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**COM4061 Research Techniques**

**Smart-Shopping**

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## Abstract

This project is a cross-platform application built with Flutter, seamlessly integrates with Firebase and NodeJS as its backend powerhouse. Designed as a solution for store owners, this app redefines the retail industry by simplifying store management, creating engaging offers, and ensuring secure authentication. Users, on the other hand, benefit from an opportunity of smart shopping and real-time tourism experience, discovering nearby stores, exclusive deals, and local attractions. Our project doesn't just streamline store management; it creates an immersive experience where users explore, shop, and engage.

## GitHub Repository

<https://github.com/ribhy-bishtawi/Graduation-Project>

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## Introduction

In the continually evolving landscape of the retail and tourism industries, Smart-Shopping emerges as an avant-garde solution, a beacon of innovation reshaping traditional paradigms. This comprehensive report aims to unravel the intricacies of Smart-Shopping, downloadable on both Google Play and the App Store. Far beyond the confines of conventional shopping apps, Smart-Shopping stands as a multifaceted platform seamlessly integrating store management, user engagement, and real-time tourism exploration.

As commerce pivots towards the digital frontier, store owners grapple with a complex landscape, juggling the expectations of tech-savvy consumers and the imperatives of effective business management. Smart-Shopping is conceived as a dynamic tool, a response to this evolving dilemma. It empowers store owners not only to streamline operations and enhance online visibility but also to engage with clientele in novel and innovative ways. However, its utility doesn't stop at serving store owners; it extends to users, offering a curated experience that fuses smart shopping with immediate tourism exploration.

At its core, Smart-Shopping aspires to transcend the limitations of traditional shopping applications. It envisions a symbiotic ecosystem where store owners effortlessly manage their establishments, users discover enticing offers from nearby stores, and tourists seamlessly explore attractions in their vicinity. This report delves into the technical foundations, user-centric features, development methodologies, and strategic decisions underpinning Smart-Shopping's creation, offering a nuanced understanding of its transformative potential in the realms of retail and tourism.

This comprehensive report seeks to provide an exhaustive understanding of Smart-Shopping, encompassing its technical architecture, user-centric features, development

methodologies, and the strategic decisions underpinning its creation. As we traverse through the subsequent pages, we will unravel the layers of this innovative application, exploring how it leverages technologies like Flutter and Node.js, embraces multilingual inclusivity, and adopts industry-standard tools for version control and project management. The report serves as a guide for developers, stakeholders, and enthusiasts alike, offering insights into the intricacies of Smart-Shopping's creation and its potential to redefine the way we shop and explore the world around us.

## Description

Smart-Shopping, a pioneering mobile application, redefines the paradigms of retail and tourism. Downloadable on Google Play and the App Store, the app seamlessly merges store management and user engagement, providing a curated blend of smart shopping and real-time tourism exploration. This transformative project leverages technologies such as Flutter and Node.js, prioritizing a multilingual interface for inclusivity. The objective is clear: simplify store management, redefine the shopping experience, and facilitate dynamic tourism exploration.

## Setup

The technological foundation of Smart-Shopping is a meticulously crafted ensemble of cutting-edge tools, ensuring efficiency, responsiveness, and a seamless user experience. Flutter, a versatile UI toolkit developed by Google, forms the mobile app's interface, offering a unified codebase compatible with both iOS and Android. This is complemented by the robust MySQL database management system, serving as the backbone for data storage with its reliability and scalability features.

For backend development, Node.js takes center stage, renowned for its efficiency in building scalable and real-time applications. Firebase Authentication plays a pivotal role in securing the application through One-Time Password (OTP) authentication, aligning with Smart-Shopping's commitment to adopting state-of-the-art technologies for user authentication. This comprehensive technological setup underscores our commitment to delivering a sophisticated, user-friendly, and secure Smart-Shopping experience to our users.

## Authentication

The authentication journey within the Smart-Shopping mobile app is seamlessly facilitated by Firebase, providing a robust and secure framework for user verification. The process commences on the app's first page, serving as the gateway to personalized experiences. Users encounter a login interface featuring a dedicated field for their phone number, a prompt to initiate login, and an option to sign up.

Upon entering a phone number and initiating login, Firebase Authentication swiftly dispatches a One-Time Password (OTP) via SMS, fortifying the login process with an additional layer of security. The user is then redirected to an OTP entry page, where they input the received code. Upon pressing login, Firebase Authentication validates the OTP, granting access upon successful verification.

Opting to sign up navigates users to a comprehensive registration page, featuring text fields for phone number and username, ensuring a seamless onboarding experience. A select field offers the options of Male or Female for gender selection. The user is presented with two options: sign up and login. The login button redirects to the initial login page, maintaining a fluid transition between authentication stages.

Firebase Authentication's integration underscores the commitment to data security and user verification within Smart-Shopping. Leveraging Firebase not only streamlines the authentication process but also ensures that user data is handled with the utmost care and compliance. This robust authentication mechanism contributes to a trustworthy, secure, and seamless Smart-Shopping experience.

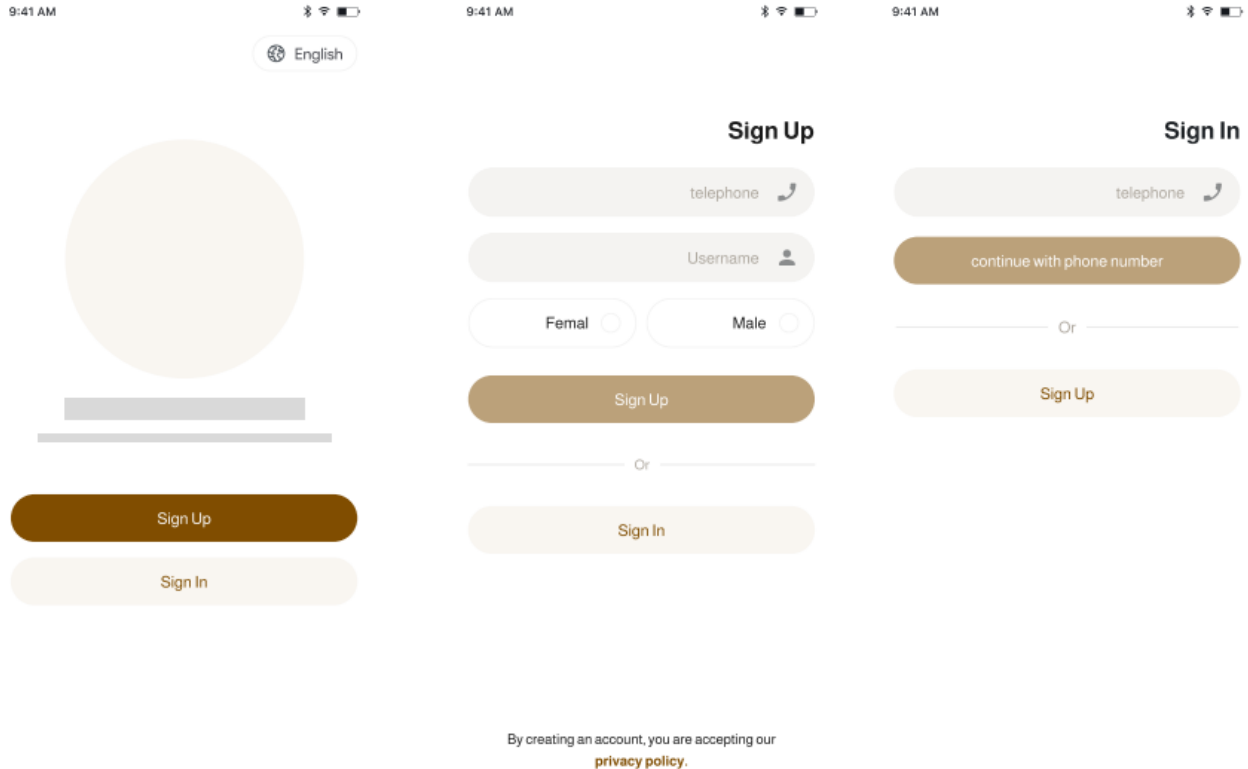


Figure 4.1 Authentication Process

## Backend

The dynamic backend of Smart-Shopping's mobile application is a result of meticulous development using Node.js, fortified by Prisma for seamless database migration, and enhanced with strategic API integration.

### Node.js

Smart-Shopping's backend infrastructure is powered by Node.js, a versatile and efficient runtime built on the V8 JavaScript engine. Renowned for its asynchronous and event-driven architecture, Node.js excels in building scalable and real-time applications. In the context of Smart-Shopping, Node.js takes center stage as the server-side technology, managing critical functionalities such as API endpoints, user authentication, and seamless integration with the MySQL database.



Node.js, with its ability to handle concurrent connections, is a strategic choice for applications where responsiveness and real-time interactions are paramount. Leveraging the event-driven nature of Node.js, Smart-Shopping's backend achieves optimal performance, ensuring a smooth and efficient user experience.

### Prisma for Database Migration

Prisma plays a pivotal role in Smart-Shopping's backend architecture, specifically focusing on the crucial aspect of database migration. Database migration ensures the continuous evolution of the database schema, allowing for structural changes without compromising existing data integrity.

As an advanced database toolkit, Prisma simplifies database interactions and migrations. It introduces a type-safe database access layer, enhancing developer productivity and minimizing the risk of runtime errors. Smart-Shopping harnesses Prisma's capabilities to facilitate efficient and version-controlled database schema changes.

Prisma's declarative data modeling syntax aligns seamlessly with Smart-Shopping's data requirements, contributing to predictable and manageable database migration processes. The integration of Prisma reflects Smart-Shopping's commitment to maintaining a scalable and well-structured database, essential for the application's long-term success.

### API Integration

Complementing the backend architecture, Smart-Shopping strategically integrates an API to enhance the application's functionalities. The API serves as the pipe for seamless communication between different components, allowing Smart-Shopping to access external services or data sources dynamically.

API integration expands the capabilities of Smart-Shopping, providing access to external data or services that enrich the user experience. Whether retrieving real-time information about store reviews, accessing the latest tourism data, or incorporating dynamic content, API integration amplifies the application's versatility.

Smart-Shopping's adept use of APIs ensures that the application remains agile and adaptable to the evolving landscape of retail and tourism. This strategic integration is a testament to Smart-Shopping's commitment to delivering a dynamic and feature-rich user experience.

The harmonious collaboration of Node.js, Prisma, and API integration in Smart-Shopping's backend not only establishes a robust foundation for existing functionalities but also positions the application for future scalability and innovation. This strategic selection of backend technologies reflects a commitment to excellence in development, contributing to the overall reliability, performance, and versatility of Smart-Shopping's backend infrastructure.

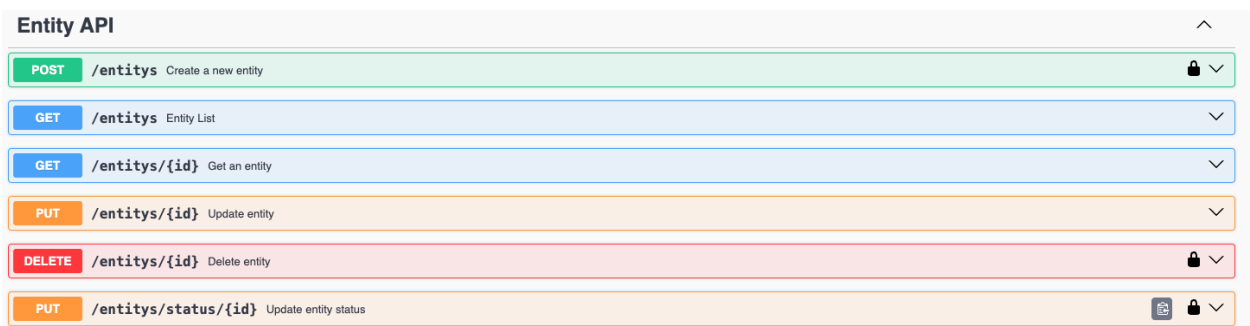


Figure 5.1 Documentation for the API using Swagger

## Application Flow

After successful authentication, the business owner is directed to the main page, which serves as the hub for managing shops, offers, notifications, and account settings. The user interface is designed for intuitive navigation, with a bottom navigation bar providing access to key functionalities.

### I. Shops:

- Shop Management Overview:
  - The "Shops" page provides an overview of all the shops associated with the business owner's account.
  - Each shop entry displays essential information, such as the shop name and location.
  - The list is dynamically updated as the business owner adds or removes shops.
- Add New Shop:
  - The business owner can easily add a new shop by tapping the designated "Add" button.
  - A streamlined form prompts the user to input details such as the shop name, category, location, and contact information.
  - Upon submission, the new shop is seamlessly integrated into the list of managed shops.
- Edit and Delete Shops:
  - For existing shops, the business owner can initiate edits to update information or make corrections.
  - A straightforward editing interface allows modifications to various fields.
  - Deletion of a shop is facilitated through a secure confirmation process, preventing accidental removal.

## II. Offers:

- Create and Manage Offers:
  - The "Offers" page serves as the control center for creating and managing promotional offers.
  - A dedicated button enables the addition of new offers, triggering a creation form.
  - Each existing offer is showcased with details such as the offer name, duration, and current status (Running or Ended).
- Offer Details:
  - Tapping on a specific offer provides detailed insights, including the opportunity description and relevant dates.
  - The interface allows quick modifications for ongoing offers, while past offers are clearly archived.

## III. Notifications:

- Notification Overview:
  - The "Notifications" page compiles a history of notifications sent by the business owner to customers.
  - Each entry displays the sender's name and message details, creating a transparent communication log.
- Sending Notifications:
  - The business owner can compose and send notifications directly from this interface.
  - Notifications undergo an approval process by administrators before being disseminated to all application users.

#### IV. Account:

- Account Management:
  - The "Account" page empowers the business owner to manage personal details, preferences, and language settings.
  - A user-friendly interface facilitates effortless edits to the user's profile information.
- Application Settings:
  - Business owners can customize application settings, including language preferences for a tailored experience.
  - Options for signing out or deleting the account are conveniently accessible, ensuring user autonomy.

This thoughtfully designed application flow prioritizes simplicity, providing business owners with an efficient platform to manage their shops, create offers, send notifications, and personalize account settings. The bottom navigation bar ensures seamless navigation between these core functionalities, contributing to a user-friendly and intuitive experience.

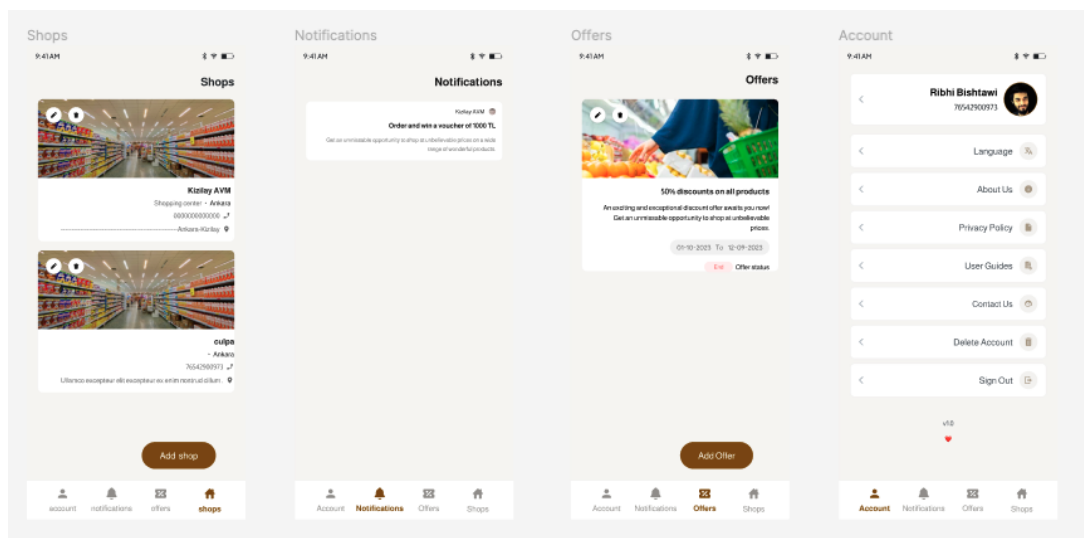


Figure 6.1 Main pages of the application

## Shop Creation Process

The shop creation process within the Smart-Shopping application is designed to be intuitive and comprehensive, allowing business owners to efficiently input essential details for their establishments. Here is an in-depth walkthrough of the fields and steps involved:

### I. Initiating Shop Creation:

- Upon navigating to the "Shops" screen, the business owner taps the "Add Shop" button, triggering the shop creation process.
- This action redirects the user to a dedicated screen designed for entering the particulars of the new shop.

### II. Data Entry Fields:

The shop creation form encompasses the following fields, capturing vital information about the establishment:

- **Store Name (in Turkish and English):**  
The business owner inputs the name of the store in both Turkish and English, ensuring a bilingual presence.
- **Categories:**  
Users can select one or more categories that best represent the type of products or services offered by the shop.
- **Keywords (Tags):**  
Limited selection of keywords or tags allows the business owner to associate specific attributes with the shop, enhancing searchability.
- **Commercial Registration Number:**  
A unique identifier, the commercial registration number, helps establish the legal identity of the shop.

- **City:**  
The city field allows the business owner to specify the geographical location of the shop.
- **Working Days/Hours:**  
Input fields for working days and hours provide information on the operational schedule of the shop.
- **Location:**  
The exact location of the shop is specified, contributing to accurate mapping and navigation.
- **Addresses for Multiple Branches:**  
If applicable, the business owner can provide addresses for multiple branches, facilitating a comprehensive overview.
- **Social Media Links:**  
Facebook, Instagram, and TikTok links offer opportunities for enhanced online visibility and engagement.
- **Contact Information:**  
The business owner includes the contact number and the name of the person to contact for inquiries or collaboration.
- **Store Image:**  
An image of the store is uploaded to create a visual representation, contributing to an attractive and informative shop profile.

### III. Submission and Confirmation:

After completing the form, the business owner submits the information.

### IV. Validation and Approval:

The entered information undergoes validation to ensure accuracy and compliance with any specified guidelines.

## V. Shop Integration:

- Once approved, the new shop integrates into the list of managed shops on the "Shops" screen.
- Users can immediately access and manage the newly added shop, leveraging the full suite of features offered by the Smart-Shopping application.

By structuring the shop creation process with a user-friendly form and comprehensive fields, Smart-Shopping empowers business owners to efficiently showcase their establishments within the application, fostering a vibrant and dynamic marketplace.

The image displays the 'Add - shop' and 'Edit- shop' interfaces of the Smart-Shopping application. The 'Add - shop' interface includes sections for Shop information (Shop name in Turkish, Shop name in English, Commercial number, Branch name, Categories, City, Time), Contact information (Telephone number, Contact name), Social Media (Facebook page, Instagram page, TikTok page), Tag words, and Shop Image. The 'Edit- shop' interface includes a similar form for editing existing shop information. The 'Cities' section lists cities like Ankara, Istanbul, Mersin, Adana, Izmir, Antalya, Kayseri, and Hatay. The 'Categories' section lists categories like Restaurant, Clothes Shop, Mail, and Fast Food. The 'Time' section shows working hours for different days of the week. The 'Maps' section shows a map of Florence with various landmarks labeled.

Figure 6.2 Add new shop interface



## Notification System Overview

The Smart-Shopping application integrates a robust notification system, empowering business owners to communicate effectively with users. This system ensures a controlled and streamlined process for delivering important messages, promotions, and updates. Here's a summary of the notification workflow:

I. Initiation:

Business owners compose messages within a specific character limit on the "Notifications" page, covering promotions, announcements, or relevant information.

II. Sender's Information:

The sender's name is included, providing users with clear and transparent information about the source of the notification.

III. Submission to Administrator:

Messages are submitted for administrator review upon pressing the "Send Message" button, ensuring content aligns with guidelines and maintains a high standard.

IV. Administrator Approval:

The administrator reviews and approves messages, acting as a quality control measure to prevent spam or inappropriate content.

V. Delivery to Users:

Approved notifications are seamlessly delivered to all application users, ensuring standardized and controlled communication.

## Key Features:

### I. Efficiency and Transparency:

The streamlined process, coupled with transparent sender information, guarantees efficient communication and fosters trust.

### II. Character Limit:

The character limit encourages concise and clear messaging, optimizing the user's experience with easily digestible content.

### III. Quality Control:

The administrator's approval step adds a layer of control, ensuring that notifications uphold the application's standards.

In summary, the notification system in Smart-Shopping enhances user engagement, facilitates efficient communication, and maintains a high standard of content quality through a meticulous approval process. This feature contributes to a positive and informed user experience within the Smart-Shopping community.

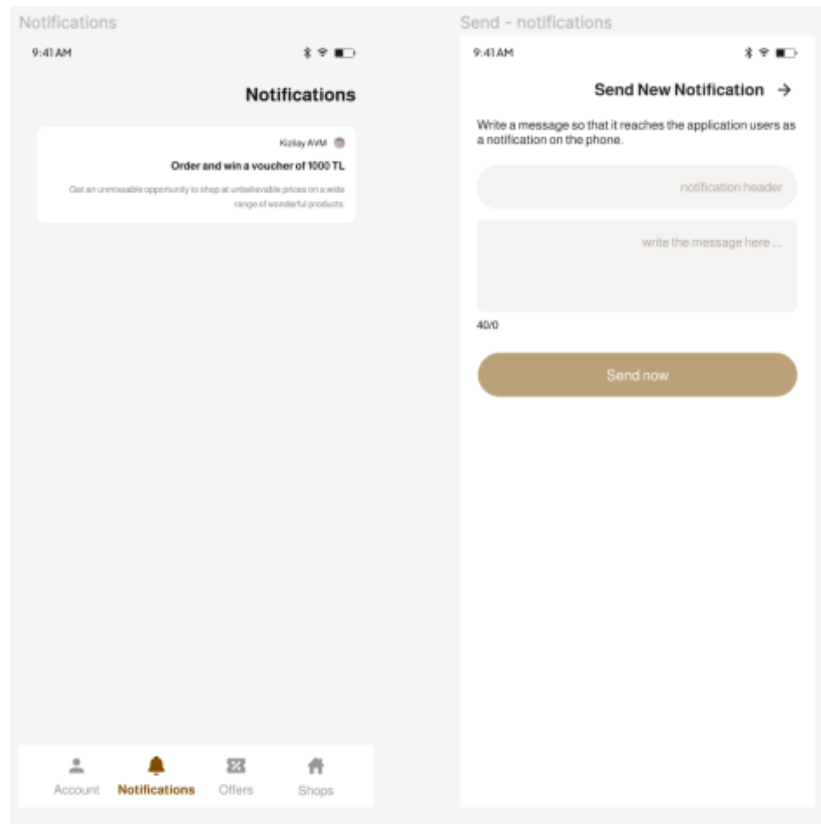


Figure 6.3 Notification and Send New Notification interface

## Offers and Offer Creation

Creating a new offer on the Smart-Shopping application is a straightforward process designed for maximum ease. Here's a concise step-by-step guide for business owners:

I. Initiation

Tap "Add Offer" on the Offers Page to start crafting a new promotion.

II. Offer Input Page:

User is redirected to a dedicated page for entering offer details.

III. Essential Details:

Input offer name, upload a visually appealing image, and provide a compelling offer description.

IV. Time Frame:

Set the offer start and end dates to communicate urgency and exclusivity.

V. Confirmation:

Confirm details and submit for immediate display in the application.

## Key Advantages:

- I. User-Friendly:  
Simplified steps for effortless navigation.
- II. Visual Appeal:  
Enhance attractiveness with an image for the offer.
- III. Time-Sensitive:  
Leverage start and end dates for time-sensitive promotions.

This streamlined process ensures that businesses can efficiently create and showcase compelling offers, fostering engagement and boosting their online presence.

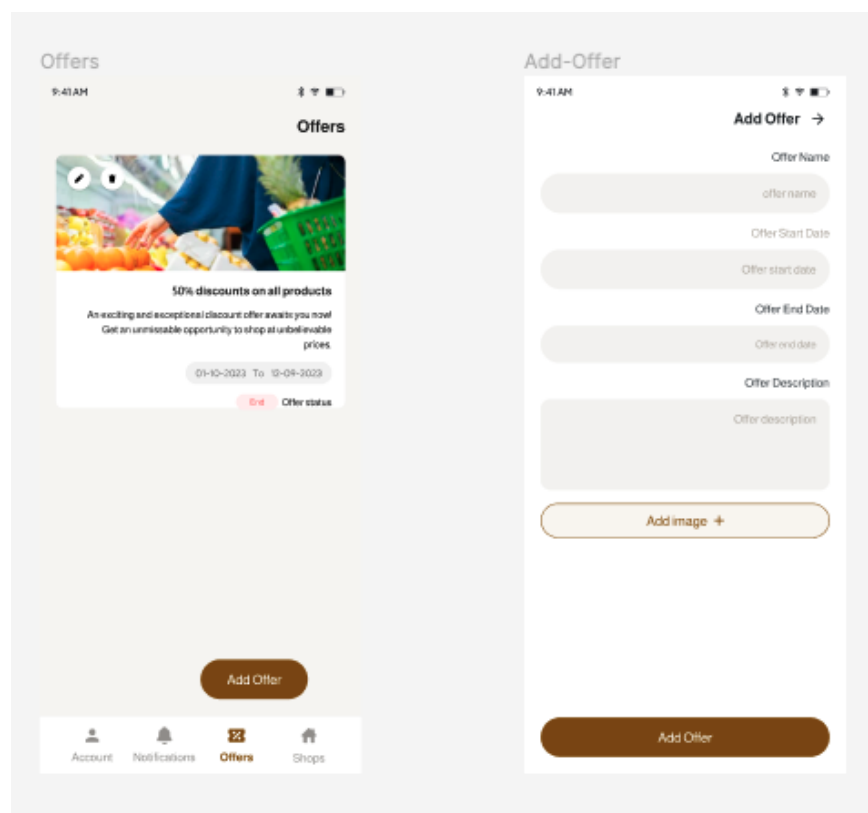


Figure 6.4 Offers and Add New Offer interface

## Conclusion

In conclusion, Smart-Shopping stands as a beacon of innovation, poised to redefine the landscape of retail and tourism experiences. The fusion of cutting-edge technology—utilizing Flutter, MySQL, Node.js, and Firebase—positions Smart-Shopping as more than just an application; it's a comprehensive solution, embodying reliability, security, and feature-rich capabilities.

For business owners, Smart-Shopping isn't a complex tool; it's a user-friendly ally streamlining store management, simplifying offer creation, and ensuring a secure login process. Its strength lies in simplicity, providing a hassle-free experience in the dynamic realm of digital commerce.

The application's appeal extends beyond businesses, offering users a seamless blend of smart shopping and real-time tourism exploration. With instant updates on offers, visually appealing promotions, and a multilingual interface, Smart-Shopping promises an accessible and enjoyable experience for all.

As we conclude this chapter, Smart-Shopping isn't reaching a final destination; it's embarking on a journey of continuous improvement. With a commitment to enhancing user experiences and incorporating valuable feedback, Smart-Shopping anticipates not just keeping up with but staying ahead in the ever-evolving digital commerce and exploration domain. In essence, it's not just an app; it's a transformative force, simplifying how we shop and explore, shaping a more connected, accessible, and enjoyable future for retail and tourism.

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