.member_name, COUNT(DISTINCT bi.book_issue_no) AS avg_books_issued
2 FROM lms_members m
3 LEFT JOIN lms_book_issue bi ON m.member_id = bi.member_id
4 GROUP BY m.member_id, m.member_name
5 HAVING COUNT(DISTINCT bi.book_issue_no) > 0;
```

MEMBER_ID	MEMBER_NAME	AVG_BOOKS_ISSUED
LM001	AMIT	1
LM002	ABDHUL	1
LM003	GAYAN	2
LM004	RADHA	1
LM005	GURU	2
LM006	MOHAN	1
LM007	Sneha	1
LM008	Rahul	1

8 rows selected.

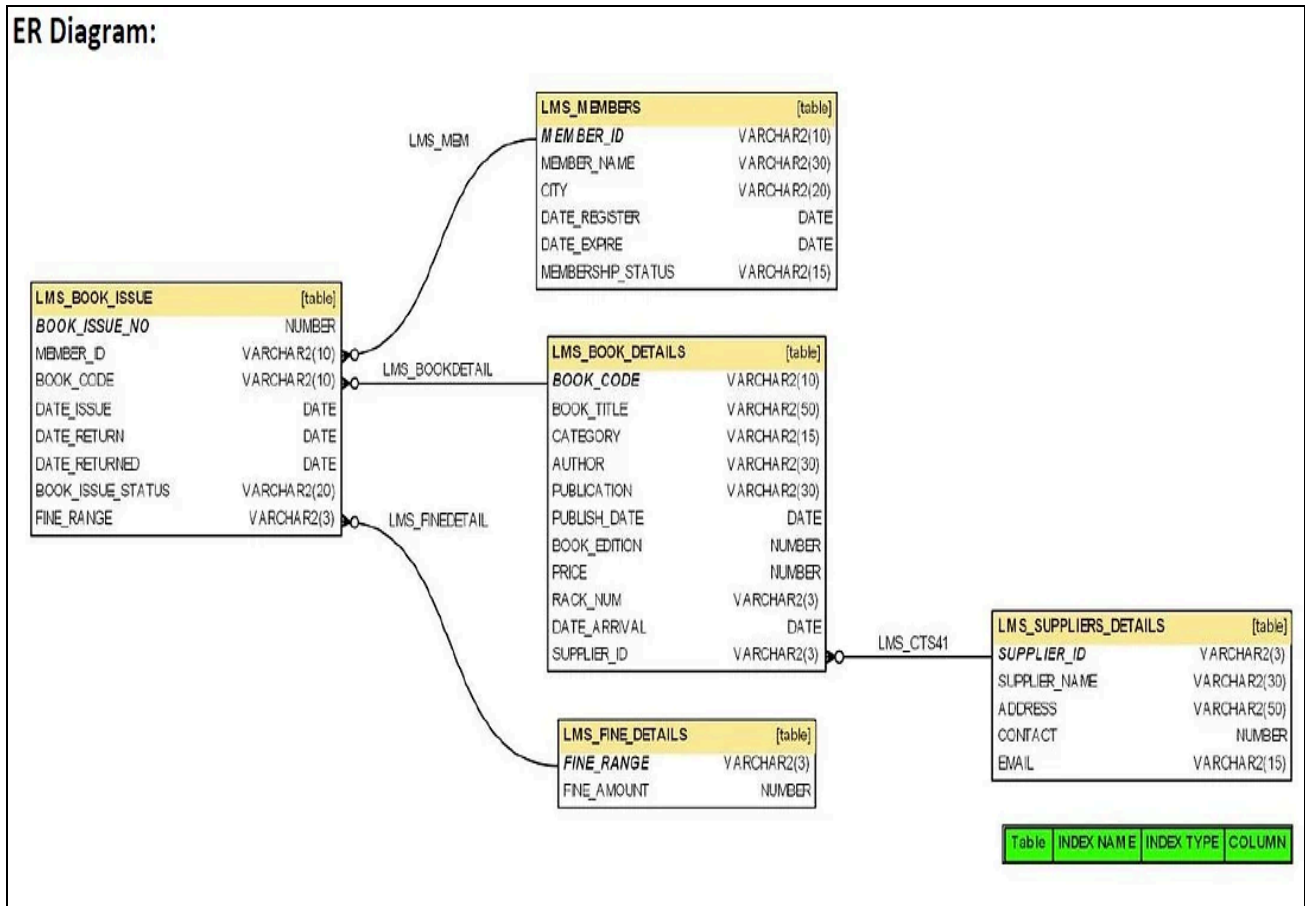
15. Write a query to display the member id, member name and number of remaining books he/she can take with "REMAINING" as column name. Assume a member can take maximum 3 books.

```
SQL> SELECT m.member_id, m.member_name, 3 - COUNT(bi.date_issue) AS remaining
2 FROM lms_members m
3 LEFT JOIN lms_book_issue bi ON m.member_id = bi.member_id
4 GROUP BY m.member_id, m.member_name;
```

MEMBER_ID	MEMBER_NAME	REMAINING
LM001	AMIT	2
LM002	ABDHUL	2
LM003	GAYAN	1
LM004	RADHA	2
LM005	GURU	1
LM006	MOHAN	2
LM007	Sneha	2
LM008	Rahul	2
LM014	Vikas	3
LM010	Arun	3
LM020	Rohan	3
LM009	Priya	3
LM012	Ravi	3
LM013	Meera	3
LM011	Neha	3
LM017	Shreya	3
LM019	Pooja	3
LM018	Ajay	3
LM015	Anjali	3
LM016	Sanjay	3

20 rows selected.

ER Diagram



One-to-Many Relationship (1:N):

- LMS_MEMBERS -> LMS_BOOK_ISSUE
- LMS_SUPPLIERS_DETAILS -> LMS_BOOK_DETAILS
- LMS_FINE_DETAILS -> LMS_BOOK_ISSUE
- LMS_BOOK_DETAILS -> LMS_BOOK_ISSUE

Data Dictionary

TABLE_NAME	COLUMN_NAME	DATA_TYPE	NULLABLE	DESCRIPTION
LMS_BOOK_DETAILS	AUTHOR	VARCHAR2	N	Author of the book
LMS_BOOK_DETAILS	BOOK_CODE	VARCHAR2	N	Unique identifier for a book
LMS_BOOK_DETAILS	BOOK_CODE	VARCHAR2	N	
LMS_BOOK_DETAILS	BOOK_EDITION	NUMBER	Y	Edition of the book
LMS_BOOK_DETAILS	BOOK_TITLE	VARCHAR2	N	Title of the book
LMS_BOOK_DETAILS	CATEGORY	VARCHAR2	N	Category of the book (e.g., Java, C)
LMS_BOOK_DETAILS	DATE_ARRIVAL	DATE	N	Date when the book arrived in the library
LMS_BOOK_DETAILS	PRICE	NUMBER	N	Price of the book
LMS_BOOK_DETAILS	PUBLICATION	VARCHAR2	Y	Publication of the book
LMS_BOOK_DETAILS	PUBLISH_DATE	DATE	Y	Date when the book was published
LMS_BOOK_DETAILS	RACK_NUM	VARCHAR2	Y	Rack number where the book is kept
LMS_BOOK_DETAILS	SUPPLIER_ID	VARCHAR2	N	Supplier ID from LMS_SUPPLIERS_DETAILS
LMS_BOOK_DETAILS	SUPPLIER_ID	VARCHAR2	N	
LMS_BOOK_ISSUE	BOOK_CODE	VARCHAR2	N	Identifier of the issued book
LMS_BOOK_ISSUE	BOOK_CODE	VARCHAR2	N	
LMS_BOOK_ISSUE	BOOK_ISSUE_NO	NUMBER	N	
LMS_BOOK_ISSUE	BOOK_ISSUE_NO	NUMBER	N	Unique identifier for a book issue
LMS_BOOK_ISSUE	DATE_ISSUE	DATE	N	Date when the book was issued
LMS_BOOK_ISSUE	DATE_RETURN	DATE	N	Date when the book is expected to be returned
LMS_BOOK_ISSUE	DATE_RETURNED	DATE	Y	Date when the book was returned
LMS_BOOK_ISSUE	FINE_RANGE	VARCHAR2	Y	
LMS_BOOK_ISSUE	FINE_RANGE	VARCHAR2	Y	Range indicating the fine associated with the issue
LMS_BOOK_ISSUE	MEMBER_ID	VARCHAR2	N	
LMS_BOOK_ISSUE	MEMBER_ID	VARCHAR2	N	Identifier of the member issuing the book
LMS_FINE_DETAILS	FINE_AMOUNT	NUMBER	N	Amount of fine associated with the fine range
LMS_FINE_DETAILS	FINE_RANGE	VARCHAR2	N	Range indicating the fine amount (e.g., R0, R1, R2)
LMS_FINE_DETAILS	FINE_RANGE	VARCHAR2	N	
LMS_MEMBERS	CITY	VARCHAR2	Y	City where the member resides
LMS_MEMBERS	DATE_EXPIRE	DATE	Y	Expiry date of the membership
LMS_MEMBERS	DATE_REGISTER	DATE	N	Date when the member registered with the library
LMS_MEMBERS	MEMBERSHIP_STATUS	VARCHAR2	N	Status of the membership (e.g., Temporary, Permanent)
LMS_MEMBERS	MEMBER_ID	VARCHAR2	N	
LMS_MEMBERS	MEMBER_ID	VARCHAR2	N	Unique identifier for a library member
LMS_MEMBERS	MEMBER_NAME	VARCHAR2	N	Name of the library member
LMS_SUPPLIERS_DETAILS	ADDRESS	VARCHAR2	Y	Address of the book supplier
LMS_SUPPLIERS_DETAILS	CONTACT	NUMBER	N	Contact number of the book supplier
LMS_SUPPLIERS_DETAILS	EMAIL	VARCHAR2	N	Email address of the book supplier
LMS_SUPPLIERS_DETAILS	SUPPLIER_ID	VARCHAR2	N	Unique identifier for a book supplier
LMS_SUPPLIERS_DETAILS	SUPPLIER_ID	VARCHAR2	N	
LMS_SUPPLIERS_DETAILS	SUPPLIER_NAME	VARCHAR2	N	Name of the book supplier



Normalization of Database

Types of Normalization Forms

First Normal Form (1NF)

Data is stored in tables with rows that can be uniquely identified by a Primary Key. Data within each table is stored in individual columns in its most reduced form. There are no repeating groups.

Second Normal Form (2NF)

All the rules from 1NF must be satisfied. Only data that relates to a table's primary key is stored in each table.

Third Normal Form (3NF)

All the rules from 2NF must be satisfied. There should be no intra-table dependencies between the columns in each table.

Types of Functional Dependencies

Full Functional Dependency:

It occurs when an attribute (or set of attributes) uniquely determines another attribute in a relation. It helps minimize redundancy and inconsistency by ensuring each attribute is uniquely determined by its entire key. It is crucial for achieving normalization and maintaining data integrity in relational databases.

Partial Dependency:

Partial Dependency arises when an attribute is functionally dependent on only a part of a candidate key, rather than the entire key. It can lead to data redundancy and anomalies, compromising data integrity. It can be addressed by decomposing relations into smaller, well-structured ones to eliminate partial dependencies and achieve higher normalization forms.

Normalization form of each table and Their respective functional dependencies

Table Name	Normalization Form	Functional Dependencies	Type of Functional Dependencies
LMS_MEMBERS	2NF	MEMBER_ID → MEMBER_NAME, CITY, DATE_REGISTER, DATE_EXPIRE, MEMBERSHIP_STATU S	Full Functional Dependency
LMS_SUPPLIERS_DE TAILS	2NF	SUPPLIER_ID → SUPPLIER_NAME, ADDRESS, CONTACT, EMAIL	Full Functional Dependency
LMS_FINE_DETAILS	2NF	FINE_RANGE → FINE_AMOUNT	Full Functional Dependency
LMS_BOOK_DETAILS	1NF	BOOK_CODE → BOOK_TITLE, CATEGORY, AUTHOR, PUBLICATION, PUBLISH_DATE, BOOK_EDITION, PRICE, RACK_NUM, DATE_ARRIVAL, SUPPLIER_ID AUTHOR → {BOOK_CODE, PUBLICATION, PUBLISH_DATE} PUBLICATION → {BOOK_CODE, AUTHOR, PUBLISH_DATE}	Partial Dependency
LMS_BOOK_ISSUE	1NF	BOOK_ISSUE_NO → MEMBER_ID,	Full Functional Dependency

		BOOK_CODE, DATE_ISSUE, DATE_RETURN, DATE_RETURNED, FINE_RANGE	
--	--	---	--

Converting Tables to 3NF

To convert the schema to 3NF, we need to ensure that every non-prime attribute is non-transitively dependent on the primary key.

We will divide the table LMS_BOOK_DETAILS into LMS_AUTHORS and LMS_PUBLICATIONS and then connect it with the BOOK_CODE by making the tables LMS_BOOK_AUTHORS and LMS_BOOK_PUBLICATIONS.

LMS_MEMBERS (MEMBER_ID, MEMBER_NAME, CITY, DATE_REGISTER, DATE_EXPIRE, MEMBERSHIP_STATUS)

LMS_SUPPLIERS_DETAILS (SUPPLIER_ID, SUPPLIER_NAME, ADDRESS, CONTACT, EMAIL)

LMS_FINE_DETAILS (FINE_RANGE, FINE_AMOUNT)

LMS_AUTHORS (AUTHOR_ID, AUTHOR, BOOK_CODE)

LMS_PUBLICATIONS (PUBLICATION_ID, PUBLICATION, PUBLISH_DATE, BOOK_CODE)

LMS_BOOK_DETAILS (BOOK_CODE, BOOK_TITLE, CATEGORY, BOOK_EDITION, PRICE, RACK_NUM, DATE_ARRIVAL, SUPPLIER_ID)

References

[1] Md Fazlul Quader Chowdhury(2015). Database Management Systems and Use of Digital Resources in Some Selected Public University Libraries of Bangladesh: An Overview

[2] Jewell, T. D., Anderson, I., Chandler, A., Farb, S. E., Parker, K., Riggio, A., & Robertson, N. D. (2018). Electronic Resource Management. Report of the DLF Initiative, Digital Library Federation, 2004.



[3] Okogwu, Flora. (2020). Electronic Resources Collection Development in University Libraries: An Empirical Review of Selected Literature.

[4] Prem Narayan Bajpai, Dr. Sanjeev Sharma (2017). MANAGEMENT OF ELECTRONIC RESOURCES IN SPECIAL LIBRARIES OF DELHI, NCR

[5] Cyprian I. Ugwu, D. C. Onyegiri, Management problems of electronic information resources: A case study of UNN Library, International Journal of Library and Information Science

[6] Singley, E., & Natches, J. (2017). Finding the gaps: A survey of electronic resource management in Alma, Sierra, and WMS. Journal of Electronic Resources Librarianship, 29(2), 71–83. <https://doi.org/10.1080/1941126X.2017.1304763>

[7] Pradhan Sanghamitra (2017). Developing standards for electronic resource management. International Journal of Information Dissemination and Technology

[8] <https://www.technavio.com/report/library-management-software-market-industry-analysis>