Project Demonstration

TableFlippers

1. Introduction

Project Overview

The Library Database Management System (LDBMS) is developed to increase the productivity and organization of library management. The system will manage book and digital media management, membership management, borrowing processes, and reporting. By implementing a structured and automated process, the LDBMS will improve user experience, reduce administrative tasks, and ensure accurate record-keeping, providing a more accessible and easier-to-use library system.

Scope

The LDBMS will cover:

- Management of library inventory, including books, digital media, and magazines.
- Tracking of client memberships, borrowing limits, and fees.
- Implementation of borrowing, returning, and reservation functionalities.

Generation of various reports related to borrowing trends, overdue items, and revenue collection.

2. Database Demonstration

Check membership status: Display the current status and account information for a specific client based on their unique ID.

```
SELECT * from "Client" where client_id =
'dd265b9b-0b8c-4f0e-8720-7bde7361813c';
```

Output:

account_statu	created_at	phone_number	membership_ty	borrow_limit	fee_rate	max_borrow_da	client_id	client_name
Verified	2025-04-19 05:03:56.16282+00	000-000-0000	Standard	5	0.3	14	dd265b9b-0b8c-4f0e-8720-7bde7361813c	Sophia Hayes

Fine calculation: Calculate the total fines owed by each member, considering overdue books

and a daily fine rate (e.g., $0.25 per day).

```sql
SELECT
    c.client_id,
    c.client_name,
    ROUND(COALESCE(SUM(b.fee), 0)::decimal, 2) AS total_fine,
    c.fee_rate,
    c.membership_type
FROM
    "Client" c
LEFT JOIN
    "Borrowing" b ON c.client_id = b.client_id
GROUP BY
    c.client_id
ORDER BY total_fine DESC;
```

Output:

client_id	client_name	total_fine	fee_rate	membership_type
5d47d66a-0220-4908-b5c5-43aa2e72d96c	James Foster	14.26	0.3	Standard
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	12.00	0.3	Standard
40a8b220-bb98-43d1-9114-ed02400fd591	Noah Mitchell	10.65	0.3	Standard
2363abc1-e9bd-4400-97ce-2a09aa946394	Evelyn Bell	7.73	0.3	Standard
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	7.50	0.15	Student
19e1aa56-1084-426f-9a8f-a45198c94071	Grace Jenkins	6.07	0.3	Standard
9ab71df0-ae4a-439e-bd8e-29e879d29a96	Lily Powell	4.80	0.15	Student
e695eaaa-4fc2-4191-ab2e-9541575a1f54	Amelia Cooper	4.50	0.3	Standard
3f4f74e6-5b95-46ee-8a4e-9a98b85f6935	Jack Richardson	4.20	0.3	Standard
ee929f66-dd32-46e6-ae9b-014cebb34c77	Hazel Long	3.90	0.15	Student
842f6ebe-f0a5-4805-a51d-8e39a45af120	Luke Hayes	3.73	0.1	Senior
5293004e-9e13-461e-b7d8-e1aaac4405cc	Isabella Brooks	2.70	0.15	Student
255096ea-e935-4a2d-b61f-ecc7aa970189	Elijah Reed	2.47	0.3	Standard
48385d26-cd97-4479-be00-9b75cd2c16ee	Aurora Jenkins	2.37	0.1	Senior
d0d683d5-b05c-42a1-9c4b-bf2f6f221db2	Ella Griffin	2.25	0.3	Standard
bc626649-6033-4c65-a5eb-4a15abd13e5f	Jackson Barnes	2.25	0.15	Student
7b0eda9f-9543-40c0-aeba-aa66cdc347a4	Henry Bailey	1.80	0.3	Standard
9c3c4c7c-f929-4043-87f9-080ec29fc171	Penelope Ross	1.24	0.15	Student
9bb54fd7-d967-4204-8647-60191621d057	Nathaniel Torres	1.12	0.1	Senior
421b2714-6b0f-4450-9749-6680a57e975c	Alexander Ward	1.05	0.3	Standard
140050cd-34ed-47b6-8ff6-608ca4559a47	Eli Martinez	0.60	0.1	Senior
f07b85c5-c6dd-45cc-9a52-6591c2cf8113	David Patterson	0.52	0.15	Student
08a04207-0e90-4d24-ba10-1b378abb9eaf	Layla Bennett	0.30	0.15	Student
fae26394-0f19-41a0-b3a8-c083b7c6f5e8	Gabriel Foster	0.10	0.1	Senior
3f5dc4f9-92fa-4367-a6c9-0b41735960d6	Chloe Simmons	0.00	0.15	Student
dd265b9b-0b8c-4f0e-8720-7bde7361813c	Sophia Hayes	0.00	0.3	Standard
1382c265-7053-449e-939e-818c695a5a1e	Logan Bryant	0.00	0.15	Student
2b9454a5-dab0-4fbe-81a5-1648a7473fdc	Mia Sanders	0.00	0.3	Standard
5786e225-2a9d-4ec9-9e51-0c9aeb0d007e	Scarlett Hughes	0.00	0.3	Standard
3a16c135-ecdc-459c-8c61-a0bea01d7549	Violet Kim	0.00	0.1	Senior
24fe50f8-1fe7-4d64-9f06-2656e5ce132a	Savannah Lee	0.00	0.1	Senior
85388e83-70f5-4909-900f-84e6939a8c68	Julian Coleman	0.00	0.15	Student
102e1786-b0c7-45be-a2c3-bd04c0277c76	William Russell	0.00	0.3	Standard
38c5a3b3-cf3a-4fc8-82c9-44a73cb0445f	Benjamin Perry	0.00	0.3	Standard
3fb6d15a-9edb-4ecf-947c-e9d9036498bd	Aria Henderson	0.00	0.15	Student
5623a608-ac4a-46a3-bdc2-b671a6e4bf03	Ava Morgan	0.00	0.3	Standard
2c9646ca-989f-4633-970e-8ecfa0662265	Sebastian James	0.00	0.15	Student
6ed8608e-5280-42ca-8c69-576b82ca6c8b	Ellie Simmons	0.00	0.1	Senior
540e8514-50dd-4a71-a80f-3aa7667fcebf	Charlotte Murphy	0.00	0.3	Standard
9e6c6fa4-62dc-4ac2-82f4-a414c88d6ad9	Abdulaziz Ali	0.00	0.1	Senior
5aad4fdf-e565-4212-8bb3-9791f5afbe3c	Harper Cox	0.00	0.3	Standard
e294717d-5c9e-42ab-ab72-535eeadbf171	Levi Powell	0.00	0.15	Student
f72f84cc-3199-4a83-8e51-c5309a507023	Lucas Price	0.00	0.3	Standard
72ad6524-872c-4d7f-8b7f-2634d48f3f5f	Liam Bennett	0.00	0.3	Standard
255f9b48-9e1c-45bb-94d5-9ca420423db4	Emma Turner	0.00	0.3	Standard
7157b864-86de-4727-9e65-bcc36999c453	Olivia Carter	0.00	0.3	Standard
60d53b4e-c595-4360-a253-5315771fdfc9	Zoe Butler	0.00	0.15	Student
29ffe329-bba2-4eed-9d30-ad26918898b4	Wyatt Peterson	0.00	0.15	Student
59ec8806-b351-4c30-9eeb-fbb536d4e26d	Daniel Howard	0.00	0.3	Standard
c6149ae5-f3ff-4d03-bbb3-21e1d8c1bf02	Nora Perry	0.00	0.15	Student

Book availability: Display a list of all available books (not currently borrowed) within a specific genre.

```sql
SELECT i.title, b.author,i.availability_status, g.genre_name as genre
FROM "Books" b
JOIN "Item" i ON i.item_id = b.item_id
JOIN "ItemGenre" ig ON b.item_id = ig.item_id
JOIN "Genre" g ON ig.genre_id = g.genre_id
WHERE g.genre_name = 'Fiction' AND i.availability_status = 'available';
```

Output:

title	author	availability_	genre
The Great Gatsby	F. Scott Fitzgerald	available	Fiction
1984	George Orwell	available	Fiction
To Kill a Mockingbird	Harper Lee	available	Fiction
Pride and Prejudice	Jane Austen	available	Fiction
The Catcher in the Rye	J.D. Salinger	available	Fiction
War and Peace	Leo Tolstoy	available	Fiction
The Odyssey	Homer	available	Fiction
The Brothers Karamazov	Fyodor Dostoevsky	available	Fiction
Crime and Punishment	Fyodor Dostoevsky	available	Fiction
The Catch-22	Joseph Heller	available	Fiction
The Grapes of Wrath	John Steinbeck	available	Fiction
The Road	Cormac McCarthy	available	Fiction
The Fault in Our Stars	John Green	available	Fiction
The Alchemist	Paulo Coelho	available	Fiction
The Kite Runner	Khaled Hosseini	available	Fiction
The Book Thief	Markus Zusak	available	Fiction
The Night Circus	Erin Morgenstern	available	Fiction

Frequent borrowers of a specific genre: Identify the members who have borrowed the most books in a particular genre (e.g., "Mystery") in the last year.

```sql
SELECT
    c.client_id,
    c.client_name,
    COUNT(b.transaction_id) AS total_books_borrowed
FROM
    "Client" c
JOIN
    "Borrowing" b ON c.client_id = b.client_id
JOIN
    "Item" i ON b.item_id = i.item_id
JOIN
    "ItemGenre" ig ON i.item_id = ig.item_id
JOIN
    "Genre" g ON ig.genre_id = g.genre_id
WHERE
    g.genre_name = 'Fiction'
    AND b.borrow_date >= NOW() - INTERVAL '1 year'
GROUP BY
    c.client_id, c.client_name
ORDER BY
    total_books_borrowed DESC;
```

Output:

client_id	client_name	total_books_borrowed
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	4
3f4f74e6-5b95-46ee-8a4e-9a98b85f6935	Jack Richardson	3
5d47d66a-0220-4908-b5c5-43aa2e72d96c	James Foster	3
19e1aa56-1084-426f-9a8f-a45198c94071	Grace Jenkins	3
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	3
40a8b220-bb98-43d1-9114-ed02400fd591	Noah Mitchell	2
842f6ebe-f0a5-4805-a51d-8e39a45af120	Luke Hayes	2
9e6c6fa4-62dc-4ac2-82f4-a414c88d6ad9	Abdulaziz Ali	1
bc626649-6033-4c65-a5eb-4a15abd13e5f	Jackson Barnes	1
c6149ae5-f3ff-4d03-bbb3-21e1d8c1bf02	Nora Perry	1
e695eaaa-4fc2-4191-ab2e-9541575a1f54	Amelia Cooper	1

Books due soon: Generate a report of all books due within the next week, sorted by due date.

```sql
SELECT
    c.client_id,
    c.client_name,
    i.title,
    b.due_date
FROM
    "Client" c
JOIN
    "Borrowing" b ON c.client_id = b.client_id
JOIN
    "Item" i ON b.item_id = i.item_id
WHERE
    b.due_date BETWEEN NOW() AND NOW() + INTERVAL '7 days'
ORDER BY
    b.due_date ASC;
```

Output:

client_id	client_name	title	due_date
e294717d-5c9e-42ab-ab72-535eeadbf171	Levi Powell	1984	2025-05-09 04:14:37.721992+00
7b0eda9f-9543-40c0-aeba-aa66cdc347a4	Henry Bailey	Interstellar (Blu-ray)	2025-05-10 04:14:37.721992+00

Members with overdue books: List all members who currently have at least one overdue book, along with the titles of the overdue books.

```sql
SELECT
    c.client_id,
    c.client_name,
    i.title,
    b.due_date
FROM
    "Client" c
JOIN
    "Borrowing" b ON c.client_id = b.client_id
JOIN
    "Item" i ON b.item_id = i.item_id
WHERE
    b.due_date < NOW()  and b.status != 'returned'
ORDER BY
    b.due_date ASC;
```

Output:

client_id	client_name	title
e695eaaa-4fc2-4191-ab2e-9541575a1f54	Amelia Cooper	The Dark Knight (Blu-ray)
bc626649-6033-4c65-a5eb-4a15abd13e5f	Jackson Barnes	National Geographic - August 2024
19e1aa56-1084-426f-9a8f-a45198c94071	Grace Jenkins	The Picture of Dorian Gray
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	Star Wars: A New Hope (Blu-ray)
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	Finding Nemo (Blu-ray)
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	The Lord of the Rings: The Fellowship of the Ring (Blu-ray)
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	Brave New World

Average borrowing time: Calculate the average number of days members borrow books for a specific genre.

```sql
SELECT
    AVG(b.due_date - b.borrow_date) AS average_borrowing_days
FROM
    "Borrowing" b
JOIN
    "Item" i ON b.item_id = i.item_id
JOIN
    "ItemGenre" ig ON i.item_id = ig.item_id
JOIN
    "Genre" g ON ig.genre_id = g.genre_id
WHERE
    g.genre_name = 'Non-Fiction'
    AND b.status = 'returned';
```

Output:

average_borrowing_days
21 days 08:55:17.255019

Most popular author in the last month: Determine the author whose books have been borrowed the most in the last month.

```sql
SELECT
    b.author,
    COUNT(br.transaction_id) AS borrow_count
FROM
    "Borrowing" br
JOIN
    "Books" b ON br.item_id = b.item_id
WHERE
    br.borrow_date >= NOW() - INTERVAL '1 month'
    AND br.status = 'returned'
GROUP BY
    b.author
ORDER BY
    borrow_count DESC
LIMIT 1;
```

Output:

author	borrow_count
Khaled Hosseini	1

Monthly fees report: Generate a report of total fees collected within the last month, broken down by membership type.

```sql
SELECT
    c.membership_type,
    SUM(p.amount) AS total_fees_collected
FROM
    "Payments" p
JOIN
    "Client" c ON p.client_id = c.client_id
WHERE
    p.created_at >= NOW() - INTERVAL '1 month'
GROUP BY
    c.membership_type
ORDER BY
    total_fees_collected DESC;
```

Output:

membership_ty	total_fees_collected
Student	16.42
Standard	3.74
Senior	1.03

Exceeded borrowing limits: Produce a list of clients who have exceeded their borrowing Limits.

```sql
SELECT
    c.client_id,
    c.client_name,
    COUNT(br.transaction_id) AS current_borrow_count,
    c.borrow_limit
FROM
    "Client" c
JOIN
    "Borrowing" br ON c.client_id = br.client_id
WHERE
    Br.status != 'returned'
GROUP BY
    c.client_id, c.client_name, c.borrow_limit
HAVING
    COUNT(br.transaction_id) > c.borrow_limit
ORDER BY
    c.client_name ASC;
```

Does Not apply as clients cannot borrow more than their set borrowing limit

Frequent borrowed items by client type: Determine the most frequently borrowed items by each client type.

```sql
SELECT
    c.membership_type,
    i.title,
    COUNT(br.transaction_id) AS borrow_count
FROM
    "Borrowing" br
JOIN
    "Client" c ON br.client_id = c.client_id
JOIN
    "Item" i ON br.item_id = i.item_id
GROUP BY
    c.membership_type, i.title
```

```
HAVING COUNT(br.transaction_id) > 1
ORDER BY
    borrow_count DESC;
```

Output:

membership_type	title	borrow_count
Student	GQ – April 2024	3
Standard	The Picture of Dorian Gray	3
Student	The Atlantic – January 2024	3
Senior	Rolling Stone – September 2023	3
Student	1984	3
Standard	The Social Network (DVD)	2
Standard	The Avengers (Blu-ray)	2
Standard	Crime and Punishment	2
Standard	Moby Dick	2
Student	The Avengers (Blu-ray)	2
Senior	The Great Gatsby	2
Student	The Book Thief	2
Standard	GQ – April 2024	2
Standard	To Kill a Mockingbird	2
Student	Wired – June 2023	2
Standard	The Book Thief	2
Standard	Time – September 2024	2
Student	Vogue – May 2023	2
Senior	The New Yorker – February 2024	2
Standard	The Dark Knight (Blu-ray)	2
Standard	War and Peace	2
Standard	The Catch-22	2

Never late returns: Find out which clients have never returned an item late.

```sql
SELECT
    c.client_id,
    c.client_name
FROM
    "Client" c
WHERE
    NOT EXISTS (
        SELECT 1
        FROM "Borrowing" br
        WHERE br.client_id = c.client_id
        AND ((br.return_date IS NULL AND br.due_date < NOW()) or br.return_date
> br.due_date)
    )
ORDER BY
    c.client_name ASC;
```

Output:

client_id	client_name
9e6c6fa4-62dc-4ac2-82f4-a414c88d6ad9	Abdulaziz Ali
3fb6d15a-9edb-4ecf-947c-e9d9036498bd	Aria Henderson
5623a608-ac4a-46a3-bdc2-b671a6e4bf03	Ava Morgan
38c5a3b3-cf3a-4fc8-82c9-44a73cb0445f	Benjamin Perry
540e8514-50dd-4a71-a80f-3aa7667fcebf	Charlotte Murphy
3f5dc4f9-92fa-4367-a6c9-0b41735960d6	Chloe Simmons
59ec8806-b351-4c30-9eeb-fbb536d4e26d	Daniel Howard
6ed8608e-5280-42ca-8c69-576b82ca6c8b	Ellie Simmons
5aad4fdf-e565-4212-8bb3-9791f5afbe3c	Harper Cox
85388e83-70f5-4909-900f-84e6939a8c68	Julian Coleman
e294717d-5c9e-42ab-ab72-535eeadbf171	Levi Powell
72ad6524-872c-4d7f-8b7f-2634d48f3f5f	Liam Bennett
1382c265-7053-449e-939e-818c695a5a1e	Logan Bryant
f72f84cc-3199-4a83-8e51-c5309a507023	Lucas Price
2b9454a5-dab0-4fbe-81a5-1648a7473fdc	Mia Sanders
c6149ae5-f3ff-4d03-bbb3-21e1d8c1bf02	Nora Perry
7157b864-86de-4727-9e65-bcc36999c453	Olivia Carter
5786e225-2a9d-4ec9-9e51-0c9aeb0d007e	Scarlett Hughes
2c9646ca-989f-4633-970e-8ecfa0662265	Sebastian James
3a16c135-ecdc-459c-8c61-a0bea01d7549	Violet Kim
102e1786-b0c7-45be-a2c3-bd04c0277c76	William Russell
29ffe329-bba2-4eed-9d30-ad26918898b4	Wyatt Peterson
60d53b4e-c595-4360-a253-5315771fdfc9	Zoe Butler

Average loan duration: Calculate the average time an item stays on loan before being
Returned.

```sql
SELECT
    AVG(br.return_date - br.borrow_date) AS average_loan_duration
FROM
    "Borrowing" br
WHERE
    br.return_date = 'returned';
```

Output:


```
average_loan_duration

21 days 09:07:46.412331
```

Monthly summary report: Generate a report summarizing the total number of items loaned,
total fees collected, and most popular items for the month.

```sql
WITH loaned_items AS (
    SELECT
        COUNT(br.transaction_id) AS total_items_loaned
    FROM
        "Borrowing" br
    WHERE
        br.borrow_date >= NOW() - INTERVAL '1 month'
),
fee_collected AS(
    SELECT
        SUM(p.amount) AS total_fees_collected
    FROM
        "Borrowing" br
    JOIN
        "Payments" p ON br.transaction_id = p.transaction_id
```

```sql
    WHERE
        br.borrow_date >= NOW() - INTERVAL '1 month'
),
popular_items AS (
    SELECT
        i.title,
        COUNT(br.transaction_id) AS borrow_count
    FROM
        "Borrowing" br
    JOIN
        "Item" i ON br.item_id = i.item_id
    WHERE
        br.borrow_date >= NOW() - INTERVAL '1 month'
    GROUP BY
        i.title
    ORDER BY
        borrow_count DESC
    LIMIT 1
)
SELECT
    li.total_items_loaned,
    coalesce(fc.total_fees_collected, 0) as total_fees_collected,
    pi.title AS most_popular_item
FROM
    loaned_items li,
    fee_collected fc,
    popular_items pi;
```

Output:

total_items_loaned	total_fees_collected	most_popular_item
6	0	1984

Statistics breakdown: Breakdown the statistics by client type and item category (books, digital media, magazines).

```sql
SELECT
    c.membership_type,
    i.item_type,
    COUNT(br.transaction_id) AS total_items_loaned,
    COALESCE(SUM(p.amount), 0) AS total_fees_collected
FROM
    "Borrowing" br
JOIN
    "Client" c ON br.client_id = c.client_id
JOIN
    "Item" i ON br.item_id = i.item_id
LEFT JOIN
    "Payments" p ON br.transaction_id = p.transaction_id
WHERE
    br.borrow_date >= NOW() - INTERVAL '1 month'
GROUP BY
    c.membership_type, i.item_type
ORDER BY
    c.membership_type, i.item_type;
```

Output:

membership_ty	item_type	total_items_loaned	total_fees_collected
Senior	book	1	0
Standard	book	1	0
Standard	media	2	0
Student	book	1	0
Student	media	1	0

Client borrowing report: Produce an individual report for each client showing their borrowing history, outstanding fees, and any reserved items.

```sql
WITH total_reserved_items_by_client AS (
    SELECT r.client_id, COALESCE(COUNT(r.reservation_id), 0) as item_count
    FROM "Reservations" r
    GROUP BY r.client_id
),
total_fee_by_client AS (
    SELECT br.client_id, COALESCE(SUM(br.fee), 0) as fee_sum
    FROM "Borrowing" br
    GROUP BY br.client_id
)
SELECT
    c.client_id,
    c.client_name,
    c.membership_type,
    COUNT(br.transaction_id) AS total_items_loaned,
    COALESCE(tf.fee_sum, 0) AS total_fees_unpaid,
    COALESCE(SUM(p.amount), 0) AS total_fees_collected,
    COALESCE(tr.item_count, 0) AS total_reserved_items
FROM
    "Client" c
LEFT JOIN
    "Borrowing" br ON c.client_id = br.client_id
LEFT JOIN
    "Payments" p ON br.transaction_id = p.transaction_id
LEFT JOIN
    total_reserved_items_by_client tr ON c.client_id = tr.client_id
LEFT JOIN
    total_fee_by_client tf ON c.client_id = tf.client_id
GROUP BY
    c.client_id, c.client_name, c.membership_type, tr.item_count, tf.fee_sum
ORDER BY
    total_items_loaned DESC, total_fees_unpaid DESC,  total_fees_collected
DESC;
```

Output:

client_id	client_name	membership_ty	total_items_l	total_fees_un	total_fees_co	total_reserve
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	Student	14	7.5	31.87	1
2363abc1-e9bd-4400-97ce-2a09aa946394	Evelyn Bell	Standard	8	7.73	6.97	0
9ab71df0-ae4a-439e-bd8e-29e879d29a96	Lily Powell	Student	7	4.8	0.9	0
5d47d66a-0220-4908-b5c5-43aa2e72d96c	James Foster	Standard	6	14.26	4.79	0
40a8b220-bb98-43d1-9114-ed02400fd591	Noah Mitchell	Standard	6	10.65	22.8	2
5293004e-9e13-461e-b7d8-e1aaac4405cc	Isabella Brooks	Student	6	2.7	4.69	0
48385d26-cd97-4479-be00-9b75cd2c16ee	Aurora Jenkins	Senior	6	2.37	2.83	0
9c3c4c7c-f929-4043-87f9-080ec29fc171	Penelope Ross	Student	6	1.24	0.41	0
9bb54fd7-d967-4204-8647-60191621d057	Nathaniel Torres	Senior	6	1.12	1.58	0
dd265b9b-0b8c-4f0e-8720-7bde7361813c	Sophia Hayes	Standard	6	0	6.9	0
ee929f66-dd32-46e6-ae9b-014cebb34c77	Hazel Long	Student	5	3.9	3	0
842f6ebe-f0a5-4805-a51d-8e39a45af120	Luke Hayes	Senior	5	3.73	0.47	0
140050cd-34ed-47b6-8ff6-608ca4559a47	Eli Martinez	Senior	5	0.6	0.2	0
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	Standard	4	12	15	0
255096ea-e935-4a2d-b61f-ecc7aa970189	Elijah Reed	Standard	4	2.47	2.89	0
255f9b48-9e1c-45bb-94d5-9ca420423db4	Emma Turner	Standard	4	0	13.8	0
24fe50f8-1fe7-4d64-9f06-2656e5ce132a	Savannah Lee	Senior	4	0	1.2	0
19e1aa56-1084-426f-9a8f-a45198c94071	Grace Jenkins	Standard	3	6.07	15.98	0
3f4f74e6-5b95-46ee-8a4e-9a98b85f6935	Jack Richardson	Standard	3	4.2	0	0
d0d683d5-b05c-42a1-9c4b-bf2f6f221db2	Ella Griffin	Standard	3	2.25	0.75	0
421b2714-6b0f-4450-9749-6680a57e975c	Alexander Ward	Standard	3	1.05	6	0
85388e83-70f5-4909-900f-84e6939a8c68	Julian Coleman	Student	3	0	0	0
bc626649-6033-4c65-a5eb-4a15abd13e5f	Jackson Barnes	Student	2	2.25	12.6	0
7b0eda9f-9543-40c0-aeba-aa66cdc347a4	Henry Bailey	Standard	2	1.8	0	0
08a04207-0e90-4d24-ba10-1b378abb9eaf	Layla Bennett	Student	2	0.3	0.3	0
e294717d-5c9e-42ab-ab72-535eeadbf171	Levi Powell	Student	2	0	0	0
e695eaaa-4fc2-4191-ab2e-9541575a1f54	Amelia Cooper	Standard	1	4.5	25.8	0
f07b85c5-c6dd-45cc-9a52-6591c2cf8113	David Patterson	Student	1	0.52	1.58	0
fae26394-0f19-41a0-b3a8-c083b7c6f5e8	Gabriel Foster	Senior	1	0.1	0	0

9e6c6fa4-62dc-4ac2-82f4-a414c88d6ad9	Abdulaziz Ali	Senior	1	0	0	5
5786e225-2a9d-4ec9-9e51-0c9aeb0d007e	Scarlett Hughes	Standard	1	0	0	0
6ed8608e-5280-42ca-8c69-576b82ca6c8b	Ellie Simmons	Senior	1	0	0	0
72ad6524-872c-4d7f-8b7f-2634d48f3f5f	Liam Bennett	Standard	1	0	0	0
c6149ae5-f3ff-4d03-bbb3-21e1d8c1bf02	Nora Perry	Student	1	0	0	0
7157b864-86de-4727-9e65-bcc36999c453	Olivia Carter	Standard	0	0	0	0
38c5a3b3-cf3a-4fc8-82c9-44a73cb0445f	Benjamin Perry	Standard	0	0	0	0
3a16c135-ecdc-459c-8c61-a0bea01d7549	Violet Kim	Senior	0	0	0	0
29ffe329-bba2-4eed-9d30-ad26918898b4	Wyatt Peterson	Student	0	0	0	0
f72f84cc-3199-4a83-8e51-c5309a507023	Lucas Price	Standard	0	0	0	0
1382c265-7053-449e-939e-818c695a5a1e	Logan Bryant	Student	0	0	0	0
3fb6d15a-9edb-4ecf-947c-e9d9036498bd	Aria Henderson	Student	0	0	0	0
5aad4fdf-e565-4212-8bb3-9791f5afbe3c	Harper Cox	Standard	0	0	0	0
59ec8806-b351-4c30-9eeb-fbb536d4e26d	Daniel Howard	Standard	0	0	0	0
2c9646ca-989f-4633-970e-8ecfa0662265	Sebastian James	Student	0	0	0	0
102e1786-b0c7-45be-a2c3-bd04c0277c76	William Russell	Standard	0	0	0	0
3f5dc4f9-92fa-4367-a6c9-0b41735960d6	Chloe Simmons	Student	0	0	0	0
540e8514-50dd-4a71-a80f-3aa7667fcebf	Charlotte Murphy	Standard	0	0	0	0
2b9454a5-dab0-4fbe-81a5-1648a7473fdc	Mia Sanders	Standard	0	0	0	0
60d53b4e-c595-4360-a253-5315771fdfc9	Zoe Butler	Student	0	0	0	0
5623a608-ac4a-46a3-bdc2-b671a6e4bf03	Ava Morgan	Standard	0	0	0	0

Item availability and history: List all items, their current availability status, and their last borrowed date. Highlight items that have not been borrowed in the past six months.

```sql
SELECT
    i.item_id,
    i.title,
    i.availability_status,
    MAX(br.borrow_date) AS last_borrowed_date,
    CASE
        WHEN MAX(br.borrow_date) IS NULL OR (MAX(br.borrow_date) < NOW() -
INTERVAL '6 months')THEN 'Not Borrowed in Last 6 Months'
        ELSE 'Recently Borrowed'
    END AS borrowing_status
FROM
    "Item" i
```

```sql
LEFT JOIN
    "Borrowing" br ON i.item_id = br.item_id
GROUP BY
    i.item_id, i.title, i.availability_status
ORDER BY
    last_borrowed_date DESC NULLS LAST;
```

Output:

item_id	title	availability_st	last_borrowed_date	borrowing_status
f47ac10b-58cc-4372-a567-0e02b2c3d519	Avatar (Blu-ray)	available	2025-05-04 08:21:19.674806+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d516	The Kite Runner	available	2025-05-03 23:17:51.994012+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d484	Moby Dick	checked_out	2025-05-03 22:33:44.591419+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d489	Inception (DVD)	checked_out	2025-04-27 04:14:37.721992+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d491	Interstellar (Blu-ray)	checked_out	2025-04-26 04:14:37.721992+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d480	1984	checked_out	2025-04-25 04:14:37.721992+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d502	Wired - June 2023	available	2025-03-01 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d521	The Avengers (Blu-ray)	available	2025-03-01 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d525	Toy Story (Blu-ray)	available	2025-02-24 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d497	The Lord of the Rings: The Fellowship of the Ring (Blu-ray)	checked_out	2025-02-24 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d510	Brave New World	checked_out	2025-02-24 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d515	The Alchemist	available	2025-02-21 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d511	The Catch-22	available	2025-01-20 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d509	The Picture of Dorian Gray	checked_out	2025-01-20 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d481	To Kill a Mockingbird	available	2025-01-20 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d513	The Road	available	2025-01-10 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d486	The Odyssey	available	2025-01-10 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d527	Star Wars: A New Hope (Blu-ray)	checked_out	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d523	Finding Nemo (Blu-ray)	checked_out	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d534	Rolling Stone - June 2024	available	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d531	Vanity Fair - March 2024	available	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d532	GQ - April 2024	available	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d494	The Dark Knight (Blu-ray)	checked_out	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d529	The Atlantic - January 2024	available	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d512	The Grapes of Wrath	available	2025-01-09 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d487	The Brothers Karamazov	available	2025-01-07 10:00:00+00	Recently Borrowed
f47ac10b-58cc-4372-a567-0e02b2c3d536	National Geographic - August 2024	available	2025-01-04 10:00:00+00	Recently Borrowed

f47ac10b-58cc-4372-a567-0e02b2c3d530	The New Yorker - February 2024	available	2024-05-24 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d520	The Social Network (DVD)	available	2024-05-24 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d517	The Book Thief	available	2024-05-24 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d524	The Incredibles (DVD)	available	2024-04-17 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d479	The Great Gatsby	available	2024-03-28 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d505	Rolling Stone - September 2023	available	2024-03-23 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d485	War and Peace	available	2024-03-21 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d503	The Economist - July 2023	available	2024-03-20 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d499	National Geographic - March 2023	available	2024-03-17 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d508	Harvard Business Review - December 2023	available	2024-03-17 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d500	Time - April 2023	available	2024-03-14 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d501	Vogue - May 2023	available	2024-03-09 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d526	Jurassic Park (DVD)	available	2024-03-01 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d537	Time - September 2024	available	2024-03-01 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d507	Scientific American - November 2023	available	2024-02-29 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d535	Wired - July 2024	available	2024-02-26 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d522	Frozen (DVD)	available	2024-02-06 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d504	Sports Illustrated - August 2023	available	2024-01-30 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d514	The Fault in Our Stars	available	2024-01-27 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d483	The Catcher in the Rye	available	2024-01-26 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d488	Crime and Punishment	available	2024-01-25 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d528	The Lion King (Blu-ray)	available	2024-01-22 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d506	People - October 2023	available	2024-01-11 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d492	The Godfather (Blu-ray)	available	2024-01-10 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d495	Pulp Fiction (DVD)	available	2024-01-10 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d496	Forrest Gump (DVD)	available	2024-01-07 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d482	Pride and Prejudice	available	2024-01-06 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d490	The Matrix (DVD)	available	2024-01-06 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d493	The Shawshank Redemption (DVD)	available	2024-01-05 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d533	Esquire - May 2024	available	2024-01-03 00:00:00+00	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d538	Scientific American - October 2024	available	NULL	Not Borrowed in Last 6 Months
31b0ccf4-0dcb-4cc7-8484-ae442245f887	Test	reference_only	NULL	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d518	The Night Circus	available	NULL	Not Borrowed in Last 6 Months
f47ac10b-58cc-4372-a567-0e02b2c3d498	The Lion King (DVD)	available	NULL	Not Borrowed in Last 6 Months
267868e3-15d9-4898-83a6-ace0fe5dc8e1	A Series of Unfortunate Events	checked_out	NULL	Not Borrowed in Last 6 Months

Overdue items report: Generate a report listing all overdue items, the client responsible, and the calculated late fees.

```
SELECT
    c.client_id,
    c.client_name,
    i.title
FROM
    "Client" c
JOIN
    "Borrowing" b ON c.client_id = b.client_id
JOIN
```

```
    "Item" i ON b.item_id = i.item_id
WHERE
    b.due_date < NOW()  and b.status != 'returned'
ORDER BY
    b.due_date ASC;
```

Output:

client_id	client_name	title	due_date	fee
e695eaaa-4fc2-4191-ab2e-9541575a1f54	Amelia Cooper	The Dark Knight (Blu-ray)	2025-01-23 10:00:00+00	4.5
bc626649-6033-4c65-a5eb-4a15abd13e5f	Jackson Barnes	National Geographic - August 2024	2025-01-25 10:00:00+00	2.25
19e1aa56-1084-426f-9a8f-a45198c94071	Grace Jenkins	The Picture of Dorian Gray	2025-02-03 10:00:00+00	4.5
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	Star Wars: A New Hope (Blu-ray)	2025-02-10 10:00:00+00	0.15
ab5d84b7-26a3-4838-9bcf-c7acbba3cbf5	Carter Wood	Finding Nemo (Blu-ray)	2025-02-10 10:00:00+00	7.35
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	The Lord of the Rings: The Fellowship of the Ring (Blu-ray)	2025-03-10 10:00:00+00	4.5
f0dbb987-7641-4bae-aad7-ccc35cbea2c8	Matthew Edwards	Brave New World	2025-03-10 10:00:00+00	7.5

Revenue summary: Summarize the library's revenue from fees, showing the breakdown by membership type and item category.

```
SELECT
    c.membership_type,
    i.item_type,
    SUM(p.amount) AS total_revenue
FROM
    "Client" c
JOIN
    "Borrowing" br ON c.client_id = br.client_id
JOIN
    "Payments" p ON p.transaction_id = br.transaction_id
JOIN
    "Item" i ON br.item_id = i.item_id
WHERE
    br.status != 'returned'
GROUP BY
    c.membership_type, i.item_type
ORDER BY
    c.membership_type, i.item_type;
```

Output:

membership_type	item_type	total_revenue
Standard	book	20.25
Standard	media	31.8
Student	magazine	12.6
Student	media	14.85

Report

Generate an operational efficiency report. This report should assess the library's operational effectiveness. Analyze key metrics such as book loan and return processing times, overdue book rates, and fine collection trends. Identify peak borrowing periods to optimize staffing levels and pinpoint potential bottlenecks in library processes to improve overall efficiency and service delivery. The steps for creating such a report may include:
Use AVG(DATEDIFF(return_date, borrow_date)) to calculate average borrowing time.
Use COUNT(*) and WHERE clauses with date conditions to calculate overdue book rates.
Use SUM(fines) and GROUP BY with time periods to analyze fine collection trends.
Use COUNT(*) and GROUP BY with borrow date to identify peak borrowing hours and days.

```sql
SELECT
  DATE(borrow_date) AS borrow_date,
  EXTRACT(HOUR FROM borrow_date) AS borrow_hour,
  COALESCE(ROUND(AVG(EXTRACT(EPOCH FROM (return_date - borrow_date)) / 86400),
2), 0) AS average_borrowing_time,
  ROUND(COUNT(*) FILTER (WHERE ((br.status = 'checked_out' AND due_date <
NOW()) OR (return_date > due_date))) * 100.0 / COUNT(*), 2) AS
overdue_book_rate,
  SUM(COALESCE(p.amount, 0)) AS total_collected_fines,
  COUNT(distinct br.transaction_id) AS peak_borrowing_count
FROM
  "Borrowing" br
LEFT JOIN
  "Payments" p ON p.transaction_id = br.transaction_id
GROUP BY
  DATE(borrow_date), borrow_hour
ORDER BY
  peak_borrowing_count DESC;
```

Output:

borrow_date	borrow_hour	average_borro	overdue_book_rate	total_collected_fines	peak_borrowing_count
2025-01-09	10	60.88	94.12	79.12	8
2024-01-03	0	12.33	16.67	1.8	6
2024-01-22	0	20.67	50.00	1.2	5
2025-01-10	10	23.75	75.00	0	4
2024-01-06	0	19.50	25.00	0	4
2024-01-07	0	19.50	25.00	6	4
2024-01-11	0	16.25	25.00	0	4
2024-03-14	0	17.00	50.00	1.76	4
2024-01-09	0	23.75	50.00	4.43	4
2024-01-27	0	23.67	66.67	0.75	3
2024-01-30	0	30.75	75.00	13.8	3
2024-04-13	0	21.33	33.33	0	3
2024-05-24	0	15.67	33.33	1.95	3
2025-01-20	10	27.00	66.67	15.98	3
2024-02-11	0	14.00	33.33	0.75	3
2025-02-24	10	10.00	66.67	15	3
2024-01-10	0	20.33	66.67	1.13	3
2024-02-26	0	33.00	100.00	2.84	3
2024-03-01	0	16.33	33.33	1.35	3
2024-03-03	0	23.25	50.00	2.89	3
2024-01-26	0	11.67	0.00	0	3
2025-01-04	10	13.00	50.00	12.6	2
2024-04-17	0	26.00	50.00	0	2
2024-03-21	0	18.00	50.00	0.97	2
2024-03-17	0	28.50	50.00	0.9	2
2024-03-08	0	14.50	0.00	0	2
2025-03-01	10	18.50	50.00	0	2
2024-02-16	0	22.50	50.00	0.2	2
2024-01-05	0	25.50	100.00	0.77	2
2025-05-04	8	0.01	0.00	0	1

2024-01-08	0	28.00	100.00	1.4	1
2024-01-25	0	28.00	100.00	4.2	1
2024-02-01	0	39.00	100.00	4.69	1
2024-02-02	0	35.00	100.00	1.58	1
2024-02-06	0	34.00	100.00	3	1
2024-02-07	0	7.00	0.00	0	1
2024-02-19	0	10.00	0.00	0	1
2024-02-20	0	14.00	0.00	0	1
2024-02-21	0	24.00	100.00	2.25	1
2024-02-29	0	9.00	0.00	0	1
2024-03-05	0	13.00	0.00	0	1
2024-03-09	0	9.00	0.00	0	1
2024-03-20	0	12.00	0.00	0	1
2024-03-22	0	10.00	0.00	0	1
2024-03-23	0	29.00	100.00	0	1
2024-03-28	0	7.00	0.00	0	1
2025-01-07	10	9.00	0.00	0	1
2025-02-21	10	24.00	100.00	0	1
2025-04-25	4	0	0.00	0	1
2025-04-26	4	0	0.00	0	1
2025-04-27	4	0	0.00	0	1
2025-05-03	22	0	0.00	0	1
2025-05-03	23	0.37	0.00	0	1
2024-01-02	0	20.00	100.00	0	1