

# University of Barishal



A Project Report on

**"Optimizing Prepaid Recharge Systems for Internet Usage"**

Database Management System Lab

Course Code: CSE-2102

**Submitted to:**

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## Project Idea Description:

The creation of a prepaid recharge system specifically designed for internet use is the main goal of the proposed concept. The method attempts to solve the inefficiencies that are frequently linked to prepaid services, specifically the waste of resources like cash, minutes, and megabytes. In order to address this problem, the project presents a novel method in which users can exchange resources they are not using with others who are in need of them. This maximizes resource use and offers economical options for both buyers and sellers.

The User Table, which controls user accounts and authentication; the Balance Table, which keeps track of each user's available resources (money, minutes, and megabytes); and the Transaction Table, which enables resource exchanges between users, are the central components of the system. Furthermore, the system's basic features are supported by auxiliary tables including Transaction Status, Feedback, Payment Method, and Subscription, which guarantee efficient operation and customer pleasure.

Users can conduct transactions on the system in a safe manner, and accountability and transparency are guaranteed by the Transaction Status Table and Feedback Table's real-time updates. The Subscription Table, Subscription Payment Table, and Subscription History Table allow users to easily manage their subscriptions and enable recurring services without having to deal with manual recharges. The Admin Table and Admin Log Table handle administrative functions and give administrators the tools they need to efficiently monitor and administer the system. The Notification Table ensures that users are always informed by providing notifications about transactions, subscriptions, and system updates.. Furthermore, the system includes features such as Resource Category, Resource Listing, Resource Purchase, Resource Transaction Log, Resource Adjustment, Resource Expiry, and Resource Usage Log tables, which collectively enable users to list, purchase, track, and adjust their resources efficiently.

In conclusion, the project that is being suggested provides a thorough way to maximize resource use in prepaid internet services. The system intends to transform the prepaid recharge experience by introducing a dynamic marketplace for resource trading and strong management functionalities, giving users more control over their resources and encouraging sustainability and economy.

### **Motivation:**

This research was motivated by the realization that conventional prepaid recharge schemes for internet usage were inefficient and wasteful. Users of these systems frequently find themselves with idle resources—such as minutes, money, and megabytes—which are eventually lost when they expire. In addition to causing users' financial losses, this waste also has an adverse effect on the environment and resource inefficiencies. We intend to address these issues and offer real advantages to users and the environment by launching a system that enables users to sell their unused resources to those in need. This project's primary driving forces are as follows:

1. **Resource Optimization:** The main goal is to maximize the use of resources in prepaid internet services, such as funds, minutes, and megabytes. We hope to ensure that resources are used properly and efficiently, minimizing waste and optimizing value for consumers, by allowing users to sell their unused resources.
2. **Cost Savings:** The option to sell their unused resources offers consumers the chance to make financial savings. Prepaid internet users can lower the total cost of utilizing these services by selling the resources they no longer need to other users, thus recouping part of their costs.

3. Access to Affordable Resources: By allowing users to buy unwanted resources from others at a discount, the project seeks to give buyers access to reasonably priced resources. This helps buyers both monetarily and by guaranteeing that resources are available to individuals who might not have as much money as others.

4. Environmental Impact: By minimizing resource wastage and promoting efficient resource utilization, the project contributes to reducing the environmental impact associated with the production and consumption of resources. By extending the lifespan of resources through resale and reuse, we aim to minimize the carbon footprint associated with prepaid internet services.

5. Empowerment and Community Building: The initiative intends to empower users and promote a sense of community and collaboration by developing a platform for resource trade. By actively engaging in resource exchange, users can support the viability and general well-being of the prepaid internet ecosystem.

Overall, the project's motivation lies in its potential to transform the prepaid recharge system for internet usage into a more sustainable, cost-effective, and community-driven model. Our goal is to provide a solution that benefits users, the environment, and society at large by tackling the inefficiencies and difficulties present in old systems.

### **Requirements of this project:**

1. User registration and authentication system.
2. Balance tracking system for money, minutes, and MBs.

3. Transaction management system with secure payment processing.
4. Feedback collection mechanism for user satisfaction.
5. Admin panel for system monitoring and management.
6. Notification system to keep users informed about transactions and updates.
7. Resource categorization and listing functionalities.
8. Subscription management for recurring services.
9. History tracking for transactions and subscriptions.
10. Resource adjustment and expiry handling for efficient resource management.

## Steps for Entity Relationship Diagram:

### Step 1: Entities

1. User
2. Balance
3. Transaction
4. Transaction Status
5. Feedback
6. Payment Method
7. Payment Log

8. Subscription
9. Subscription Payment
10. Subscription History
11. Admin
12. Admin Log
13. Notification
14. Resource Category
15. Resource Listing
16. Resource Purchase
17. Resource Transaction Log
18. Resource Adjustment
19. Resource Expiry
20. Resource Usage Log

## Step 2: Schema

- 1. Users**(`user\_id`, `username`, `password`, `email`, `phone\_number`)
- 2. Balance**(`balance\_id`, `balance\_type`, `amount`, `expiry\_date` )
- 3. Transaction**(`transaction\_id`, `amount\_transferred`, `transaction\_date`)
- 4. Transaction Status**(`status\_id`, `status\_code`, `status\_description`, `status\_date`)

5. **Feedback** ( `feedback\_id`, `rating`, `comment`, `feedback\_date` )
6. **Payment Method** ( `method\_id`, `method\_name`, `description` )
7. **Payment Log** ( `payment\_id`, `amount\_paid`, `payment\_date` )
8. **Subscription** ( `subscription\_id`, `subscription\_type`, `start\_date`, `end\_date`, `status` )
9. **Subscription Payment** ( `payment\_id`, `amount\_paid`, `payment\_date` )
10. **Subscription History Table**( `history\_id`, `action`, `action\_date` )
11. **Admin** ( `admin\_id`, `username`, `password`, `email` )
12. **Admin Log** ( `log\_id`, `action`, `log\_date` )
13. **Notification** ( `notification\_id`, `notification\_type`, `message`, `notification\_date` )
14. **Resource Category** ( `category\_id`, `category\_name` )
15. **Resource Listing**( `listing\_id`, `price`, `quantity\_available`, `listing\_date` )
16. **Resource Purchase** ( `purchase\_id`, `quantity\_purchased`, `purchase\_date` )
17. **Resource Transaction Log**( `log\_id`, `resource\_type`, `amount`, `log\_date` )
18. **Resource Adjustment**( `adjustment\_id`, `adjustment\_type`, `adjustment\_amount`, `adjustment\_date` )
19. **Resource Expiry** ( `expiry\_id`, `expiry\_date`, `expiry\_reason` )
20. **Resource Usage Log** ( `usage\_id`, `usage\_type`, `usage\_amount`, `usage\_date` )

### Step 3: Relationships

#### **User Table:**

- Each user has one balance associated with their account.
- Each user can have multiple transactions.
- Each user can have multiple subscriptions.
- Each user can have multiple interactions with administrators.
- Each transaction status corresponds to one transaction.
- Many feedback entries can be associated with one user.
- Many feedback entries can be associated with one transaction.
- Each payment method can be used for multiple transactions.
- Each payment log corresponds to one transaction.
- Many subscriptions can belong to one user.
- Each subscription can have multiple payments.
- Many payments can be associated with one subscription.
- Many subscription history entries can be associated with one subscription.
- Each administrator can have interactions with multiple users.
- Each administrator can have multiple log entries.
- Many log entries can be associated with one administrator.
- Each notification can be sent to multiple users.
- Each resource category can have multiple listings.
- Many listings can belong to one category.
- Each listing can have multiple purchases.
- Many purchases can be associated with one listing.
- Many purchases can be made by one user.
- Each transaction log corresponds to one purchase.
- Resource Adjustment Table:
- Many adjustments can be associated with one listing.
- Many adjustments can be made by one administrator.
- Many expiries can be associated with one listing.
- Many usage logs can be associated with one listing.

### Step 4: Cardinality ratio and participation

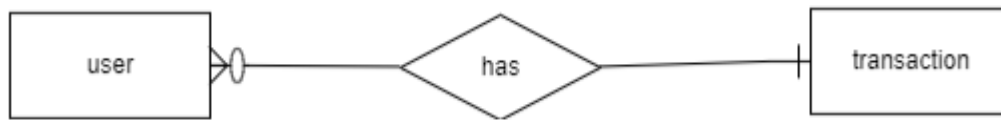
#### 1. User associated with transaction.

- A user can have multiple balances (e.g., money balance, minutes balance, MBs balance).
- Each balance belongs to only one user.
- Cardinality Ratio: One-to-Many (1:N)



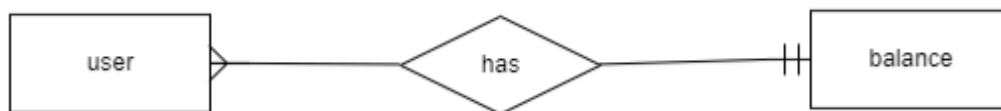
- Participation: Total participation on the user side (mandatory), partial participation on the balance side (optional).

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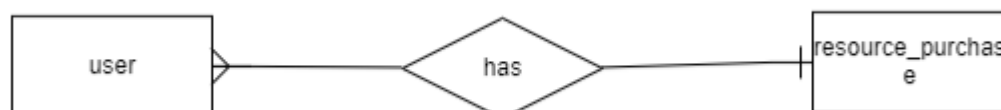
## 2. User has balance.

- A user can have multiple balances (e.g., money balance, minutes balance, MBs balance).
- Each balance belongs to only one user.
- Cardinality Ratio: One-to-Many (1:N)
- Participation: Total participation on the user side (mandatory), partial participation on the balance side (optional).



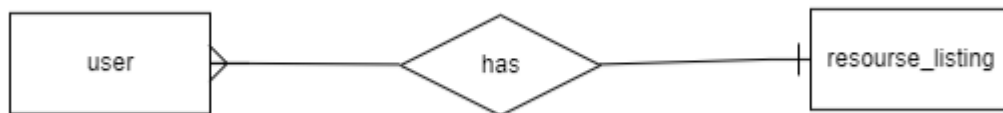
## 3. User have resource\_purchase

- Relationship: One-to-Many relationship with the User Table for the buyer.
- Participation: Total participation (mandatory) on the buyer\_id and listing\_id attributes.



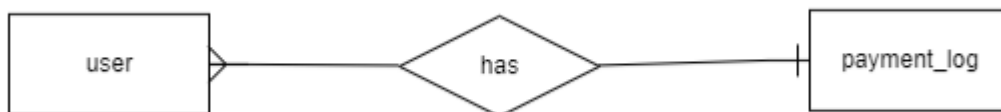
#### 4. User have resource listing

- Relationship: One-to-Many relationship with the User Table for the seller.
- Participation: Total participation (mandatory) on the seller\_id, category\_id, and balance\_id attributes.



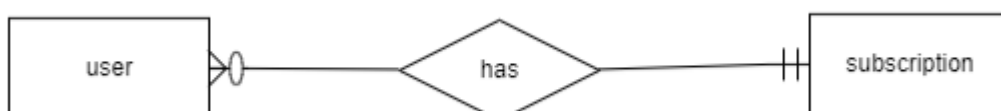
#### 5. User does payment\_log

- Relationship: One-to-Many relationship with the User Table.
- Participation: Total participation (mandatory) for user\_id and method\_id attributes.



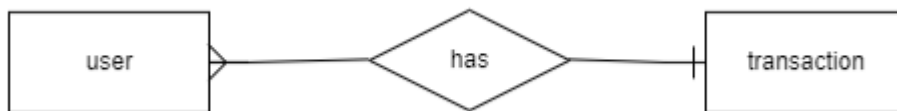
#### 6. User has subscription

- Cardinality ratio: One-to-Many relationship with the User Table.
- Participation: Total participation (mandatory) on the user\_id attribute.



### 7.user has transaction

- Cardinality ratio: One-to-Many relationship with the Balance Table.
- Participation: Total participation (mandatory) for seller\_id, buyer\_id, and balance\_id attributes.



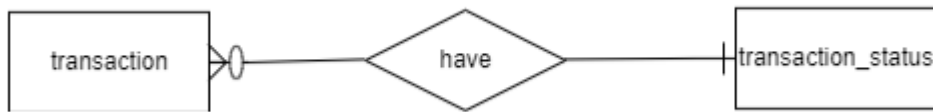
### 8.user gets notification

- Relationship: One-to-Many relationship with the User Table.
- Participation: Total participation (mandatory) on the user\_id attribute.



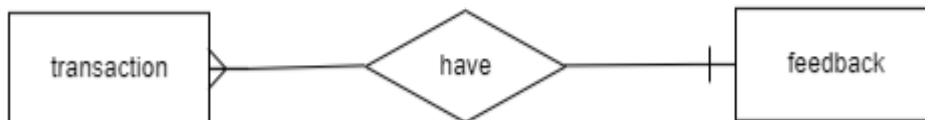
### 9.transaction have transaction status

- One-to-One relationship with the Transaction Table.
- Participation: Total participation (mandatory) on the transaction\_id attribute.



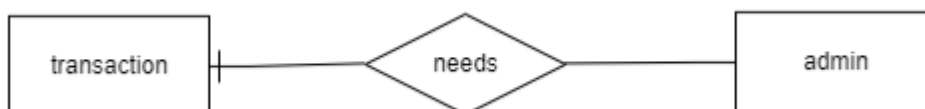
#### 10. Transaction have feedback

- Relationship: One-to-One relationship with the Transaction Table.
- Participation: Partial participation (optional) on the transaction\_id attribute.



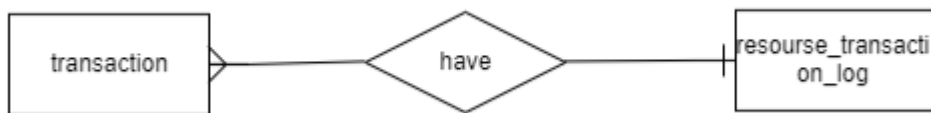
#### 11. Transaction needs admin

- Relationship: None.
- Participation: Total participation (mandatory) for all attributes.



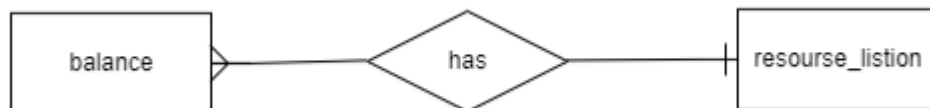
### 12.transaction have resource\_transaction\_log

- Relationship: One-to-Many relationship with the Transaction Table.
- Participation: Total participation (mandatory) on the transaction\_id attribute.



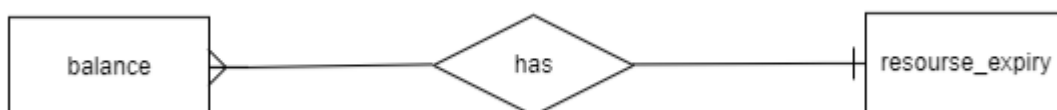
### 13.balance has resource\_listing

- Relationship: One-to-Many relationship with the Balance Table.
- Participation: Total participation (mandatory) on the seller\_id, category\_id, and balance\_id attributes.



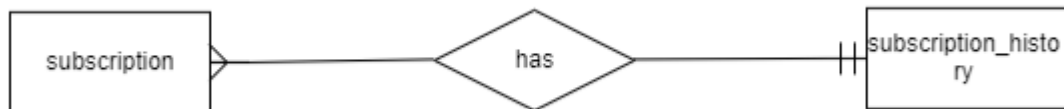
### 14. Balance has resource\_expiry

- Relationship: One-to-Many relationship with the Balance Table.
- Participation: Total participation (mandatory) on the balance\_id attribute.



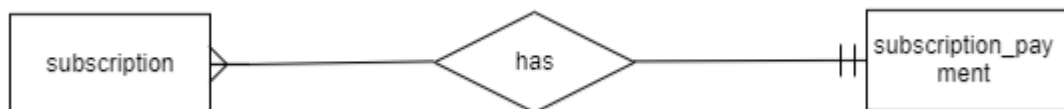
### 15.subscription has subscription\_history

- Relationship: One-to-Many relationship with the Subscription Table.
- Participation: Total participation (mandatory) on the subscription\_id attribute.



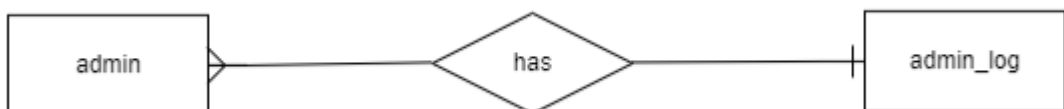
### 16.subscription has subscription\_payment

- Relationship: One-to-Many relationship with the Subscription Table.
- Participation: Total participation (mandatory) on the subscription\_id attribute.



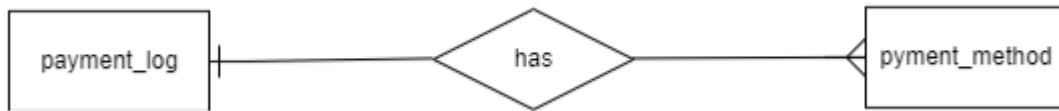
### 17.admin has admin\_log

- Relationship: One-to-Many relationship with the Admin Table.
- Participation: Total participation (mandatory) on the admin\_id attribute.



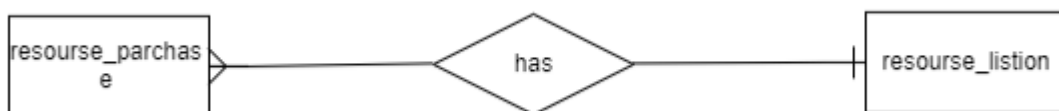
### 18.payment\_log has payment\_method

- Relationship: None.
- Participation: Total participation (mandatory) for all attributes.



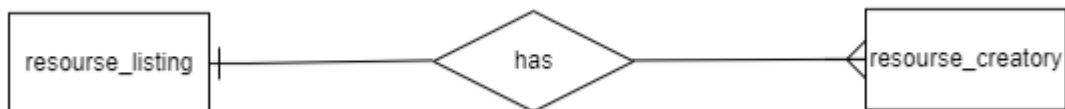
#### 19.resource\_purchase has resource\_listing

- Relationship: One-to-Many relationship with the Resource Listing Table.
- Participation: Total participation (mandatory) on the buyer\_id and listing\_id attributes



#### 20.resource\_listing has resource\_category

- Relationship: None.
- Participation: Total participation (mandatory) for all attributes.



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## Step 5: Drawing ER Diagram

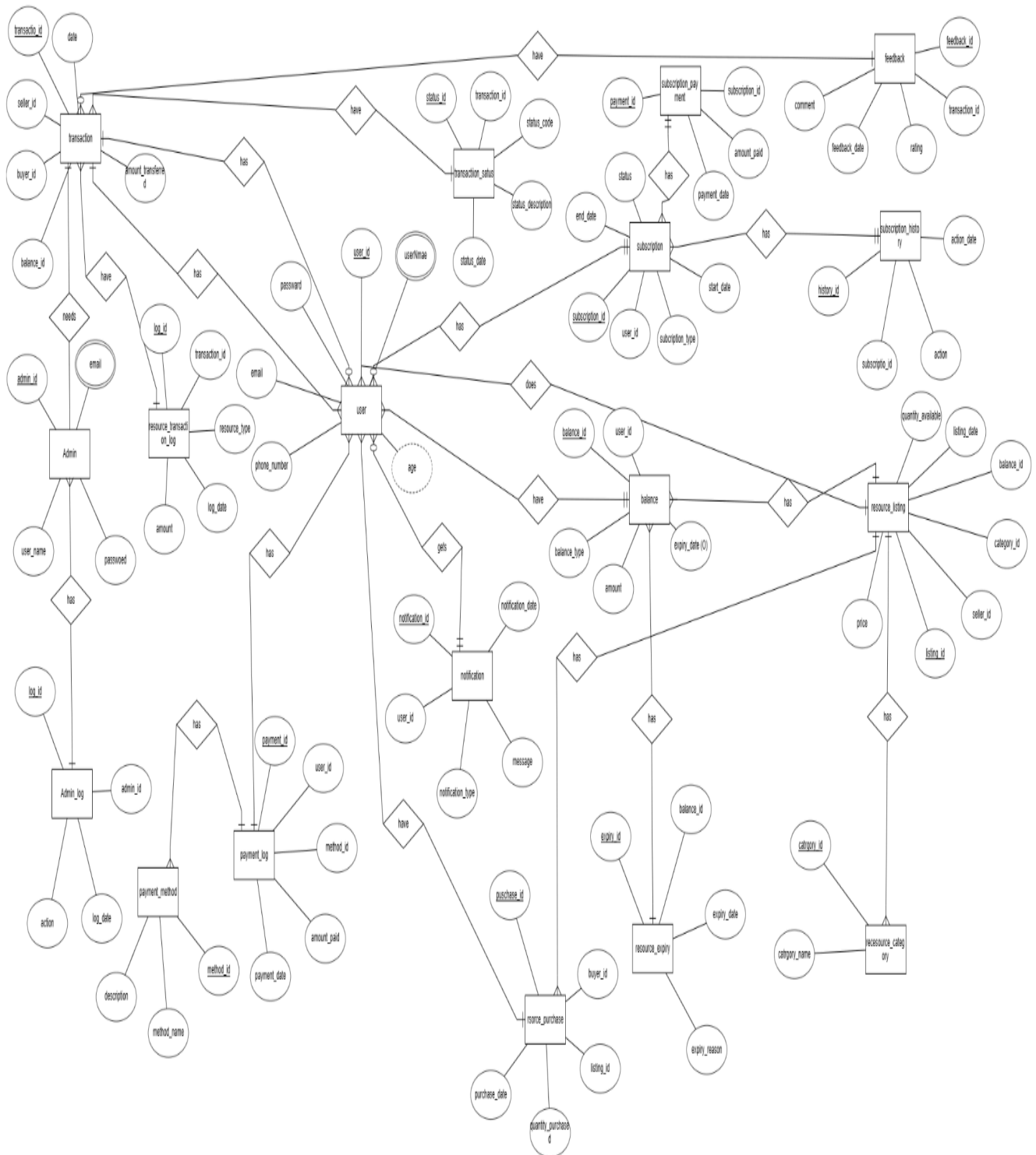


Figure: ER diagram for Optimizing Prepaid Recharge Systems for Internet Usage

## Relations/ Tables:

- 1. User Table** (`user\_id` (pk), `username`, `password`, `email`, `phone\_number`)
- 2. Balance Table** (`balance\_id` (Pk), `user\_id` (Fk), `balance\_type`, `amount`, `expiry\_date`)
- 3. Transaction Table** (`transaction\_id` (Pk), `seller\_id` (Fk), `buyer\_id` (Fk), `balance\_id` (Fk), `amount\_transferred`, `transaction\_date`)
- 4. Transaction Status Table** (`status\_id` (pk), `transaction\_id` (Fk), `status\_code`, `status\_description`, `status\_date`)
- 5. Feedback Table** (`feedback\_id` (pk), `transaction\_id` (Fk), `rating`, `comment`, `feedback\_date`)
- 6. Payment Method Table** (`method\_id` (Primary Key), `method\_name`, `description`)
- 7. Payment Log Table** (`payment\_id` (Pk), `user\_id` (Fk), `method\_id` (Fk), `amount\_paid`, `payment\_date`)
- 8. Subscription Table** (`subscription\_id` (Pk), `user\_id` (Fk), `subscription\_type`, `start\_date`, `end\_date`, `status`)
- 9. Subscription Payment Table** (`payment\_id` (Pk), `subscription\_id` (Fk), `amount\_paid`, `payment\_date`)
- 10. Subscription History Table** (`history\_id` (Pk), `subscription\_id` (Fk), `action`, `action\_date`)
- 11. Admin Table** (`admin\_id` (Pk), `username`, `password`, `email`)
- 12. Admin Log Table** (`log\_id` (pk), `admin\_id` (FK), `action`, `log\_date`)
- 13. Notification Table** (`notification\_id` (Pk), `user\_id` (Fk), `notification\_type`, `message`, `notification\_date`)
- 14. Resource Category Table** (`category\_id` (pk), `category\_name`)

**15. Resource Listing Table** ( `listing\_id` (Pk), `seller\_id` (Fk), `category\_id` (Fk), `balance\_id` (Fk), `price`, `quantity\_available`, `listing\_date` )

**16. Resource Purchase Table** ( `purchase\_id` (Pk), `buyer\_id` (Fk), `listing\_id` (Fk), `quantity\_purchased`, `purchase\_date` )

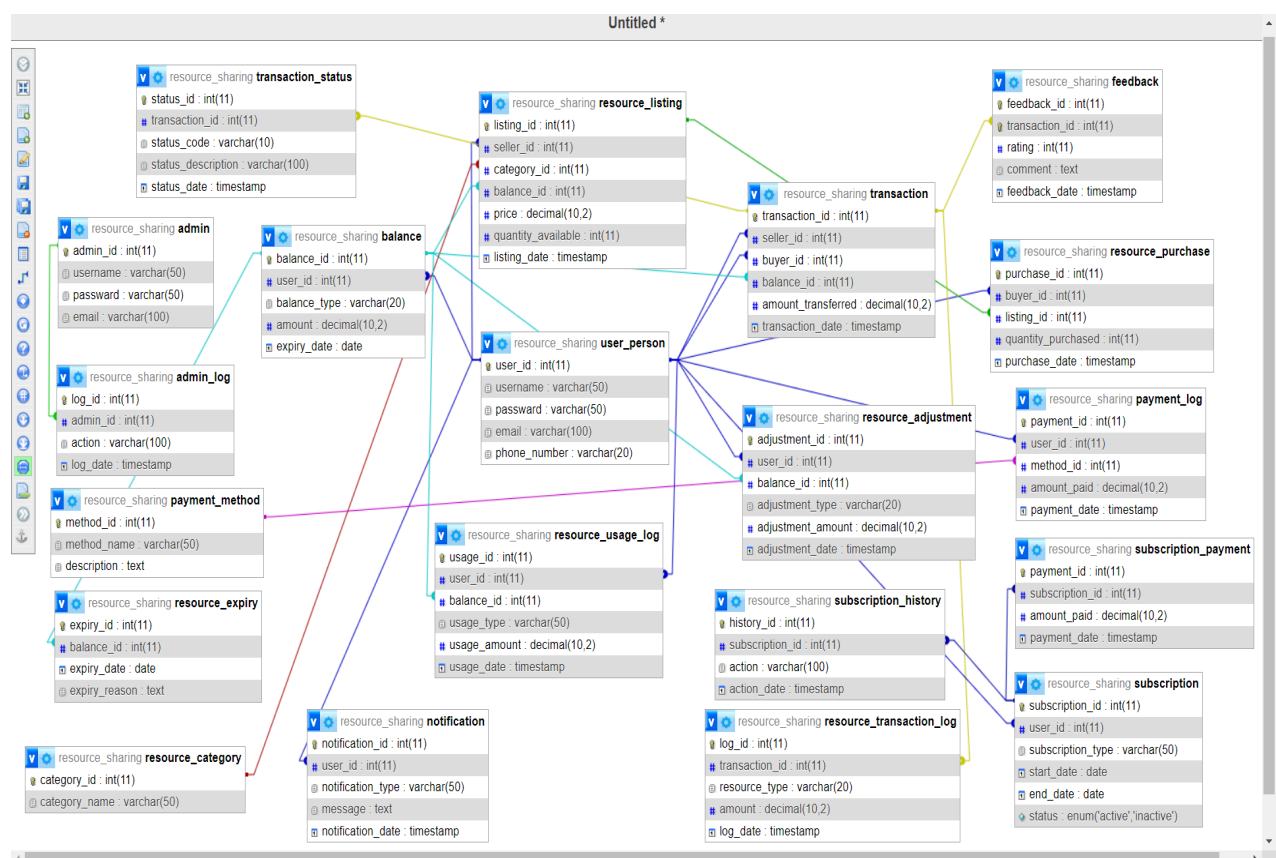
**17. Resource Transaction Log Table** ( `log\_id` (Pk), `transaction\_id` (Fk), `resource\_type`, `amount`, `log\_date` )

**18. Resource Adjustment Table** ( `adjustment\_id` (Pk), `user\_id` (Fk), `balance\_id` (Fk), `adjustment\_type`, `adjustment\_amount`, `adjustment\_date` )

**19. Resource Expiry Table** ( `expiry\_id` (Pk), `balance\_id` (Fk), `expiry\_date`, `expiry\_reason` )

**20. Resource Usage Log Table** ( `usage\_id` (Pk), `user\_id` (Fk), `balance\_id` (Fk), `usage\_type`, `usage\_amount`, `usage\_date` )

### Schema diagram:



## Conclusion and future plan:

To sum up, the suggested prepaid recharge system offers a viable way to address the issues of resource waste and ineffectiveness in conventional internet consumption models. Through the sale of surplus resources and transparent transaction processing via an efficient platform, the system helps users optimize their resources and save money, all the while encouraging a sense of community and teamwork. If the project is successfully carried out, it will not only help individual users by saving money and giving them access to reasonably priced resources, but it will also minimize resource waste and carbon footprint, which will improve environmental sustainability.

In order to increase user experience and functionality, the project's future plan calls for ongoing expansion and development. This entails putting in place systems for users to provide feedback so that insights may be gathered for additional improvement, strengthening security to guarantee that user data is protected, and looking at joint ventures with internet service providers to include the system into already-existing prepaid products. In addition, the initiative intends to simplify transaction procedures and offer users individualized recommendations by utilizing cutting-edge technology like blockchain and artificial intelligence. The ultimate objective is to position the prepaid recharge system as the cornerstone of community-driven and sustainable internet usage, providing consumers with real advantages and helping to create a more just and efficient digital economy.