7. Самарский А.А., Михайлов А.П. Математическое моделирование: Идеи. Методы. Примеры. – М.: Наука, 1997. – 320 с.

8. Якубов С.Х. Системный анализ оптимизации проектирования инженерных конструкций и сооружений. - // Проблемы оптимизации сложных систем: Докл. Седьмой междунар. Азиатской школы-семинара. - Ташкент,2011. - С.154-163.

9. Якубов С.Х. Методы и алгоритмы синтеза и анализа конструкторских и технологических решений в системе автоматизированного проектирования инженерных конструкций и сооружений. Монография. - М.: ИНФРА-М, 2019. -164 с.

10. Якубов С.Х., Хамраев А.А., Хушбоков И.У. Алгоритмизация оптимизационных моделей и алгоритмов для автоматизированного проектирования инженерных конструкций. – LAP LAMBERT Academic Publishing RU, 2022. – 119 p. ISBN: 978-620-5-50772-8.

11. Якубов С. Х., Хушбоков И.У., Даминова Б.Е., Расулов У. Ш. Специальный алгоритм случайного поиска для оптимизации инженерных конструкций//Агентство по интеллектуальной собственности Республики Узбекистан. Свидетельство № DGU 45440, 12.12.2024.

12. Якубов С. Х., Хушбоқов И.У., Норкулов Э. О., Даминова Б.Э., Расулов У. Ш. Алгоритмическая система оптимизации инженерных конструкций // Агентство по интеллектуальной собственности Республики Узбекистан. Свидетельство № DGU 45441, 12.12.2024.

DEVELOPING MOBILE APPLICATIONS FOR LOCAL FOOD MARKETS

Турдиев Тимур Тахирович
старший преподаватель кафедры «Информационной безопасности»
Ташкентский университет информационных технологий имени Мухаммада Аль-Хорезми Ургенчский филиал
temurbek199002@gmail.com
Бахрамов Темурбек Ойбекович
студент по направления «Компьютерная инженерия» Ташкентский университет информационных технологий имени Мухаммада Аль-Хорезми Ургенчский филиал
temurbekbaxramov150@gmail.com

Annotation. In today's digital era, developing a user-friendly and efficient mobile application for local grocery markets is essential. OVVO is a mobile application designed for local grocery stores that integrates various features to enhance the shopping experience. This article highlights the design principles, functional components, and technologies implemented in the OVVO app, focusing on the minimalist interface, intuitive navigation, and seamless product browsing. The app includes sections like product categories, discounts, top-selling items, and a shopping cart with customizable collection options. It allows users to manage their purchases, track their order history, and engage with customer support through a chat feature.

Keywords: mobile application development, user experience, product management, Firebase Authentication, Room Database, e-commerce, local markets, shopping experience.

РАЗРАБОТКА МОБИЛЬНЫХ ПРИЛОЖЕНИЙ ДЛЯ МЕСТНЫХ ПРОДУКТОВЫХ РЫНКОВ

Аннотация. В современную цифровую эпоху разработка удобного и эффективного мобильного приложения для местных продуктовых магазинов имеет ключевое значение.

OVVO — это мобильное приложение, разработанное для местных продуктовых магазинов, которое включает различные функции для улучшения покупательского опыта. В этой статье рассматриваются принципы дизайна, функциональные компоненты и технологии, реализованные в приложении OVVO, с акцентом на минималистичный интерфейс, интуитивную навигацию и бесшовный процесс просмотра товаров. Приложение включает разделы, такие как категории товаров, скидки, самые продаваемые товары и корзина с возможностью создания настраиваемых коллекций. Пользователи могут управлять своими покупками, отслеживать историю заказов и общаться с поддержкой через чат.

Ключевые слова: разработка мобильных приложений, пользовательский опыт, управление продуктами, Firebase Authentication, Room Database, электронная коммерция, местные рынки, покупательский опыт.

MAHALLIY OZIQ-OVQAT MARKETLARI UCHUN MOBIL ILOVA ISHLAB CHIQISH

Annatatsiya - Bugungi raqamli asrda mahalliy oziq-ovqat do'konlari uchun qulay va samarali mobil ilovani ishlab chiqish muhim ahamiyatga ega. OVVO – xarid qilish tajribasini yaxshilash uchun turli funksiyalarni o'z ichiga olgan mahalliy oziq-ovqat do'konlari uchun mo'ljallangan mobil ilova. Ushbu maqola minimalist interfeys, intuitiv navigatsiya va mahsulotni uzluksiz ko'rib chiqish tajribasiga e'tibor qaratgan holda OVVO ilovasida amalga oshirilgan dizayn tamoyillari, funktsional komponentlari va texnologiyalarini o'rganadi. Ilova mahsulot toifalari, chegirmalar, eng ko'p sotuvchilar va maxsus to'plamlarni yaratish qobiliyatiga ega xarid qilish savati kabi bo'limlarni o'z ichiga oladi. Foydalanuvchilar xaridlarini boshqarishi, buyurtmalar tarixini kuzatishi va chat orqali qo'llab-quvvatlash bilan bog'lanishi mumkin.

Kalit so'zlar: mobil ilovalarni ishlab chiqish, foydalanuvchi tajribasi, mahsulotni boshqarish, yong'in bazasi autentifikatsiyasi, xona ma'lumotlar bazasi, elektron tijorat, mahalliy bozorlar, mijozlar tajribasi.

Introduction

In the modern world, where digital solutions increasingly shape consumer behavior, mobile applications have become a fundamental part of various industries, including retail. The local grocery market is no exception, as mobile apps offer a convenient and efficient way for consumers to access products, make purchases, and stay updated on the latest deals. OVVO is a mobile application specifically developed for local grocery markets, designed to simplify and enhance the shopping experience for customers. With a focus on user-friendly design, seamless navigation, and secure functionalities, OVVO combines the power of modern technology with the everyday needs of consumers.

The app incorporates several innovative features, such as product categories, shopping cart management, customizable collection options, and secure communication with customer support. Additionally, OVVO emphasizes data security, with Firebase Authentication ensuring secure user access and Room Database securely storing product information. Regular updates, encryption techniques, and secure transmission channels further contribute to a smooth and safe experience. As mobile shopping continues to grow in popularity, OVVO aims to provide a trustworthy, efficient, and enjoyable platform that meets the evolving needs of users, all while fostering trust and customer satisfaction.

TABLE 1. Application Features.

No.	Feature	Description
1	User Authentication	Users can log in using Google sign-in. Only one name is associated per email.

2	Admin Role	Admin (by predefined email) has extended privileges, such as managing messages.
3	Real-Time Chat	Users can send and receive messages in real time.
4	Chat Message Restrictions	Admin can delete all messages; users can only delete their own.
5	Cart System	Products are grouped by categories and added to a local shopping cart.
6	Grouped Order View	Each product group (e.g., "Home", "Birthday") is displayed with total price.
7	Simulated Online Payment	Fake payment screen for demo purposes (card number, phone, code entry).
8	Order Submission per Group	Each group has an "Order Now" button to submit orders individually.
9	Address Input	Users can specify their delivery address while placing an order.
10	Telegram Notification System	Orders are sent to the store owner via Telegram bot with full order details.
11	Persistent Login State	User login is remembered via SharedPreferences for smoother experience.
12	Cart Item Management	Users can increase, decrease, or remove items from the cart.

1. Overview of the OVVO Mobile Application

OVVO is a mobile application tailored for local grocery markets, offering a wide range of features to facilitate a seamless and enjoyable shopping experience for users. The app's primary goal is to bridge the gap between local markets and their customers by providing easy access to products, discounts, and personalized shopping options. By combining a minimalist design with intuitive navigation, OVVO ensures that users can find products quickly, manage their orders efficiently, and stay connected with their preferred stores.

The app is designed to cater to the evolving needs of modern consumers who increasingly rely on their mobile devices for shopping. Whether users are browsing for fresh produce, beverages, or discounts on top-selling items, OVVO presents a unified platform where all the necessary functionalities are within reach. By incorporating features such as product categories, a customizable shopping cart, and secure communication channels, the app offers a comprehensive and convenient solution for grocery shopping.

2. User Experience and Interface Design

One of the cornerstones of the OVVO mobile application is its user-centric design. The app is built on a minimalist aesthetic, using a clean color palette of white, green, and beige, which not only creates a visually appealing interface but also enhances usability. The simple yet effective layout allows users to navigate the app easily and quickly locate their desired items.

The home screen of the app showcases essential categories such as news, discounts, and best-selling products, arranged in horizontal scroll formats. This allows users to explore the latest offers without feeling overwhelmed. Additionally, the bottom navigation bar provides easy access to key sections like products, shopping cart, and chat, ensuring that users can seamlessly move between different app functionalities. The use of a Navigation Drawer on the left side of the screen gives users quick access to additional sections like profile management, store information, and

contact details. The app's design aims to minimize clutter, allowing customers to focus on their shopping tasks while ensuring all necessary information is readily available at their fingertips.

3. Product Categories and Shopping Cart Management

OVVO offers an intuitive approach to browsing and purchasing products by categorizing them into clear, easily navigable sections. Categories such as fruits, vegetables, beverages, and other grocery items are displayed vertically on the main screen. When a user clicks on a category, the app displays a list of relevant products, each including key details like price and availability.

Each product page features an interactive "+" button that allows users to add items to their shopping cart. When clicked, the app prompts the user to specify the quantity or weight of the product before confirming the addition. Additionally, users can organize their shopping into custom sections like "birthday shopping," "weekly groceries," or any other category they choose. This feature offers flexibility, enabling users to maintain separate lists based on specific shopping needs.

The Shopping Cart section is designed to keep track of the items a user adds throughout their shopping journey. It is organized by collection, with each collection containing a list of items and their total price. If the user adds a product to an existing collection, the app updates the total price automatically, providing real-time cost tracking. In case the user needs to make any changes to their cart, such as modifying quantities or removing products, these adjustments can be done with ease.

4. Product and Cart Data Management. To ensure a smooth shopping experience, OVVO utilizes the Room Database to store product and shopping cart information on the user's device. This local storage solution ensures that users can continue their shopping journey even when they are offline, offering a seamless experience that works regardless of internet connectivity.

Room Database also ensures that all the data related to the products users add to their carts is stored securely on their devices. The app leverages encryption techniques to protect sensitive information, providing an added layer of security for users concerned about data privacy. Moreover, the Room Database structure allows for easy management and retrieval of data, ensuring quick access to product details and cart information.

By incorporating this local storage solution, OVVO can offer an efficient shopping experience without overwhelming users with constant server queries or slow data retrieval. The combination of local data storage and efficient encryption helps the app deliver a responsive and secure experience.

5. Secure User Authentication and Communication

Security is a top priority for OVVO, especially considering the sensitive nature of customer data and the need to protect user privacy. The application integrates Firebase Authentication, a robust authentication system that ensures secure login and user data access control. By using Firebase Authentication, OVVO allows users to sign up and log in using their email, phone number, or social media accounts, providing a quick and convenient login process.

Firebase Authentication also provides an extra layer of protection by verifying the identity of users and safeguarding personal information. This is particularly important in the e-commerce space, where data protection is critical. In addition to secure user authentication, OVVO utilizes HTTPS connections to secure communication between the app and the server. This ensures that all data transmitted—whether it be payment details, personal information, or shopping cart contents—is encrypted and protected from potential cyber threats.

The application also incorporates a Chat feature, allowing users to communicate directly with customer support. This feature not only enhances the overall user experience but also adds an

extra layer of trust, as customers can receive immediate assistance if they encounter issues during the shopping process.

6. Data Encryption and Regular Updates

While data security is emphasized throughout the app, OVVO also takes steps to ensure that customer data remains private and protected over time. The app uses encryption techniques to protect sensitive data stored on the user's device, preventing unauthorized access to private information. This approach safeguards user details, including order history, payment information, and personal preferences, creating a secure environment for online shopping.

Moreover, OVVO is committed to continuous improvement and security enhancement. Regular updates are pushed to the app to address potential vulnerabilities, fix bugs, and improve performance. As the mobile threat landscape evolves, OVVO remains vigilant, implementing necessary security patches to keep users' data protected. These updates are also designed to enhance the user experience, providing new features and optimizing existing ones to meet the growing demands of consumers.

7. Multi-Layered Approach to Security and User Privacy

In addition to Firebase Authentication and encryption techniques, OVVO employs a multi-layered security strategy to mitigate potential risks. The app's security measures include access control mechanisms, which restrict unauthorized users from gaining access to sensitive data and functionality. Additionally, OVVO adheres to privacy policies that govern the collection, storage, and use of customer data, ensuring that users are informed about how their information is being handled.

By implementing a layered security approach, OVVO strengthens the confidentiality, integrity, and availability of user data, fostering trust and confidence among its customers. This comprehensive security framework is essential for maintaining a reliable and secure shopping platform, especially in an era where cyber threats are becoming increasingly sophisticated.

This diagram shows how users interact with the shopping app, from login and cart grouping to simulated payment and Telegram-based order notification.
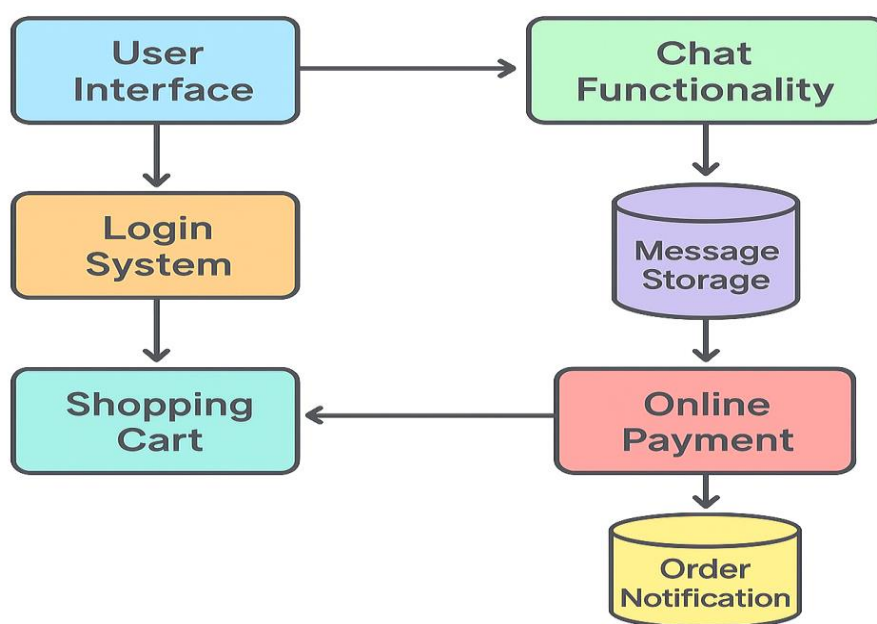
Conclusion

OVVO represents the intersection of technology, design, and user experience in the mobile application space for local grocery markets. By combining secure authentication, efficient data

storage, and an intuitive interface, the app provides users with a seamless and enjoyable shopping experience. With its focus on security, ease of use, and continuous improvements, OVVO aims to become the go-to platform for local grocery shopping, offering a reliable and safe solution for modern consumers. Through innovative features and a commitment to security, OVVO is well-positioned to cater to the needs of both consumers and local grocery store owners, ensuring a mutually beneficial relationship in the evolving e-commerce landscape.

References

1. Android Developers. (2023). *Security Best Practices for Android Apps*. Retrieved from https://developer.android.com

2. Firebase Documentation. (2023). *Firebase Authentication & Security Rules*. Retrieved from https://firebase.google.com/docs/auth

3. Stallings, W. (2020). *Network Security Essentials: Applications and Standards* (6th ed.). Pearson.

4. Scarfone, K., & Mell, P. (2007). *Guide to Intrusion Detection and Prevention Systems (IDPS)*. NIST Special Publication 800-94.

5. Menezes, A. J., van Oorschot, P. C., & Vanstone, S. A. (1996). *Handbook of Applied Cryptography*. CRC Press.

6. Gulomov, S. R., Khudayberganov, T. R., Ravshanova, M. X., Turdiev, T. T., & Atabayev, S. S. (2024). *Exploring Post-Quantum Cryptographic Algorithms for Secure Data Transmission*. 2024 IEEE 3rd International Conference on Problems of Informatics, Electronics, and Radio Engineering (PIERE).

7. Khudaybergenov, T. A., Turdiev, T. T., Khafizov, M. R., & Kugurakova, V. V. (2024). *The Influence of Dynamic Game Difficulty Balancing on Player Experience in Puzzle Games*. 2024 IEEE 25th International Conference of Young Professionals in Electron Devices and Materials (EDM).

8. Turdiyev, T. T., Palvanov, B. Y., Sadikov, M. A., Salayev, K. A., & Sabirov, I. B. (2023). *Parallel Algorithm for the One-Dimensional Problem of Oil Movement in a Porous Medium*. In *Artificial Intelligence, Blockchain, Computing, and Security*, Volume 2 (pp. 729-734).

9. Kirayeva, R. R., Khafizov, M. R., Turdiev, T. T., & Kugurakova, V. V. (2023). *Automated Testing of Functional Requirements for Virtual Reality Applications*. 2023 IEEE XVI International Scientific and Technical Conference on Actual Problems of Electronic Instrument Engineering (APEIE).

SENTIMENT TAHLIL: MATNNI BOSHLANG'ICH QAYTA ISHLASH (TEXT PREPROCESSING)

Abdulla Abdullayev
URIU ITIIPKTB *bo'limi boshlig'i*
abdulla_abdullayev9270@mail.ru

Annotatsiya: Ma'lumotlar sentiment tahlilining "xom ashyosi" hisoblanadi – agar ma'lumotlar sifatsiz, noto'g'ri yoki yetarli emas bo'lsa, natijalar ham xato yoki foydasiz bo'lib chiqadi. Sentiment tahlilda ma'lumotlarni boshlang'ich qayta ishlash (preprocessing) jarayoni juda muhim rol o'ynaydi, chunki bu bosqich ma'lumotlarning sifatini oshiradi va modelning aniqligini yaxshilaydi. Ma'lumotlarni boshlang'ich qayta ishlash sentiment tahlilining asosiy qismidir, chunki xom matnlar ko'pincha keraksiz ma'lumotlar, shovqin yoki tuzilmasiz