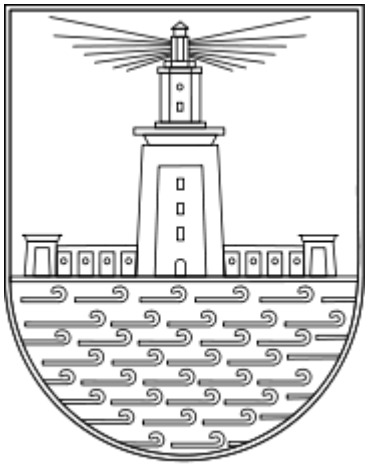


Alexandria University - Faculty of Engineering
Electrical Engineering Department

Summer Research Project - 2015

Weekly Report Num. 1

Supervision:

Dr. Bassem Mahmoud Mokhtar - EED

Researcher:

Abanoub Milad Nassief - CSED

Research Fields:

databases, android/web development and machine learning.

Research Goals:

Developing an intelligent application for efficient database management.
Development of a front-end (android/web app) and back-end prototype, and the design of a database to store various data with a large set of attributes.
Capability of applying intelligent data management techniques on the stored data.

Research and software development phases

1. Requirements gathering and analysis

Determine the requirements of the system like; Who is going to use the system? How will they use the system? What data should be input into the system? What data should be output by the system?
Analyze the gathered requirements for their validity and the possibility of incorporating the requirements in the system.
Finally, a Requirement Specification document is created which serves the purpose of guideline for the next phase.

2. Design

System and software design is prepared from the requirement specifications. Specify hardware and system requirements which also helps in defining overall system architecture. The system design specifications serve as input for the next phase of the model.

3. Implementation

Work is divided in modules/units and actual coding is started.

4. Testing

Test against the requirements to make sure that the application is actually solving the needs addressed and gathered during the requirements phase. Unit testing, integration testing, system testing, acceptance testing are done.

5. Deployment
After successful testing the application is deployed to the customers.

6. **Maintenance**
Solve any issues facing users. Study feedbacks for further modification.

Week-1 plan

- Study, gather and analyze the system requirements.
- Design a relational database that meets the specifications.
- specify the UX/UI based on the operations intended to be performed by users (client-side mockup).

Week-1 approach

Requirements gathering and analysis (Requirement Specification)

Users of the system

People of different ages interested in online shopping, product information, shopping offers or smart suggestions based on products and shopping preferences.

Users' interaction with the system

System displays the various shopping domains which users can select from and get the available stock products with detailed information including price, manufacturer, vendor, store and other features.

Users can input data related to their preferred items from the various shopping domains like food, clothes, sports, electronics, etc. The system will direct users to their preferred and most fitting available stock products with their detailed information.

Data input into the system

Users' Interesting items by the product world-known name or product relevant features.

Add items and offers to the watchlist in order to receive alerts concerning specific shopping domains, items or features.

Data output by the system

Lists of shopping domains, specific domain's items and detailed information about every item.

Suggestion based on user preferences.

Alerts of offers and matching preferences based on the watchlist.

Design (client/server-side interaction blueprint)

1- Customers interaction

Can be implemented as an android app or web app or both. Includes:

Front-end:

- Display shopping domains, products, offers and alerts.
- Input preferences.
- Add, edit or remove items from the watchlist.
- GUI (web/android) that supports the previous operations.
- Performed by the application (web/android).

Back-end:

- Server holds the database carrying products, stores, vendors, offers, clients etc.

- App communicates using http protocol with the server side to perform data exchange requests and get responses then delivers them to the front-end.

- Server interacts with customers with pre-specified privileges which are different from the store/system managers' privileges.

- Server responds to customer requests such as prediction, searching, retrieving database information, schedule alerts and applying machine learning / recommendation algorithms.

Store/system managers interaction

Implemented as a web app to increase the usability and accuracy. Includes:

Front-end:

- Provides data manipulation operation of adding, editing and removing items such as products, features, stores, offers, vendors, clients etc.

- Web based GUI that supports the previous operations.
Performed by the web application.

Back-end:

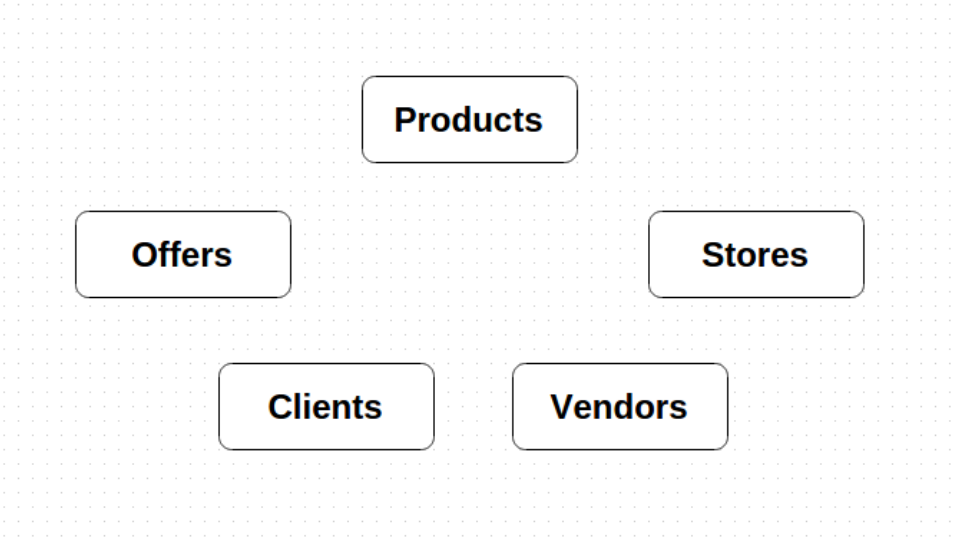
- App communicates with the server to perform data manipulation operation requests and get responses then delivers them to the front-end (web-based GUI).

- Server interacts with store/system managers with pre-specified privileges which are different from the customers' privileges.
-Server responds to mangers' request of storing and updating data on the database.

Database

- Identifying Entities (types of information saved in the database)

Products, Stores, Clients, Offers and Vendors.



- Identifying Relationships

We have 5 choose 2 relations (5C2 = 10)

- Stores & Clients and Stores & Vendors no interest in these relations.

- **Stores & Products M:N**

a store may have many products (one or more) , a product may be sold in many stores (one or more).

- **Stores & Offers M:N**

a store may have many offers (zero or more), an offer may exist in many stores (one or more).

- Vendors & Clients and Vendors & Offers no interest in these relations.

- **Vendors & Products M:N**

a vendor may supply many products (one or more), a product may be supplied by many vendors (one or more).

- **Clients & Products 1:N**

a client can prefer many products (zero or more), products are not related to clients (no interest in this backward relation).

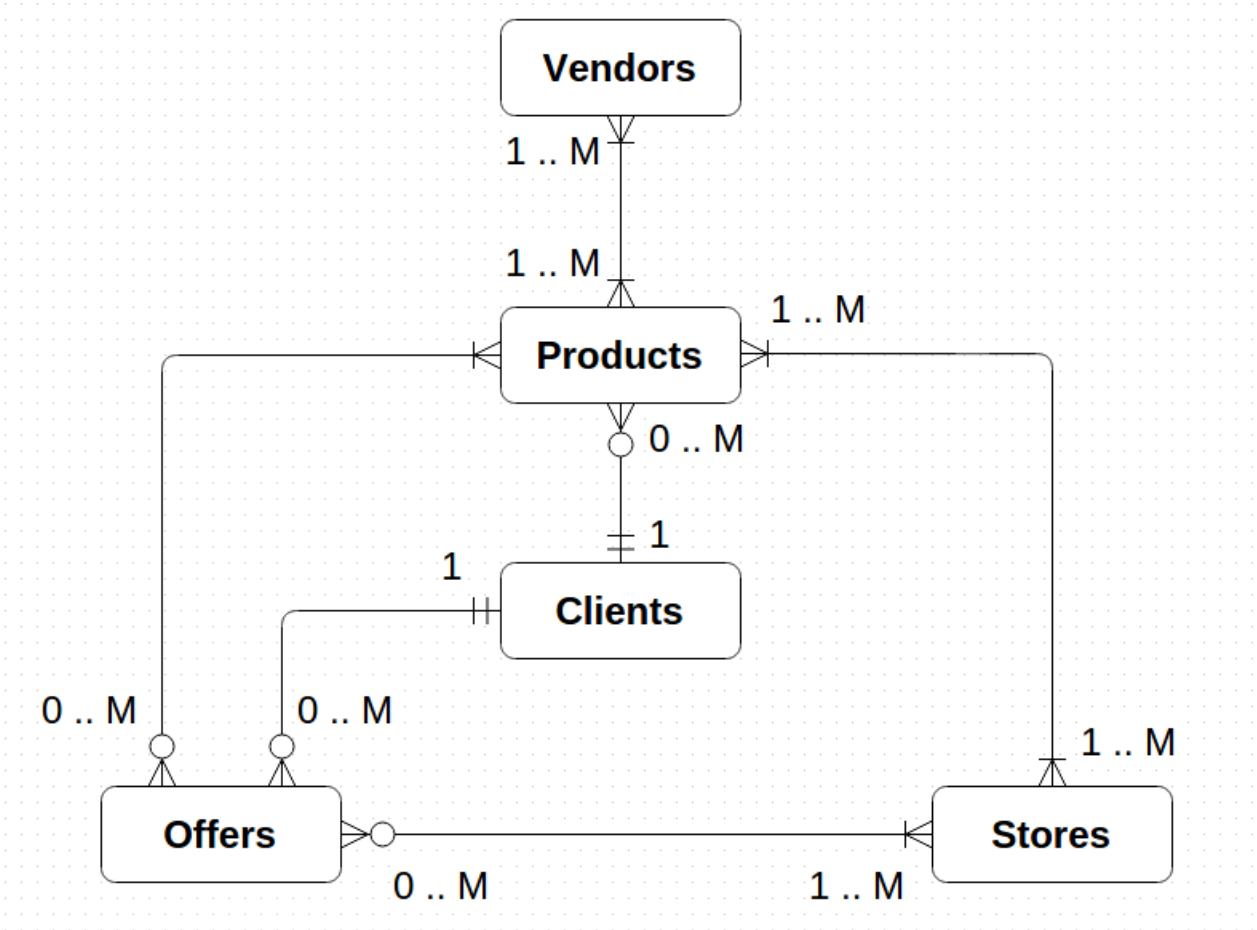
- **Clients & Offers 1:N**

a client can prefer many offers (zero or more), offers are not related to clients (no interest in this backward relation).

- **Offers & Products M:N**

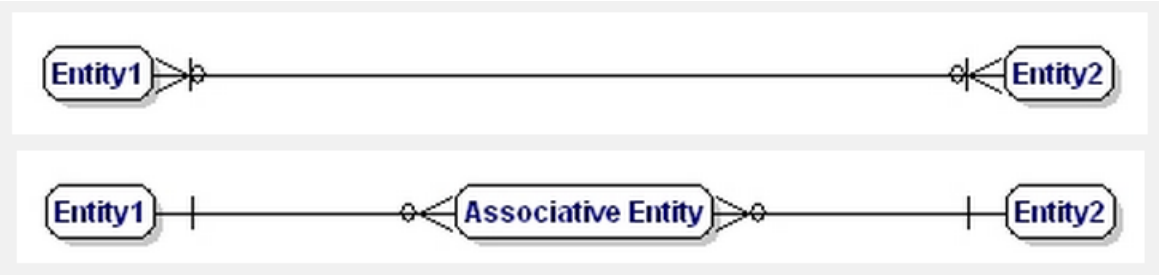
an offer has many products (one or more), a product may be include many offers (zero or more)

1:N / 1:M one-to-many relationship
M:N many-to-many relationship

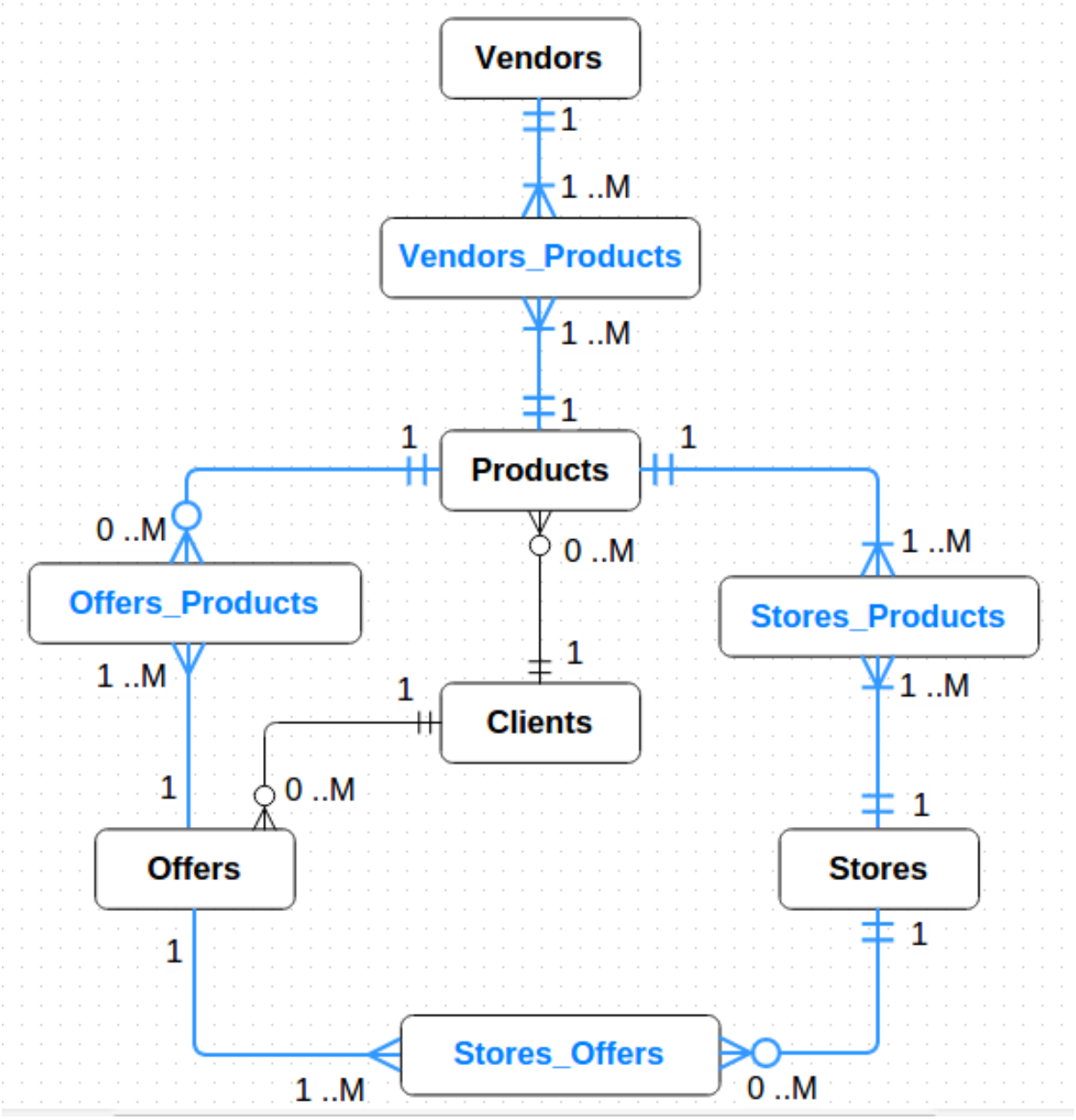


- Solving Many-to-Many Relationships

To solve the many to many relationships we need to create a new entity that is in between the related entities.
In logical models this is called an associative entity and in physical database terms this is called a link table or junction table.
The new associative entity converts the many-to-many relation into two one-to-many relations.



Here we introduce a new associative entity Stores_Products to represent Stores & Products relation, Stores_Offers to represent Stores & Offers, Offers_Products to represent Products & Offers and finally Vendors_Products to represent Vendors & Products.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1
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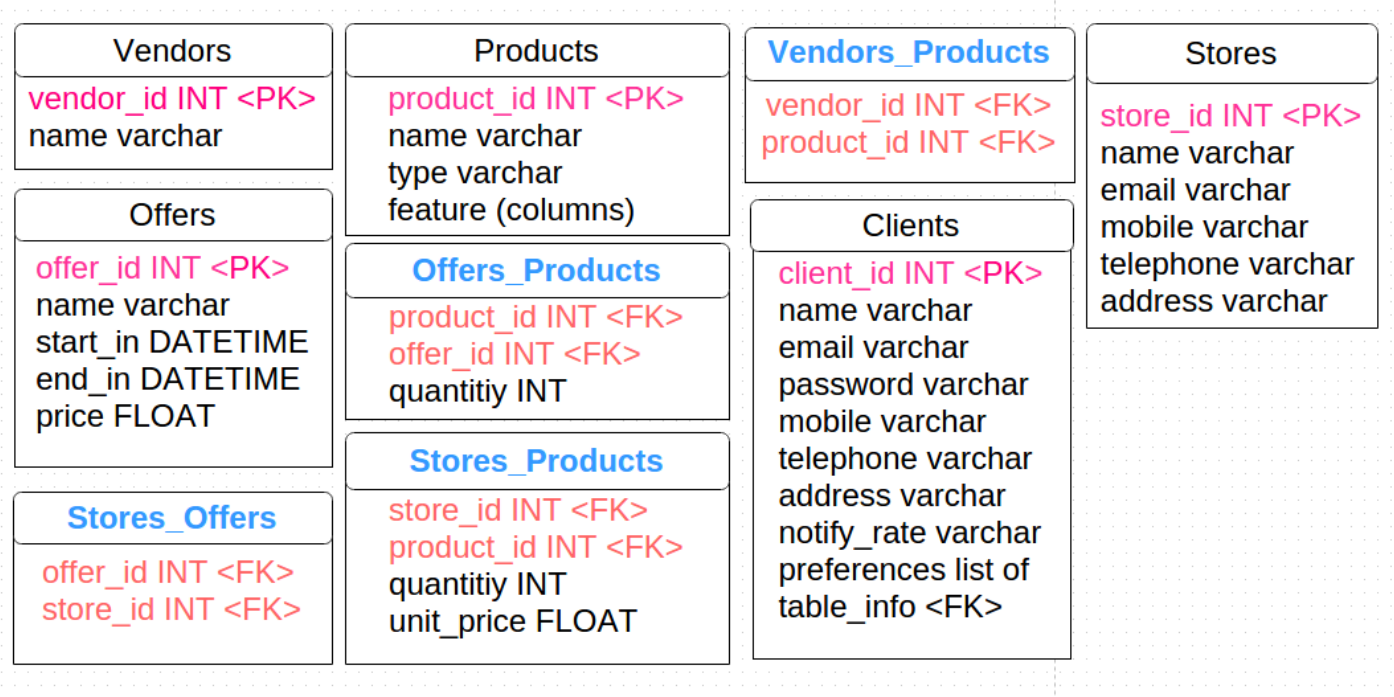
0 ..M

- Identifying Attributes and Assigning Keys



- Specifying Attribute (column) Data Types

VARCHAR (Text)

for name, address, mobile phone, telephone, email, feature columns of products and password attributes.

The range of Length is 1 to 255 characters. VARCHAR values are sorted and compared in case-insensitive fashion

DATETIME

for date attributes.

The supported range is '1000-01-01 00:00:00' to '9999-12-31 23:59:59'. MySQL displays DATETIME values in 'YYYY-MM-DD HH:MM:SS' format

Integer

for ID attributes.

The signed range is –2147483648 to 2147483647. The unsigned range is 0 to 4294967295.

SMALLINT

for quantity attribute.

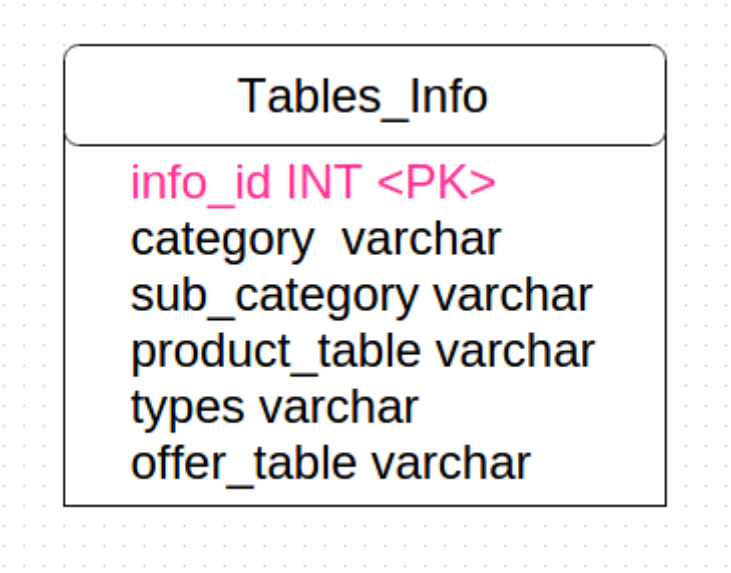
The signed range is –32768 to 32767. The unsigned range is 0 to 65535.

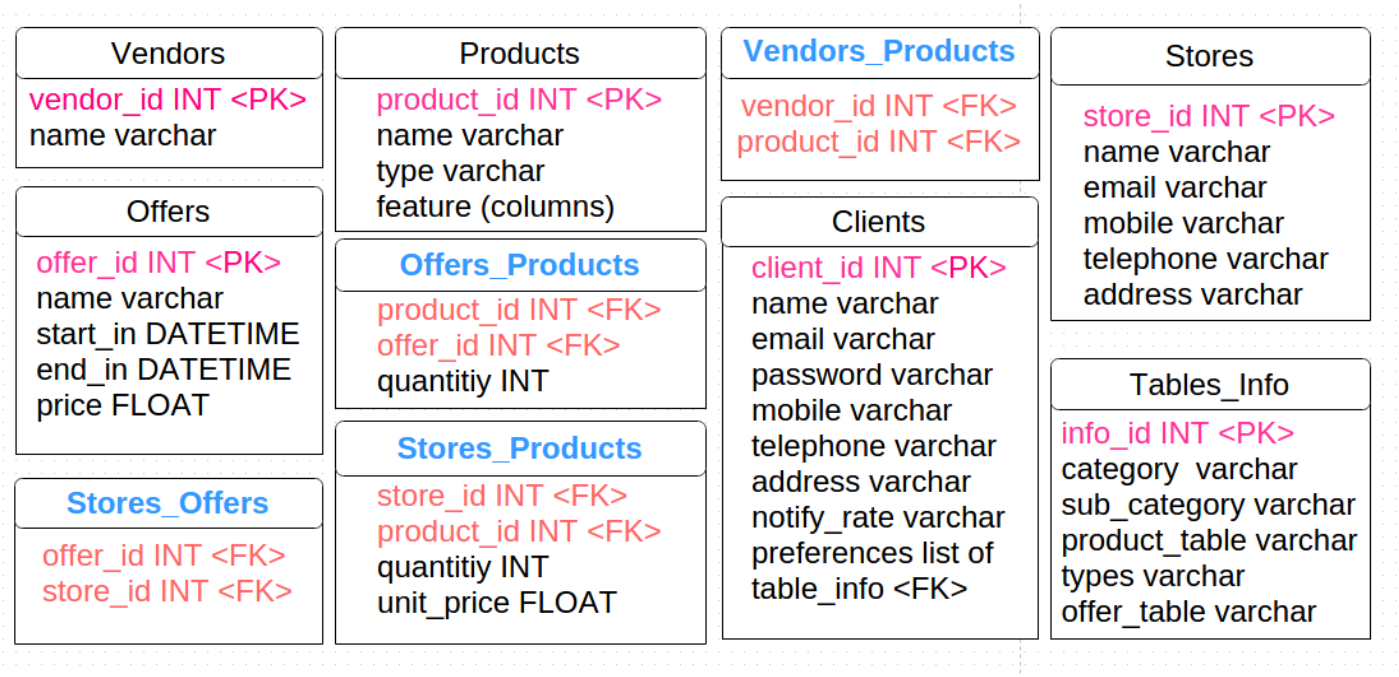
Float

for price attribute.

Ranges are –3.402823466E+38 to –1.175494351E-38, 0 and 1.175494351E-38 to 3.402823466E+38.

We need an extra table for storing the categories, subcategories, product table names, offer table names and product types to specify the available types of a subcategory.





category represents one of the different kinds of categories books, sports, food, drinks, electronics etc.

sub_category represents the product class in that category. Electronics category has products class like: mobiles, computers, GPS, tablets etc.

product_table the product table name in the database which holds all the detailed products associated with that subcategory.

types represents the available types of a specific product. A subcategory like "computers" has two possible types a laptop or desktop.

offer_table the offer table name in the database which holds all the detailed offers associated with that subcategory.

- Normalize the Database Design

First Normal Form (1NF): A table is 1NF if every cell contains a single value, not a list of values (*atomic)*. 1NF also prohibits repeating group of columns such as item1,item2,.., itemN. Instead, we create another table using one-to-many relationship.

Second Normal Form (2NF): A table is 2NF, if it is 1NF and every non-key column is fully dependent on the primary key.

Third Normal Form (3NF): A table is 3NF, if it is 2NF and the non-key columns are independent of each others. In other words, the non-key columns are dependent only on primary key and nothing else.

- Integrity Rules

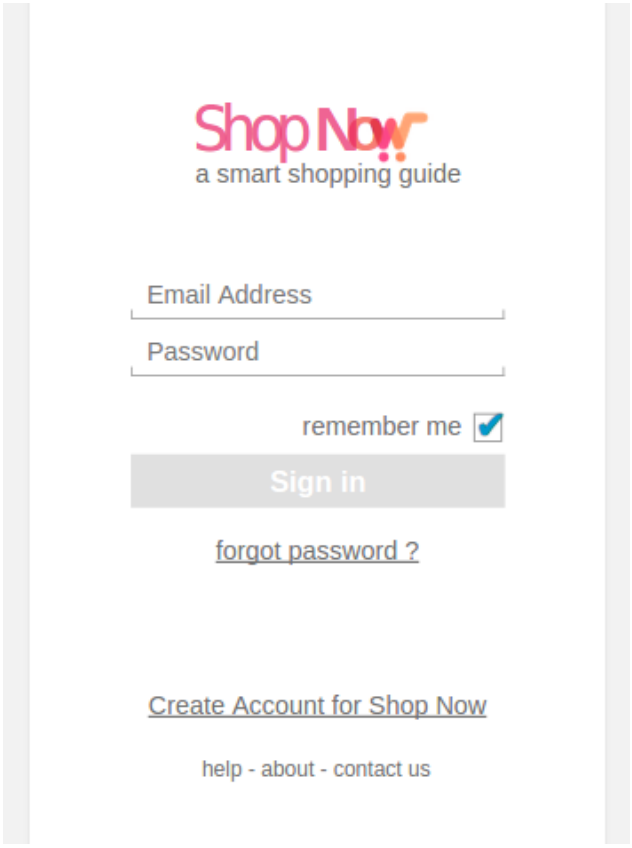
Entity Integrity Rule: The primary key cannot contain NULL.

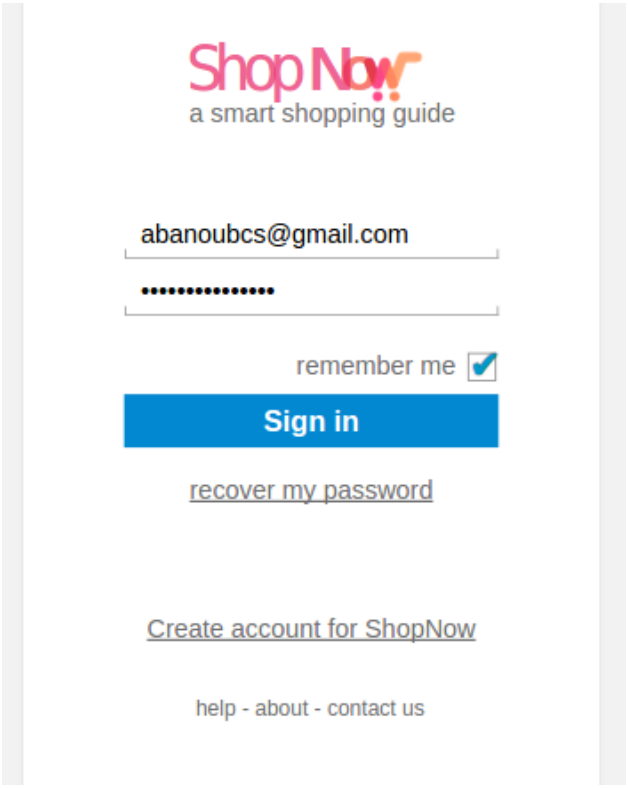
Referential Integrity Rule: Each foreign key value must be matched to a primary key value in the table referenced (or parent table).

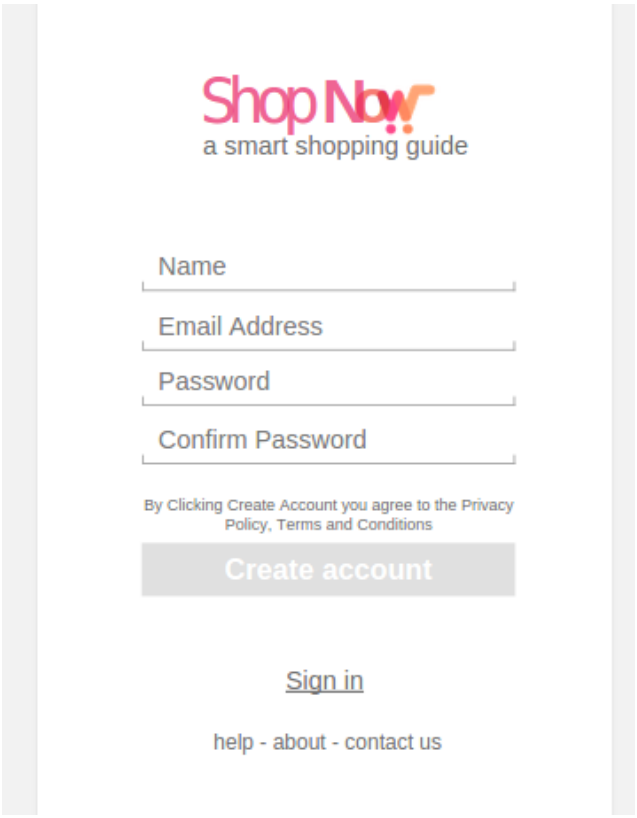
You can insert a row with a foreign key in the child table only if the value exists in the parent table.

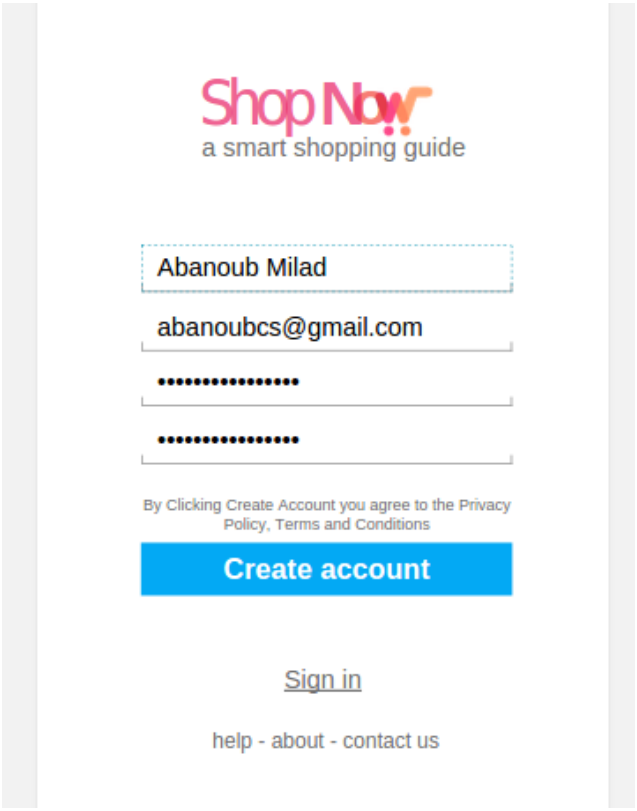
If the value of the key changes in the parent table (e.g., the row updated or deleted), all rows with this foreign key in the child table(s) must be handled accordingly.

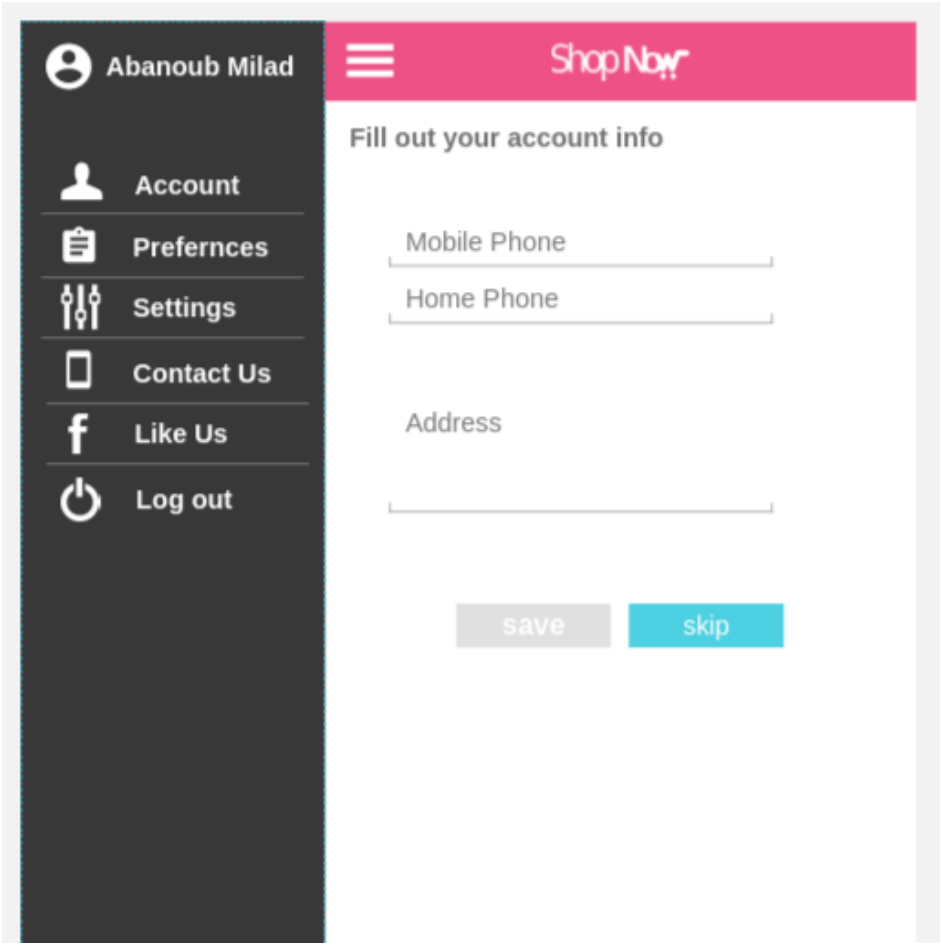
Client-side (Android) UI Mockups







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Like Us
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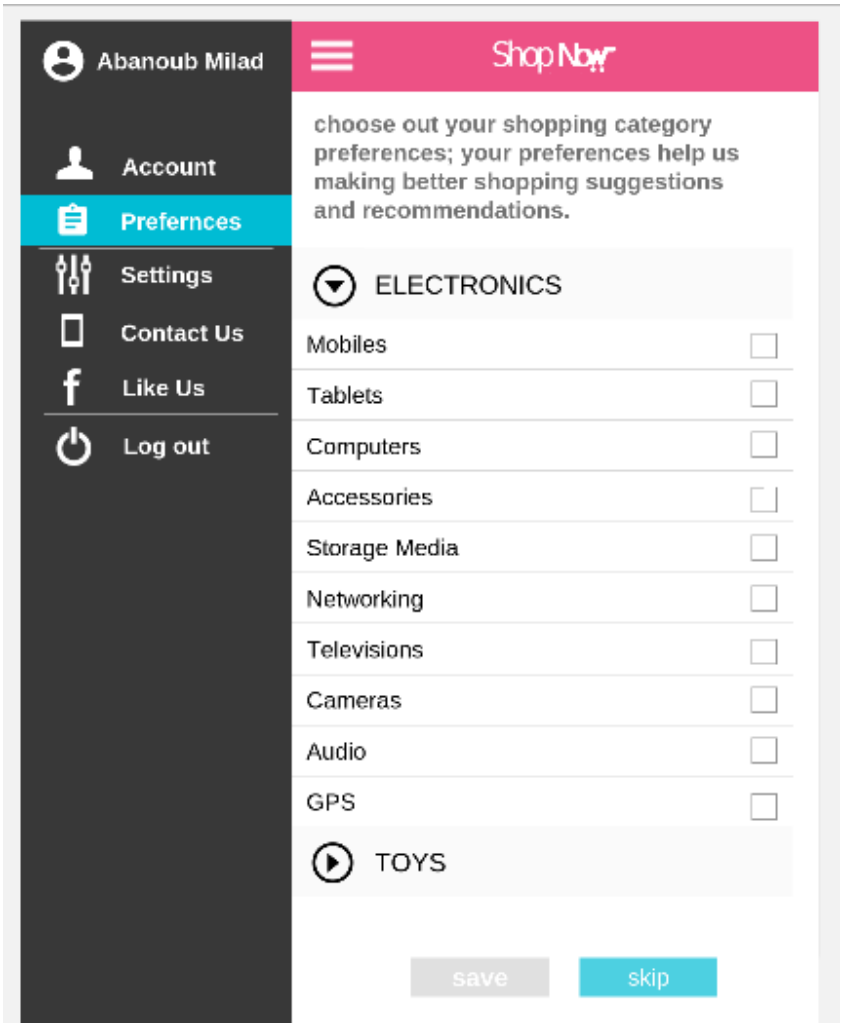
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choose out your shopping category preferences; your preferences help us making better shopping suggestions and recommendations.
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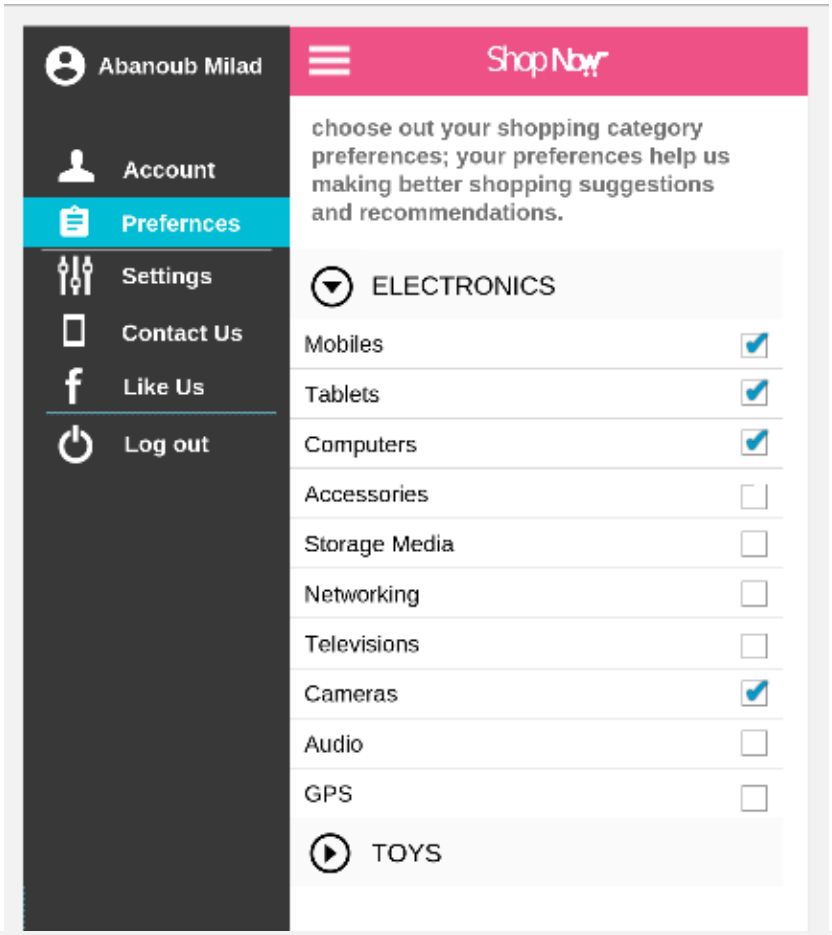
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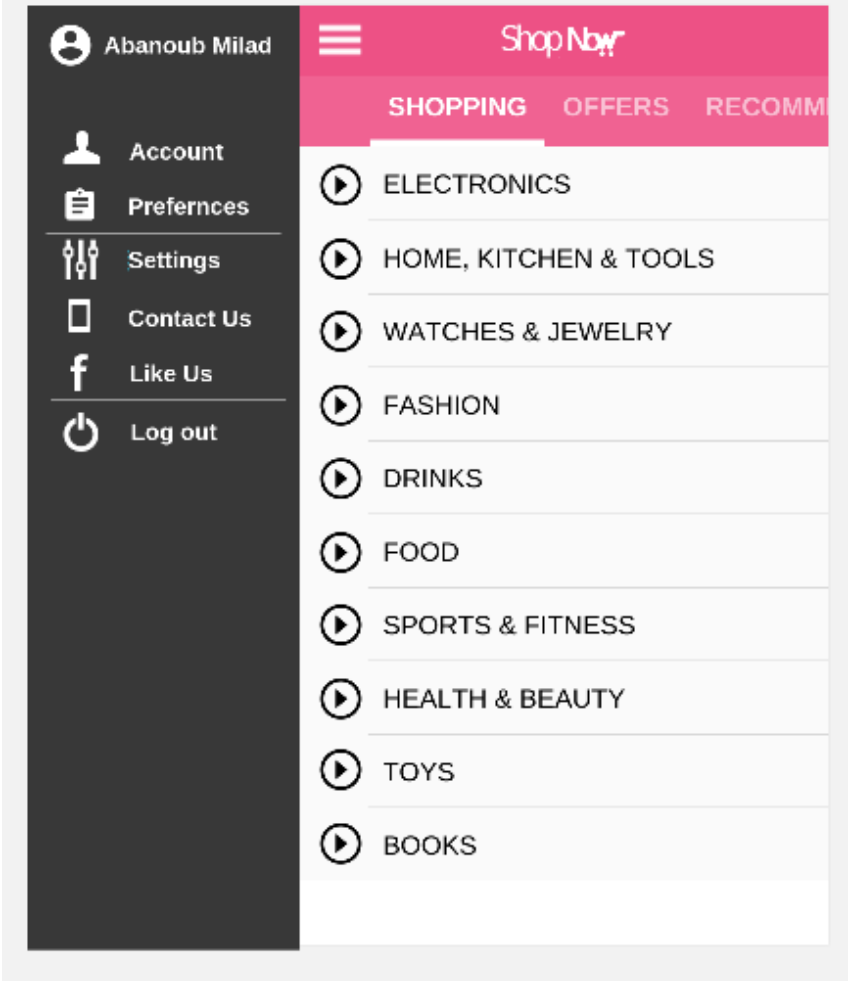
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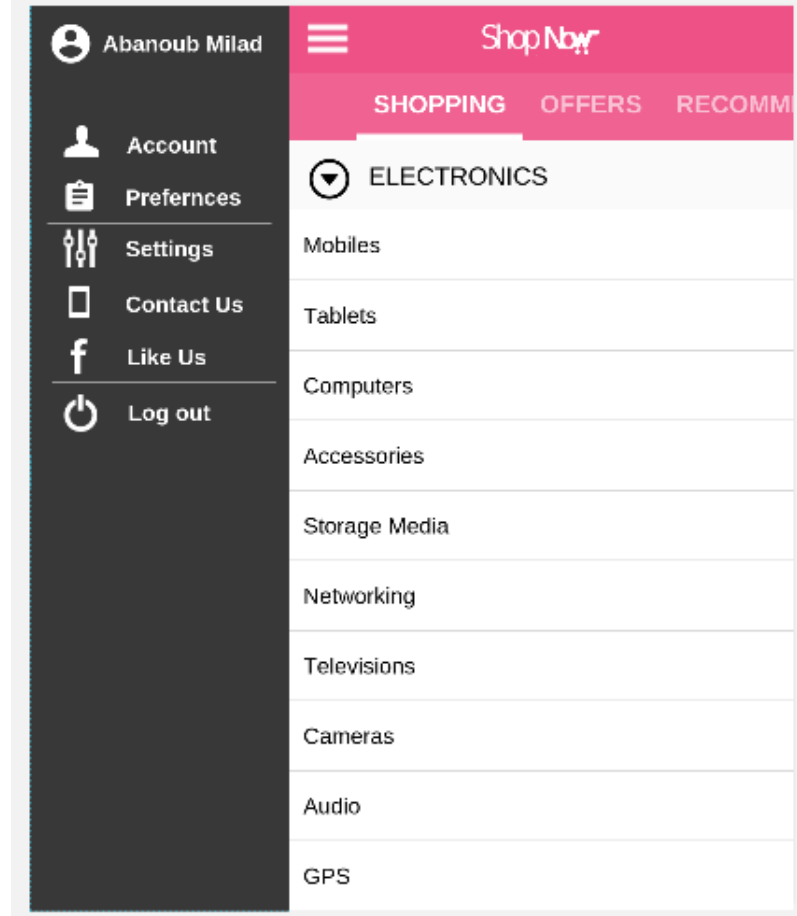
BOOKS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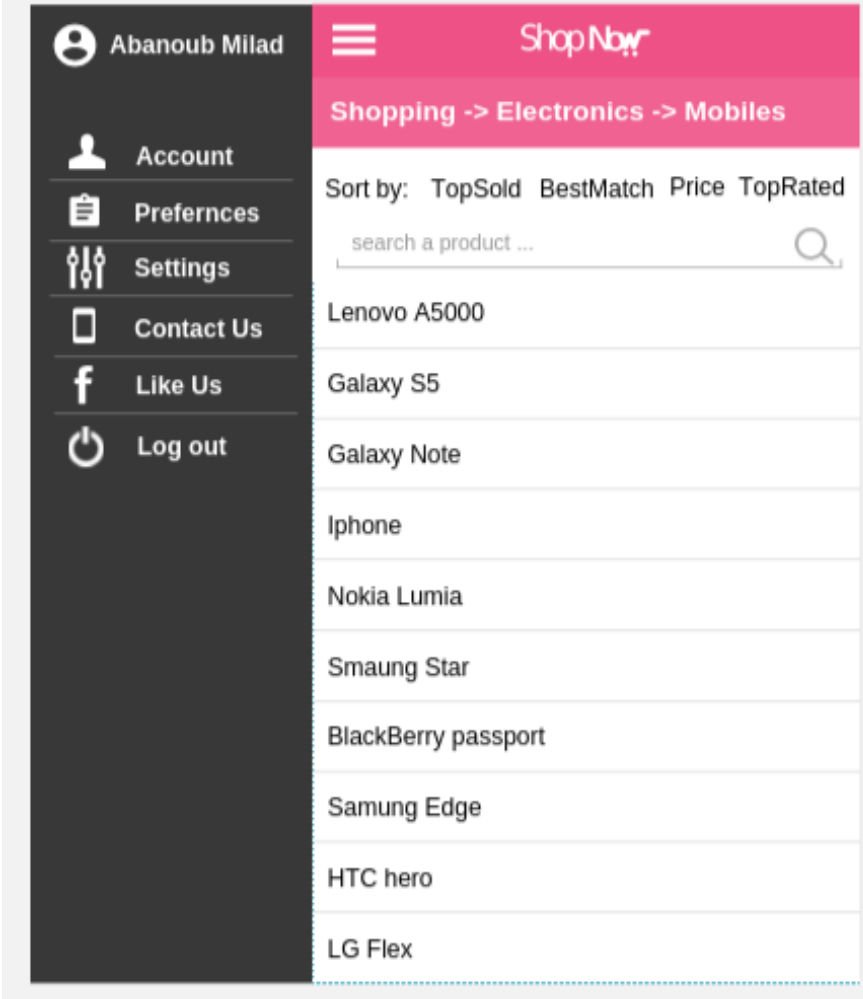
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Galaxy Note
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Nokia Lumia
Smaung Star
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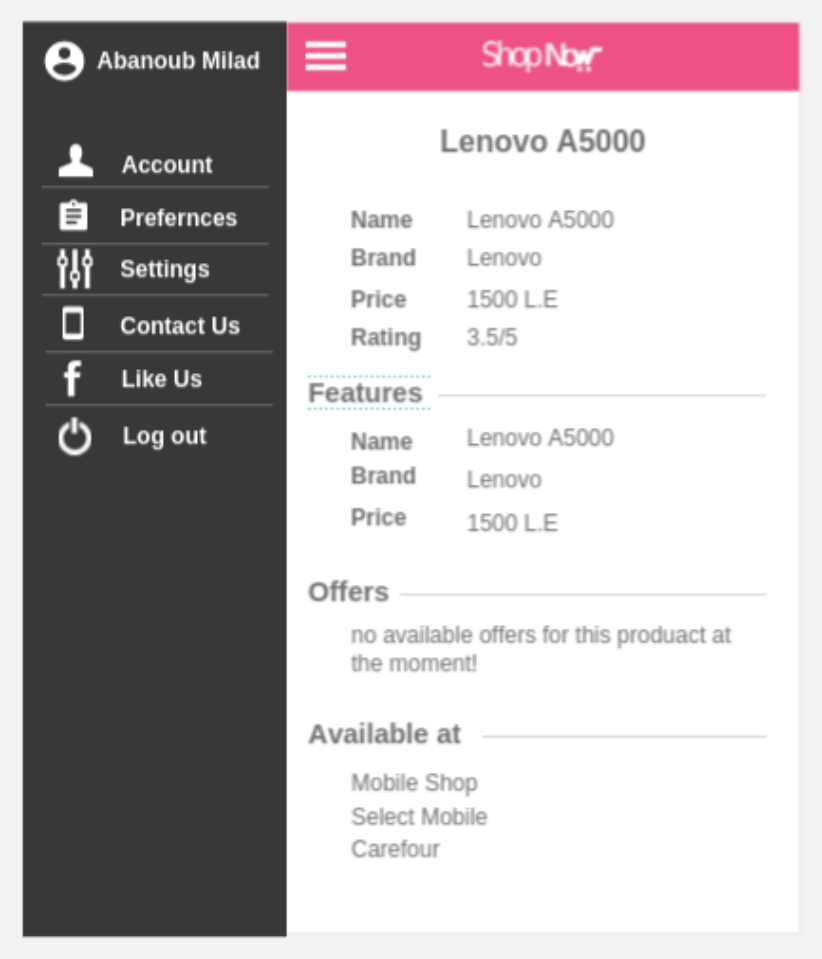
Samung Edge
HTC hero
LG Flex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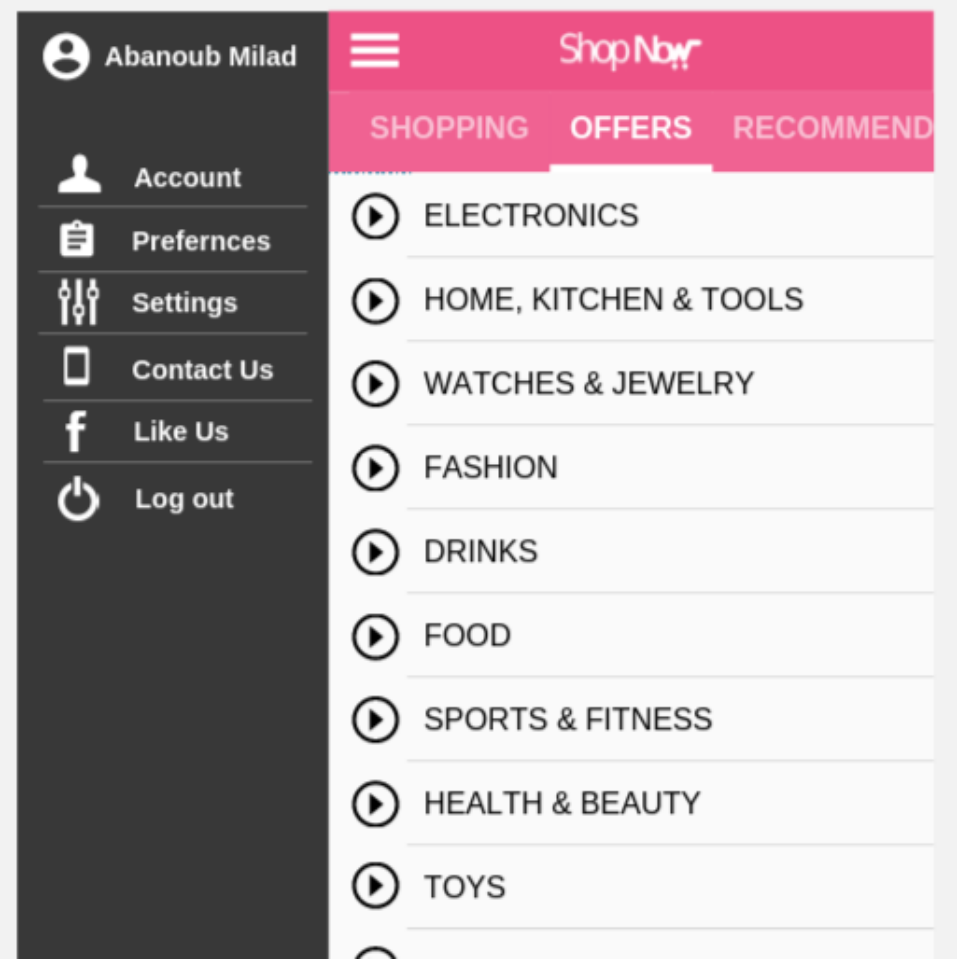
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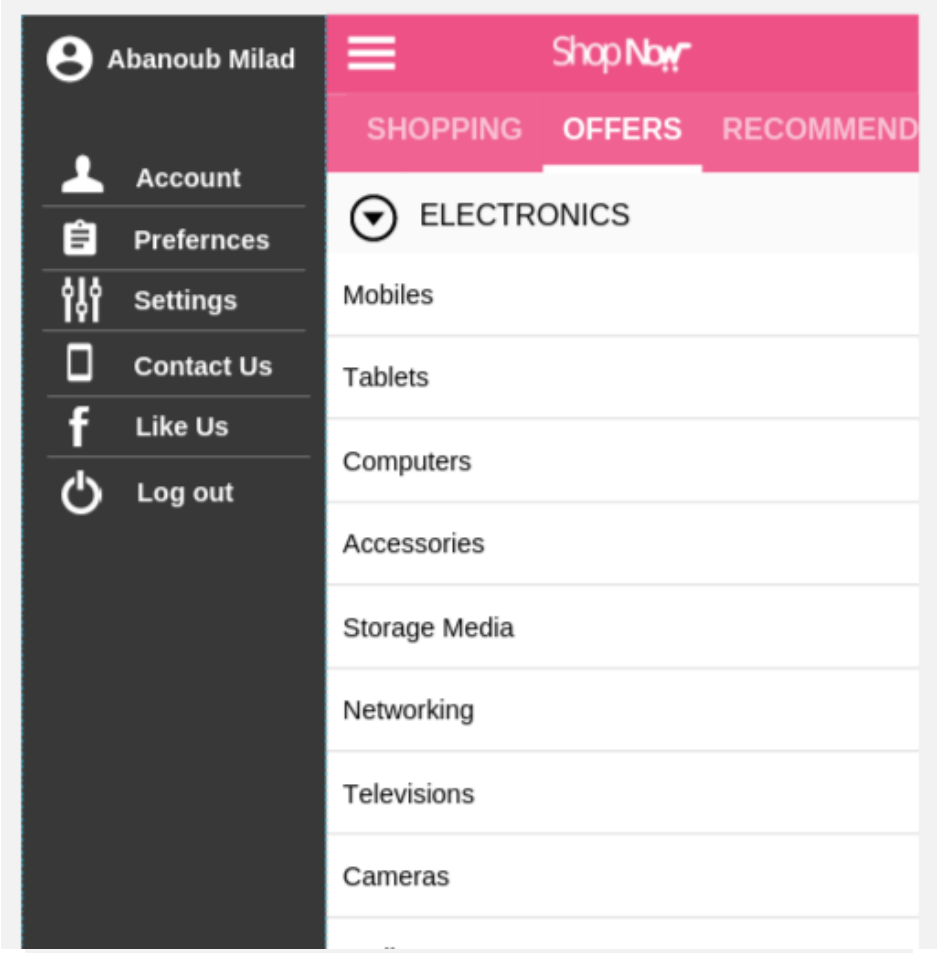
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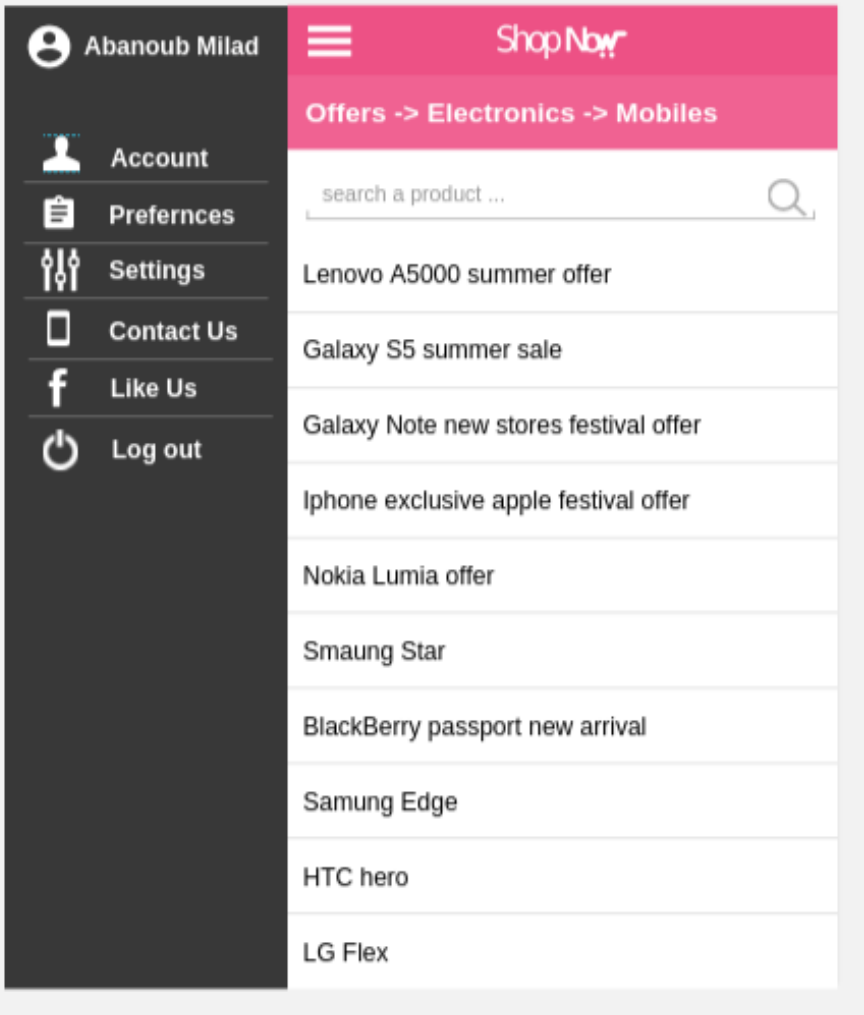
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Lenovo A5000 summer offer
Galaxy S5 summer sale
Galaxy Note new stores festival offer
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Nokia Lumia offer
Smaung Star
BlackBerry passport new arrival
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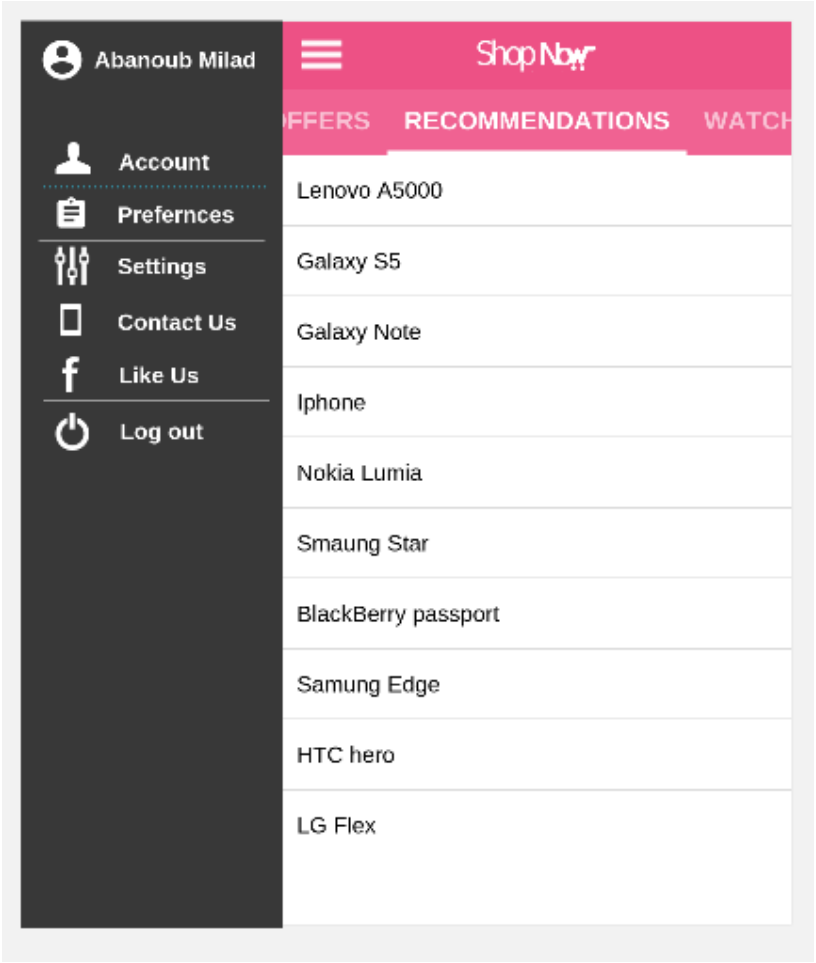
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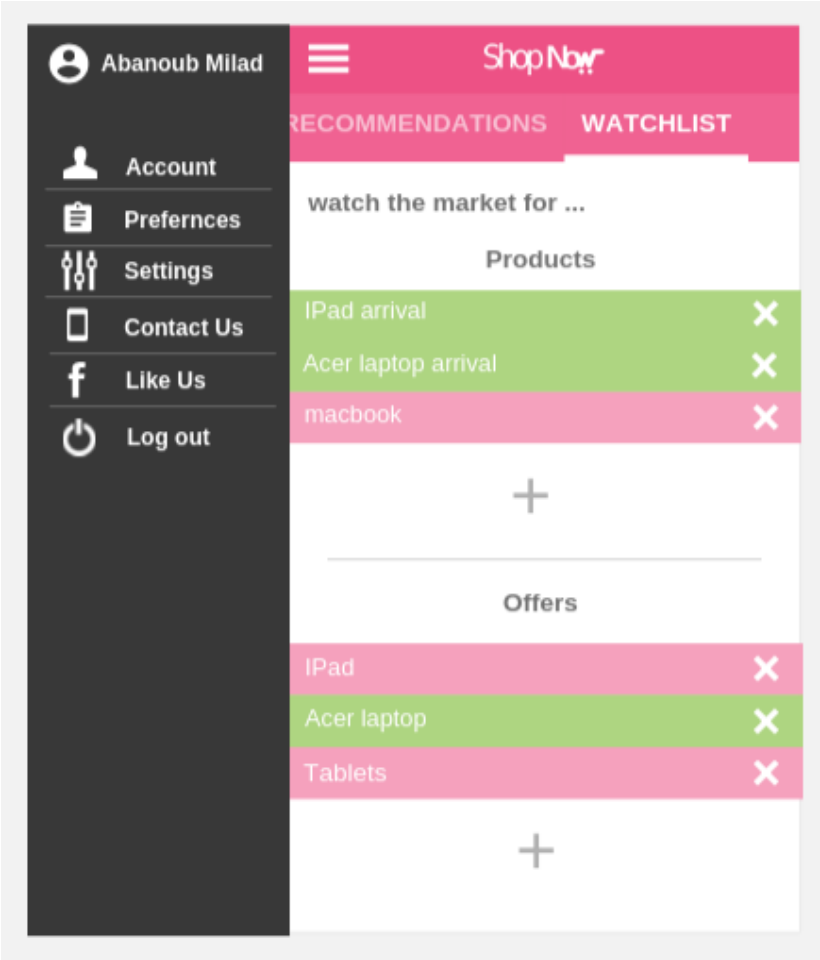
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Acer laptop arrival
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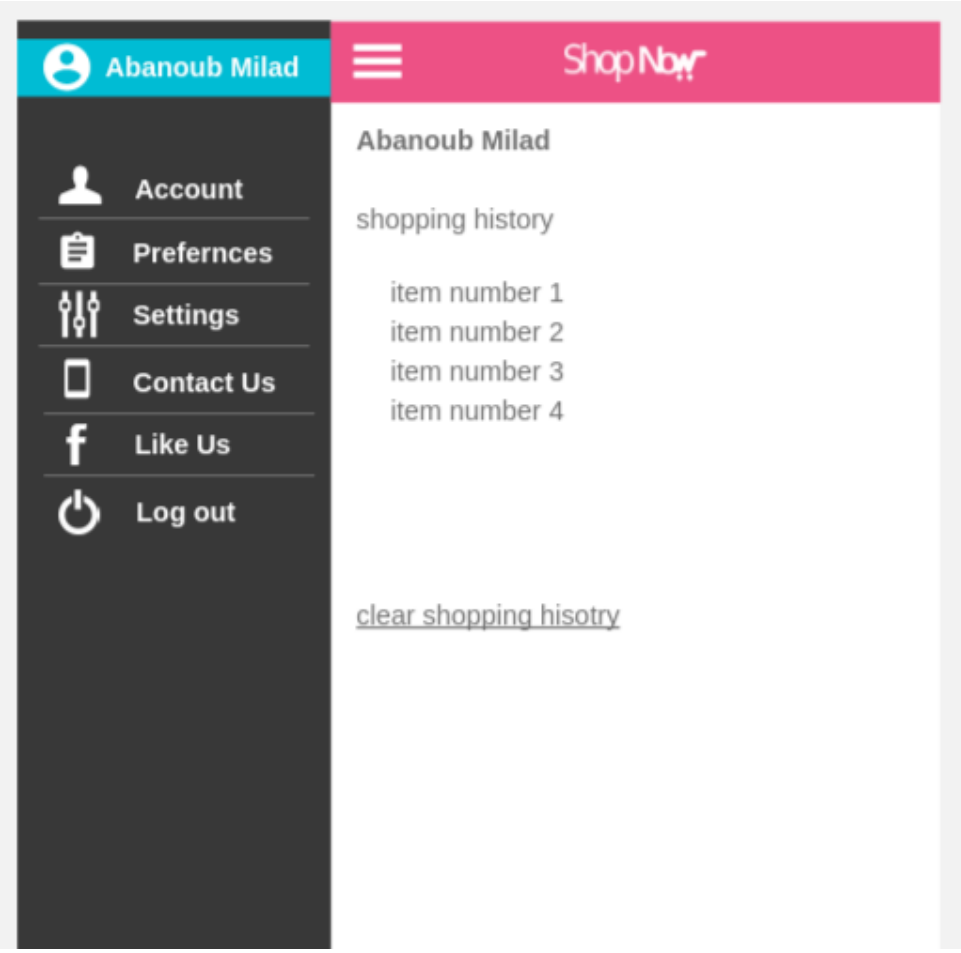
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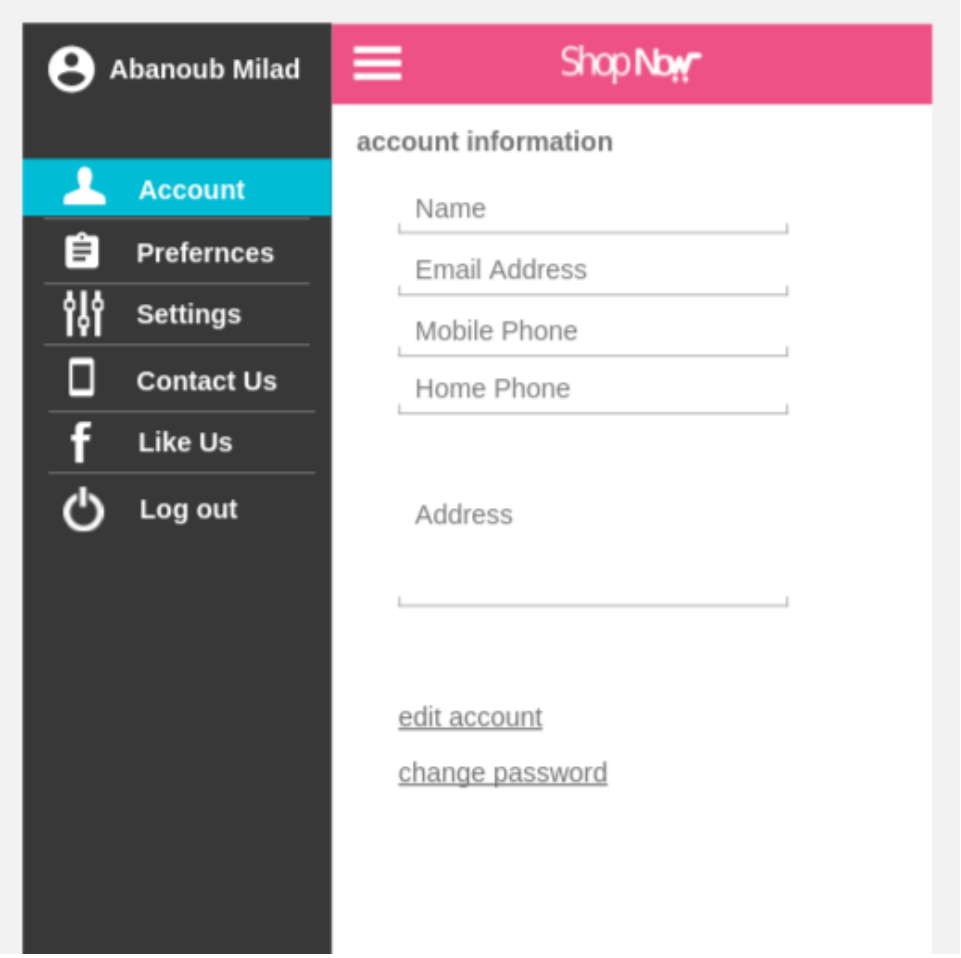
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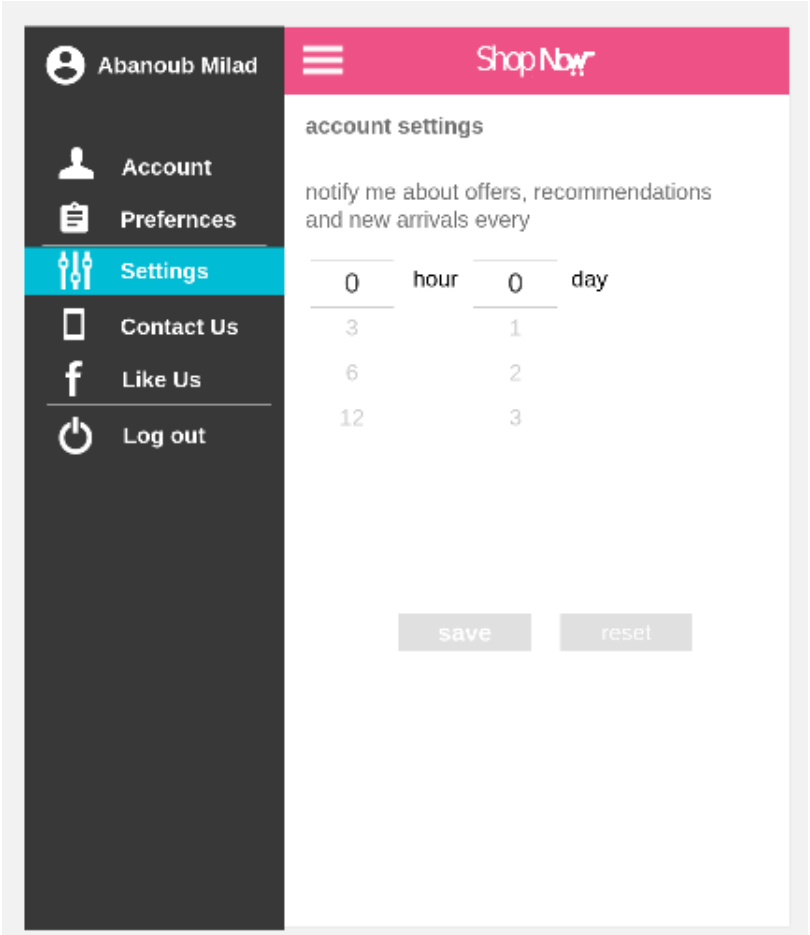
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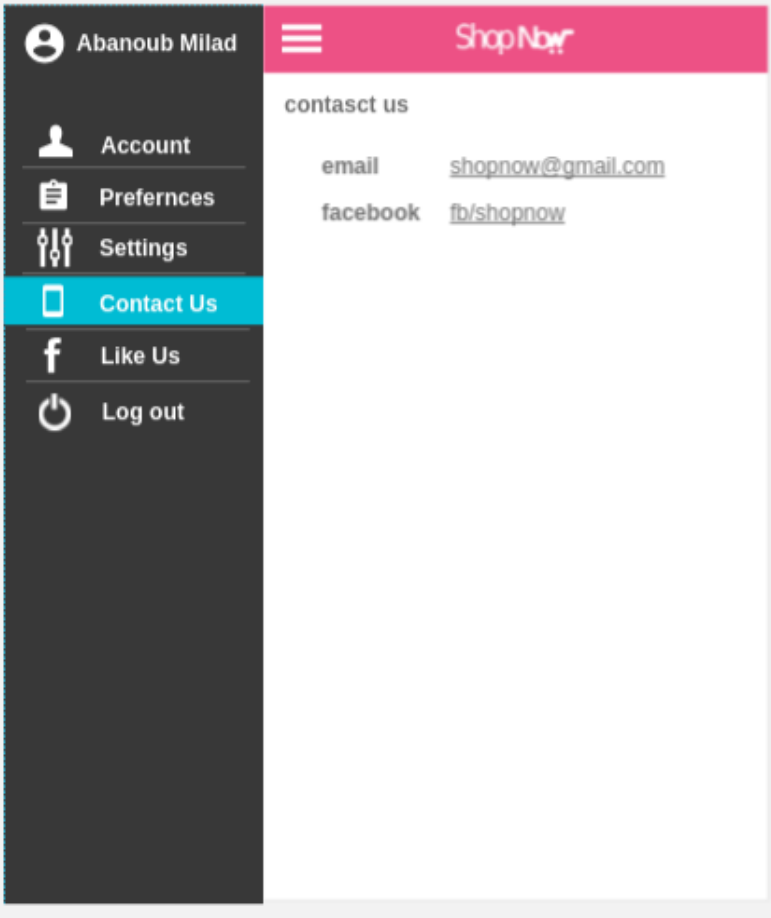
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