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By

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Title of the thesis

Souki : A fast and intelligent Mobile Marketplace Platform

Under the supervision of

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Composition of the jury

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Abstract

Local commerce in Algeria still runs on informal channels: store visits, word of mouth, Facebook groups. No digital platform connects people to shops nearby. This thesis describes Souki, a mobile marketplace built around geolocation for the Algerian market. The name comes from the Arabic word for market. Souki links consumers, local sellers, and delivery drivers in one system, organized by wilaya. Products can be discovered by location or by photograph — a user takes a picture of any object and finds it for sale nearby without typing anything. Orders follow a structured lifecycle that reserves stock and prevents two drivers from claiming the same delivery job. The platform is built on a Node.js back end, a MongoDB geospatial database, and a Python AI microservice for image search. The mobile app runs on Flutter. The system is fully deployed and operational.

Key words: Geolocation marketplace; Visual search; CLIP; Mobile commerce

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الملخص

لا تزال التجارة المحلية في الجزائر تعتمد على قنوات غير رسمية: زيارة المتاجر، والتوصيات الشفهية، ومجموعات فيسبوك. لا توجد منصة رقمية تربط الناس بالمحلات القريبة منهم. تصف هذه الأطروحة سوقي، سوقاً إلكترونياً متنقلاً قائماً على تحديد الموقع الجغرافي، صُمِّم للسوق الجزائرية. الاسم مأخوذ من الكلمة العربية للسوق. يربط سوقي المستهلكين والبائعين المحليين وسائقي التوصيل في منظومة واحدة منظَّمة على مستوى الولايات. يمكن اكتشاف المنتجات بالقرب الجغرافي أو عن طريق الصورة: يلتقط المستخدم صورة لأي غرض فيجده معروضاً للبيع في مدينته دون كتابة أي شيء. تتبع الطلبات دورة حياة منظَّمة تحجز المخزون وتمنع سائقَين من المطالبة بنفس مهمة التوصيل. تعتمد المنصة على واجهة خلفية بـ Node.js وقاعدة بيانات MongoDB الجغرافية وخدمة ذكاء اصطناعي بـ Python للبحث بالصور. التطبيق المحمول مبني بـ Flutter. المنصة منشورة وجاهزة للاستخدام.

الكلمات المفتاحية: سوق إلكتروني جغرافي؛ بحث بصري؛ CLIP؛ تجارة متنقلة

Résumé

Le commerce local en Algérie tourne encore par des canaux informels: visites en magasin, bouche-à-oreille, groupes Facebook. Aucune plateforme numérique ne relie vraiment les consommateurs aux commerces de leur quartier. Cette thèse décrit Souki, une marketplace mobile centrée sur la géolocalisation, conçue pour le marché algérien. Le nom vient du mot arabe pour marché. Souki relie consommateurs, vendeurs locaux et livreurs dans un seul système, organisé par wilaya. Les produits se trouvent par proximité géographique ou par photo: l'utilisateur photographie un objet et trouve où l'acheter en ville, sans taper un mot. Les commandes suivent un cycle de vie structuré qui réserve le stock et empêche deux livreurs de prendre la même course. La plateforme repose sur un back-end Node.js, une base de données MongoDB géospatiale et un microservice Python pour la recherche par image. L'application mobile tourne sur Flutter. Le système est déployé et opérationnel.

Mots clés : Marketplace géolocalisée ; Recherche visuelle ; CLIP ; Commerce mobile

Dedication

To my brother, sister, family ,my little nephew and friends, you have been my pillars of support and joy throughout my education journey. I must also acknowledge my professors, whose invaluable guidance and knowledge were crucial. I dedicate my graduation thesis to you, praying that the Almighty may bless you long and healthy life and bless you with goodness.

"قُمْ لِلمُعَلِّمِ وَفِّهِ التَبجيلا ... كادَ المُعَلِّمُ أَن يَكونَ رَسولا"

Brahimi Karim

In the name of Allah, the Most Gracious, the Most Merciful

"وَٱخْفِضْ لَهُمَا جَنَاحَ ٱلذُّلِّ مِنَ ٱلرَّحْمَةِ وَقُل رَّبِّ ٱرْحَمْهُمَا كَمَا رَبَّيَانِى صَغِيرًا"

Quran 17:24

To my mother, Houria

My first home and safest shelter. Your late night prayers and silent sacrifices carried me here. I love you beyond words, Mama.

To my father, Houcin

You taught me that dignity is built through quiet, honest hard work. Your unwavering faith in me has been my greatest strength. Thank you, Baba.

To my siblings: Fouad, Mouna, Asma, Oussama, Yacin, and Anis

My favorite chaos and my oldest comfort. Thank you for being my steady ground and the piece of home I carry with me everywhere.

To my thesis partner , Karim

Through the late-night doubts and the shared breakthroughs, you were more than a partner—you were my anchor. We survived this together. Thank you, brother.

To my friends: Assil, Bahaa, Mokim, Ziad, Salah, Azize, Mahmoud, Yasser, Amin, and Sabir

Real friendship just shows up, and you always did. Thank you for the laughs, the honesty, and for being the family I chose.

To everyone who prayed for me in secret and believed in me when I couldn't This is for you.

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General Introduction

Digital technology has changed how people communicate, shop, and trade. Smartphones, mobile internet, and location services reshaped commerce everywhere, from global platforms down to neighborhood markets.

In Algeria, this shift is still early. The country has over 35 million internet users and one of Africa's highest smartphone penetration rates. But local commerce still runs on physical store visits, word of mouth, and Facebook groups. There is no structured digital platform that connects people to nearby shops.

The retail sector contributes about 13 percent of non hydrocarbon GDP and employs roughly 1.8 million people. Yet digital tools for this sector barely exist compared to Morocco, Tunisia, or the UAE.

This project builds Souki [1] a geolocation powered marketplace for the Algerian market. "Souki" comes from the Arabic word for "my market." It connects consumers, local shops, and delivery drivers in one platform. It combines map based product discovery, AI image search using CLIP [7], and a delivery system that prevents double claiming.

Souki runs on Node.js [3] with Express [4], MongoDB [5] for data, Redis [6] for caching, and a Python microservice running CLIP [7] for image search. Authentication uses JWT [18] with tokenVersion invalidation. Push notifications go through Firebase [10].

The thesis has four chapters. Chapter One looks at local commerce in Algeria, identifies the main actors, and defines the problem and solution. Chapter Two covers the system design: architecture, data model, API, middleware. Chapter Three describes the implementation: environment, modules, AI pipeline, security, deployment. Chapter Four evaluates the system through testing and benchmarks. The conclusion discusses limitations and future work.

Chapter 1: Background and Problem Statement

INTRODUCTION

This chapter studies local commerce in Algeria. It starts with the economic weight of the sector, then identifies the three main actors consumers, sellers, and delivery drivers and what they need. It looks at existing platforms and why they fall short across five dimensions. Based on that, it sets objectives and introduces Souki.

Tech has reshaped economic life over the past twenty years. Simple websites grew into intelligent platforms. Mobile phones and location services changed what people expect from shopping speed, convenience, accuracy.

In Algeria, this shift is still at an early stage. While global e commerce continues to expand at a notable rate, local trade remains largely tied to traditional methods. Consumers still depend on physical store visits, personal recommendations, and informal social media channels to find and buy products. Although tools such as Facebook Marketplace and Ouedkniss have gained some adoption, they lack the reliability, structure, and technical depth needed to serve as robust local commerce systems.

1. Overview of Local Commerce Systems

Local commerce, in its most fundamental sense, refers to the buying and selling of goods and services within a defined geographic area typically a city, district, or region. It forms the core of everyday economic activity, linking consumers with nearby sellers and supporting employment, local revenue, and community economic stability. In many developing countries, local commerce accounts for a considerable share of GDP and remains one of the primary ways people meet their daily needs.

In Algeria, local commerce currently operates mainly through three informal channels. The first involves physical shops and traditional weekly markets known as souks, which run on fixed schedules and serve limited geographic areas. The second relies on word of mouth and social connections, where buyers learn about available products through friends or community ties. The third uses unstructured digital channels particularly Facebook groups and WhatsApp broadcasts

which offer little product organization, price transparency, or reliable trust building mechanisms between buyers and sellers.

Several digital platforms currently serve the Algerian market, each with distinct strengths and limitations. At the international level, Jumia Algeria offers a centralized marketplace model with its own logistics network, but its warehouse model bypasses local storefronts entirely: a consumer in Constantine ordering a smartphone receives it from Jumia's warehouse in Algiers, not from a nearby electronics shop that could offer same day delivery and in person after sales support. Temu, the Chinese owned platform, entered the market in 2023 with aggressively low prices on household goods and electronics, but operates entirely from overseas warehouses with delivery timelines of seven to fifteen days, making it structurally incompatible with local, same day commerce.

On the domestic side, Ouedkniss Algeria's largest classifieds platform, founded in 2007 functions as a digital bulletin board where individuals and businesses post listings for cars, electronics, real estate, and services. Ouedkniss is widely used across Algeria, with an estimated 15 million monthly visits, but it lacks transaction management, meaningful geolocation filtering beyond city level search, integrated payment, rating systems, and delivery coordination. Facebook groups represent an even less structured channel, with no searchable inventory or transaction infrastructure whatsoever.

The consequence of this fragmented context is clear: a consumer looking for a specific item may spend considerable time scrolling through disorganized Facebook posts, contacting multiple sellers via WhatsApp to ask about prices, and visiting several physical shops only to find the item is out of stock. This inefficiency represents a real economic cost and points to a clear opportunity

Fig. 1.1: Overview of existing e commerce platforms (Ouedkniss, Jumia, Alibaba).

2. Actors of the Proposed System

Any platform designed to serve a multi sided marketplace must carefully identify the distinct roles played by its participants. The Souki platform is built around three core actor groups, each with its own needs, goals, and interaction patterns.

2.1. Consumer

The consumer is the end user who seeks to discover, compare, and purchase products from nearby stores. The primary goal of the consumer is to find the right product at the right price within a reasonable distance and to complete the transaction within the shortest time possible and with minimum trouble. In the current Algerian context, a consumer looking for a specific electronic item a laptop charger, for example must either visit multiple physical stores in person, which is time consuming and offers no price comparison, or turn to Ouedkniss or Facebook groups, where the same item may be listed by a seller located 500 kilometers away with no indication of shipping feasibility or seller reliability.

Additional pain points include the lack of seller quality signals, the absence of structured delivery options, the general difficulty of searching for products without knowing precise keywords or brand names. For less digitally literate users, text based search poses an additional barrier: approximately 22 percent of the Algerian adult population has limited literacy in both French and Standard Arabic, relying instead on Algerian Darija for daily communication. Darija is an oral language with no standardized written form, meaning many users cannot reliably express product queries in writing.

2.2. Seller

The seller is a local store owner who wishes to list products and reach nearby customers. The seller’s primary goal is to increase sales volume without incurring prohibitive costs or requiring advanced technical skills. In the current context, a typical local seller faces a structural visibility problem: competing internet presence from national retailers and international platforms means that a well stocked local electronics shop may be invisible to a consumer living two streets away who is searching online.

Social media based selling imposes its own costs: the seller must photograph products, post them manually to multiple groups, respond individually to each inquiry, manage order

tracking through scattered message threads, and coordinate delivery or pickup on an ad hoc basis. The administrative burden of this unstructured workflow

grows with order volume and quickly becomes unsustainable. A seller using Souki gains structured product management with bulk image upload, inventory tracking, automatic visibility to nearby consumers through geolocation based discovery, and an analytics dashboard that reveals sales trends, popular products, and low stock alerts.

2.3. Delivery Person

The delivery person performs transportation of goods from stores to consumers. The primary goal is to find delivery assignments efficiently, complete them within the expected timeframe, and build a reputation that leads to more assignments. In the current Algerian ecosystem, delivery coordination happens almost exclusively through phone calls and WhatsApp messages with no centralized dispatch system. Within Souki, delivery personnel can browse available tasks filtered by wilaya, view pickup and drop off locations on a map before accepting, claim assignments atomically (preventing two drivers from accepting the same task simultaneously), update delivery status in real time, and build a reputation score through consumer ratings.

3. Limitations of Existing Systems

The existing ecosystem of platforms serving Algerian commerce collectively fails to satisfy the requirements of local, proximity based commerce. The following analysis examines these limitations across five critical dimensions.

3.1. Absence of Meaningful Localization

None of the existing platforms provide meaningful geolocation based discovery at theneighborhood or intra city level. Facebook Marketplace and Ouedkniss offer city level filtering at best: a search for a product on Ouedkniss returns listings from across Algiers Province, a geographic area spanning over 1,000 square kilometers with a population exceeding three million. For a consumer in the Bab Ezzouar neighborhood, a seller located in Draria a 45 minute drive appears equally relevant as one located 500 meters away. Jumia operates its own logistics network and does not expose store locations to consumers at all. Temu ships from international warehouses and offers no local component.

3.2. Inefficient Search Mechanisms

All existing platforms rely exclusively on text based keyword matching for product discovery. A consumer searching for a milk frother as "جهاز حليب" while the seller listed it as "mousseur à lait" yields no results despite semantic relevance. No platform offers visual search,

image based product discovery, or tolerance for misspelled or transliterated queries. This exclusion of non textual search disproportionately affects the significant portion of the population with limited literacy in Algeria's formal written languages.

3.3. Fragmentation of Commerce Services

A typical transaction requires at least three separate digital tools: a marketplace for discovery, a messaging application for price negotiation, and separate payment and delivery coordination. None of these tools share data with one another. The consumer gets no single view of past orders. The seller has no real record of how many inquiries turned into actual sales. The delivery person can't show past deliveries to prove they're reliable. This fragmentation creates more headaches for everyone the more transactions they handle.

3.4. Structural Exclusion of SMEs

Jumia's third party seller program requires formal business registration, tax documentation, and compliance with logistics requirements conditions that exclude the vast majority of micro enterprises and informal neighborhood shops. Ouedkniss and Facebook Marketplace have no formal onboarding requirements, but they also provide no tools for inventory management, order tracking, or analytics. The opportunity cost is significant: time spent managing digital listings through fragmented manual workflows is time not spent serving in store customers.

3.5. Erosion of Consumer Trust

On Ouedkniss, anyone can post anything. No ratings, no checks, no one to call if you get scammed. Facebook Marketplace is a bit better , at least you can see the seller's profile but that doesn't stop people from selling fake stuff or taking your money and disappearing. Pay upfront, get nothing back. And if you're an honest seller, you look just as suspicious as the scammers because there's no way to prove you're legit.

Table 1.1: Platform Comparison Across Evaluation Dimensions.

Dimension	Facebook Market	Ouedkniss	Jumia Algeria	Souki (proposed)
Localization	City level	City level	None (warehouse)	GPS, configurable radius
Search method	Text only	Text only	Text + categories	CLIP visual + text + RRF
Delivery	None	None	Jumia managed	Integrated, atomic assignment
Transactions	None	None	COD + card	Full lifecycle + FCM
Trust signals	FB profile	None	Product ratings	Store + driver ratings
Seller tools	None	None	Basic dashboard	Analytics, stock alerts, premium
Revenue model	Free	Premium slots	Commission	Freemium subscriptions

4. Objectives and Goals

4.1. General Objectives

The main objective of this project is to make it possible that anyone can sell online with user friendly interface, so anyone can buy without needing to read formal Arabic or French perfectly.

Use artificial intelligence, geolocation services, and real time data processing to deliver a commerce experience that is faster, smarter, and more reliable than existing alternatives

Support the digital transformation of Algerian SMEs by offering accessible tools for product listing, customer engagement, and business performance monitoring

Build a trust centered ecosystem governed by verified identities, transparent pricing, and reputation based accountability mechanisms

Contribute to broader economic development by stimulating local commerce and keeping consumer spending within regional economies

4.2. Specific Technical Goals

Design and implement a geolocation engine capable of displaying product availability on an interactive map, with filtering by proximity, category, price, and real time stock status

Develop an AI based product recognition module using CLIP that allows users to initiate product searches using images captured from their device camera

Build a scalable wilaya level marketplace structure that organizes listings by Algeria's 69 administrative provinces

Implement a fully integrated delivery management subsystem with atomic assignment, real time tracking, and driver performance evaluation

Create a seller analytics dashboard providing actionable insights into product performance, customer engagement, and sales trends

Introduce a tiered premium subscription model that unlocks advanced marketing and operational capabilities for sellers

Table 1.2: Value Proposition by Stakeholder Category.

Stakeholder	Core Value	Key Platform Features
Consumer	Faster, reliable, proximity based discovery	Map search, AI recognition, order tracking
Store Owner	Digital visibility, customer reach, insights	Product listing, analytics, premium tools
Delivery Person	Structured work with integrated tools	Assignment matching, routing, reputation
Local Economy	Stimulated local trade, reduced imports	Wilaya marketplace, SME support

5. ARTIFICIAL INTELLIGENCE AND RELATED TECHNOLOGIES

The proposed system draws on several interrelated fields within Artificial Intelligence (AI). This section provides a structured overview of these fields, with an emphasis on the

concepts and techniques that are directly relevant to visual product search, image understanding, and similarity based retrieval in the Souki platform.

5.1. Artificial Intelligence

Artificial Intelligence is a branch of computer science concerned with building systems capable of performing tasks that, when performed by humans, require intelligence: reasoning, learning, perception, and language understanding. The term encompasses numerous subfields, each addressing different aspects of intelligent behavior

5.2. Machine Learning

Machine Learning is a subfield of AI focused on algorithms that learn patterns from data without being explicitly programmed for each specific task. Rather than encoding domain knowledge through hand crafted rules, ML systems derive knowledge from examples labeled or unlabeled datasets.

ML algorithms are broadly categorized into three paradigms. In supervised learning, a model is trained on labeled input output pairs, learning to map inputs (e.g., an image of a product) to outputs (e.g., a category label such as “smartphone”). In unsupervised learning, the model discovers structure in unlabeled data, such as clustering similar product images without predefined categories. In reinforcement learning, an agent learns by interacting with an environment and receiving feedback in the form of rewards or penalties.

In the context of Souki, supervised learning underpins the core visual understanding capability: the CLIP model was trained on 400 million (image, text) pairs in a supervised contrastive setup, learning to map images and their descriptions into a shared vector space. This pre training enables the system to recognize product categories and visual patterns without ever being trained on Souki’s own catalog, a property known as zero shot transfer.

5.3. Deep Learning

Deep Learning (DL) is a specialized branch of Machine Learning that uses multi layered artificial neural networks deep neural networks to learn hierarchical representations of data. The term “deep” refers to the number of layers in the network: each successive layer transforms its input into a progressively more abstract representation, allowing the model to capture complex, non linear patterns that shallow methods cannot.

Deep learning has produced state of the art results across image recognition, speech processing, and natural language understanding. Its success in computer vision has been particularly

transformative: deep models now surpass human accuracy on several benchmark image classification tasks. Two architectural families dominate modern computer vision: Convolutional Neural Networks (CNNs) and, more recently, Vision Transformers (ViTs). Souki relies on the latter through its use of CLIP's ViT B/32 backbone.

5.3.1. Artificial Neural Networks

An Artificial Neural Network (ANN) is a computational model inspired by the structure of biological neural networks. It consists of interconnected processing units, called neurons, organized into layers: an input layer, one or more hidden layers, and an output layer.

Each connection between neurons carries a weight that is adjusted during training through backpropagation. The network learns by minimizing a loss function a measure of discrepancy between its predictions and the ground truth using gradient based optimization algorithms such as Stochastic Gradient Descent (SGD) or Adam.

The depth of a neural network the number of hidden layers directly determines its capacity to model complex, non linear relationships. Deep networks with many layers are therefore essential for high dimensional inputs such as raw images, where the mapping from pixel values to semantic concepts (e.g., "this is a smartphone") is highly non linear.

5.3.2. Convolutional Neural Networks

Before the advent of Vision Transformers, Convolutional Neural Networks (CNNs) were the dominant architecture for image understanding. A CNN alternates between convolutional layers, which apply learned filters to local regions of the input image to detect features such as edges, textures, and shapes, and pooling layers, which downsample the feature maps to reduce spatial dimensions and introduce translation invariance.

CNNs are organized hierarchically: early layers detect low level features (edges, corners), intermediate layers combine these into patterns (circles, rectangles, specific textures), and deeper layers recognize high level concepts (faces, wheels, screens). This hierarchical feature extraction made CNNs highly effective for image classification, object detection, and segmentation tasks.

However, CNNs have a fundamental limitation: each convolutional filter operates on a local neighborhood of pixels. Capturing long range dependencies relationships between distant regions

of an image requires many stacked layers, making the network deep and computationally expensive. The receptive field grows only linearly with convolution depth.

5.3.3. Vision Transformers (ViT)

Vision Transformers (ViT) represent a paradigm shift in computer vision architecture. Instead of using convolutional filters, ViT applies the Transformer architecture originally developed for natural language processing directly to image data.

The core idea is straightforward. An input image is divided into a grid of fixed size non overlapping patches in CLIP's ViT B/32 variant, each patch is 32×32 pixels. Each patch is flattened into a vector and linearly projected into an embedding space. A special classification token ([CLS]) is prepended to the sequence, and fixed positional encodings are added to retain spatial information

about each patch's original location in the image. The resulting sequence of patch embeddings is passed through 12 Transformer encoder layers.

Each Transformer layer consists of two sub layers: a multi head self attention mechanism and a feed forward neural network, with residual connections and layer normalization around each. The critical innovation is self attention: every patch attends to every other patch simultaneously, allowing the model to capture relationships between distant image regions in a single layer. This gives ViT an effective receptive field that is global from the very first layer, unlike CNNs where it grows only with depth.

After 12 Transformer layers, the [CLS] token's final hidden state serves as a global image representation. This is projected through a final linear layer to produce the output embedding. In CLIP, the final output is a 512 dimensional unit vector a compact numerical fingerprint encoding the image's visual semantic content.

ViT was chosen over CNN based backbones for Souki because of its superior performance on representation learning tasks: the self attention mechanism captures global visual context (e.g., the overall shape and design of a product) that is critical for accurate similarity matching, whereas CNN based features tend to emphasize local textures, which can cause visually dissimilar products with similar surface patterns to be incorrectly matched.

5.3.4. Contrastive Learning and CLIP

CLIP (Contrastive Language Image Pre training) is a neural network trained by OpenAI on 400 million (image, text) pairs collected from the internet. Unlike traditional vision models trained on manually labeled datasets such as ImageNet, CLIP learns visual concepts from natural language supervision.

The training objective is contrastive: given a batch of N (image, text) pairs, CLIP learns to maximize the cosine similarity between the correct (image, text) pairings (N positive pairs) while minimizing the similarity between the $N^2 - N$ incorrect pairings (negative pairs). Both the image encoder (ViT) and the text encoder (a Transformer) are trained jointly to project images and their descriptions into a shared 512 dimensional embedding space.

This training procedure produces two crucial properties. First, the learned embedding space is semantically organized: images of visually similar objects two different smartphone models, for example are mapped to nearby points regardless of textual description. Second, the model generalizes to visual concepts it was never explicitly trained to classify, because the text encoder can

compose novel concepts from words seen during pre training. This is known as zero shot transfer.

For Souki, zero shot transfer is essential. The platform's product catalog consists of everyday consumer goods electronics, household items, clothing that are well represented in CLIP's pre training data. The model can therefore produce accurate visual embeddings for Souki products without any fine tuning on Algerian marketplace data, eliminating the need for a large labeled training set.

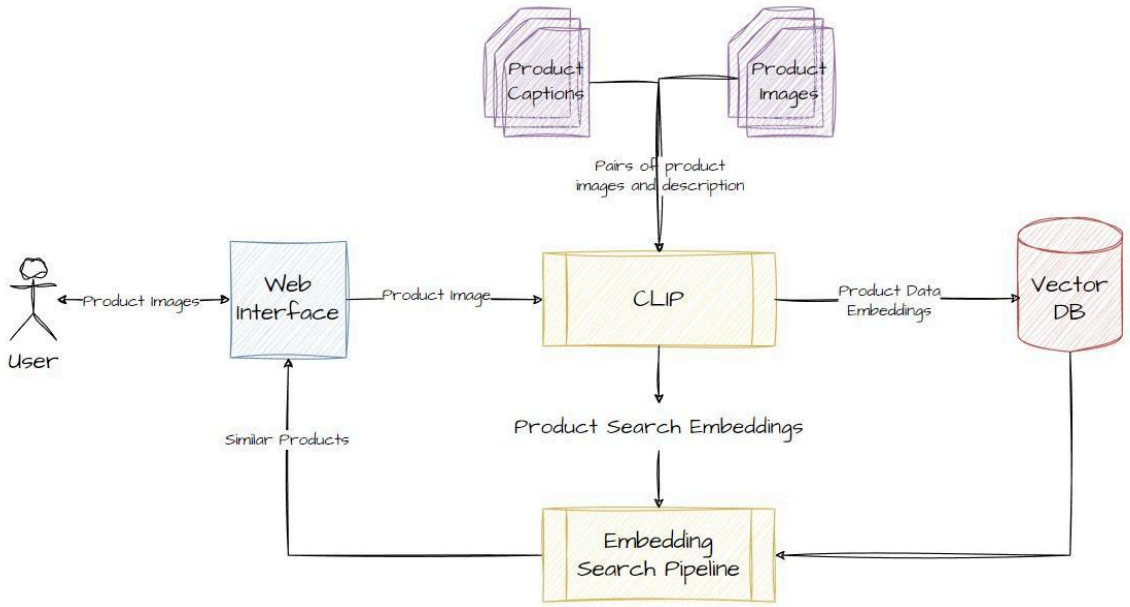

Fig. 1.2: Illustration of how CLIP works.

5.3.5. Embeddings and Visual Similarity

An embedding is a dense, low dimensional vector representation of a high dimensional input in this case, an image. CLIP's ViT B/32 encoder produces a 512 dimensional unit vector for each input image, meaning the vector has a Euclidean norm of 1. This normalization is intentional: it allows similarity to be measured efficiently using cosine similarity, which for unit vectors reduces to the dot product:

$$\text{cosine\_sim}(A, B) = A \cdot B$$

where A and B are the 512 dimensional embedding vectors of two images. The result is a scalar between 0 and 1, where 1 indicates identical visual content and 0 indicates completely unrelated content.

In Souki's architecture, the embedding process is decoupled from the real time search path. When a seller lists a product, the product image is sent asynchronously to the Python CLIP microservice. The encoder splits the image into 32×32 patches, passes them through the 12 Transformer layers, and outputs a 512 dimensional unit vector. This embedding is stored alongside the product document in MongoDB and never recomputed unless the seller replaces the image. This design choice minimizes latency: the expensive forward pass through the Transformer happens exactly once per product, at listing time.

At search time, when a consumer uploads a query photo, the same encoder generates a query embedding in real time. The system then computes cosine similarity between the query vector and every indexed product embedding in the consumer's wilaya. Raw cosine similarity serves as the primary relevance signal.

5.3.6. Image Classification vs. Visual Similarity Search

It is important to distinguish between image classification assigning a single label to an image from a predefined set of categories and visual similarity search retrieving database entries whose visual content resembles a query image.

In a classification formulation, the model would be trained to predict a category such as "smartphone," "laptop," or "headphones" for each product image. This approach has a fundamental limitation for marketplace applications: the category set must be predefined and

fixed. A seller listing a new type of product that does not fit any predefined category would be misclassified, and the consumer would be unable to search for it.

Souki solves this problem by framing product discovery as a similarity search rather than a classification task. The CLIP embedding space is continuous and open ended: any image can be embedded, regardless of whether its category was seen during training. A consumer can photograph a product and retrieve visually similar items even if no textual description exists for either the query or the results. This approach is more flexible and more inclusive particularly for users who cannot easily express product names in writing.

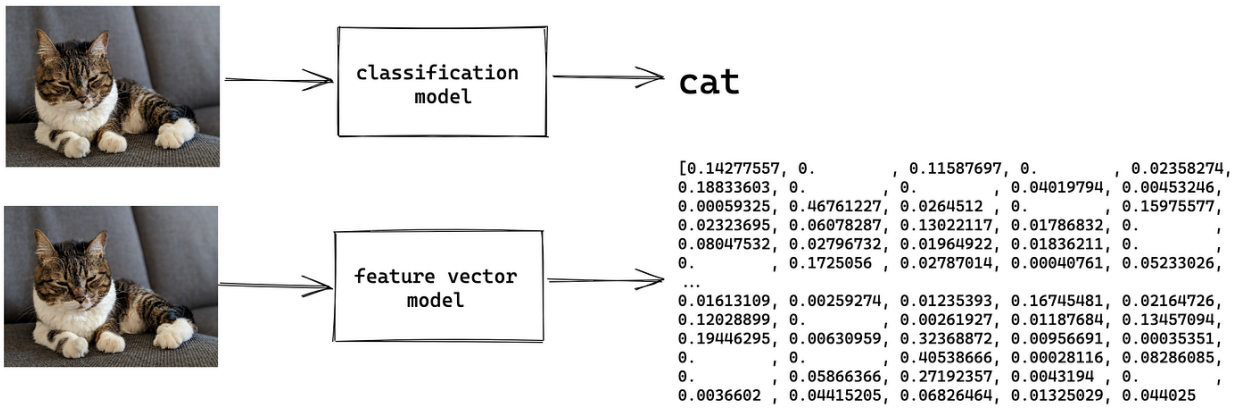

Fig. 1.3: Visual search vs classification comparison.

5.3.7. Hybrid Search and Reciprocal Rank Fusion

Visual similarity alone is not always sufficient. A consumer may have a specific brand or model in mind and want to constrain the search textually for example, photographing a smartphone but searching only for “Samsung” models.

Souki exposes a hybrid search endpoint that accepts both a query image and a text query simultaneously. In this path, two independent searches run in parallel:

1. CLIP visual search: cosine similarity against product embeddings

2. BM25 full text search: MongoDB’s text index scoring against product names and descriptions

The two result lists are fused using Reciprocal Rank Fusion (RRF):

$$\mathbf{RRF\_score(d) = \Sigma\ 1\ /\ (k + rank\_i(d))}$$

where rank_i(d) is the position of document d in result list i, and k is a constant (typically k = 60). Products appearing in both lists receive a compounded score they appear twice in the summation and naturally rise to the top. The RRF score alone determines the final ranking in the hybrid path, encoding both visual and textual relevance without requiring manual weight tuning between the two modalities.

6. Proposed Solution

To overcome the limitations identified through contextual analysis and to fulfill the objectives outlined above, this project proposes the development of Souki an intelligent, geolocation driven mobile commerce platform designed specifically for the Algerian market. The name “Souki” references to the traditional Algerian souk, the open marketplace that has served as the social and economic heart of local communities for centuries.

6.1. Geolocation Based Product Discovery

At the heart of Souki’s user experience is a map based interface that allows consumers to see nearby stores and available products in real time. The geolocation engine uses the device’s GPS to establish the user’s current position and then queries the platform’s product database for relevant listings within a configurable radius. This is implemented using MongoDB’s $nearSphere geospatial query operator combined with a 2dsphere index on both Store and Product collections. The configurable radius is a deliberate design choice: it allows consumers in dense urban areas such as Algiers and Oran to find results within walking distance while enabling those in less dense wilayas such as Adrar and Tamanrasset to expand their search radius to compensate for lower seller density.

6.2 AI Powered Visual Search

Visual search is what sets Souki apart. Snap a photo of any product and the system finds visually similar listings from nearby stores no need to describe it in words.

It's powered by OpenAI's CLIP (ViT B/32). When a seller lists a product, the image gets encoded into a 512 dimensional vector a compact visual fingerprint stored in MongoDB. At search time, the query photo goes through the same encoder and gets matched against every product in your wilaya by cosine similarity (0 to 1, where 1 = visually identical).

Similarity alone isn't enough, so the final score blends four signals:

Final Score = similarity × 0.75 + views norm × 0.10 + is Premium × 0.10 + recency × 0.05.

Visual match dominates at 0.75, but popular, premium, and fresh listings get a fair boost and there's also a hybrid endpoint that accepts both a photo and text simultaneously.

6.3 Wilaya Level Marketplace Organization

Algeria is divided into 58 administrative wilayas. Souki uses this existing administrative geography to organize its marketplace into wilaya level commercial zones, each functioning as an independent souk with its own listing catalog, trending products, and featured sellers. For consumers, this creates a familiar, regionally coherent browsing experience. For sellers, it ensures that listings are shown primarily to consumers within their natural service area, improving relevance and conversion rates.

6.4 Integrated Delivery Management System

Unlike platforms that treat delivery as an afterthought directing users to external courier services without any integrated coordination Souki builds delivery management into its core architecture. When a seller marks an order as prepared, the platform automatically notifies registered delivery personnel within the relevant geographic zone. The critical operation is delivery claim, which must handle concurrent access correctly. Souki implements this through the use of MongoDB’s atomic findOneAndUpdate with a conditional guard checking for a null deliveryPersonId field ,this eliminates race conditions without distributed locks or message queues.

CONCLUSION

This chapter established the foundational context for the Souki platform by examining the current state of local commerce in Algeria, identifying the key actors and their unmet needs, analyzing the limitations of existing digital platforms across five critical dimensions, and defining both the general and technical objectives that guide the proposed solution. The economic significance of local commerce in Algeria contributing over 13 percent of non hydrocarbon GDP and employing approximately 1.8 million workers underscores the importance of developing digital infrastructure that serves this sector rather than bypassing it. The comparison with related work confirms that while existing platforms address individual aspects of the local commerce challenge,

no platform combines geolocation based discovery, AI powered visual search, wilaya level market organization, and integrated delivery management within a single system designed specifically for the Algerian context.

CHAPTER TWO

SYSTEM ARCHITECTURE AND DESIGN

INTRODUCTION

In this chapter, we present the complete design of the Souki platform following a structured software engineering approach. We begin by outlining the overall system architecture using the C4 model, describing the system context and the containerized components. We then detail each major component: the back end server with its data model, API routing, controller logic, middleware pipeline, and database access layer; the end users mobile application with its pages, use cases, flow charts, and sequence diagrams; and the admin dashboard. All diagrams in this chapter follow UML notation and the C4 model conventions.

1 System Architecture

We describe the architecture of Souki using two C4 model perspectives: Context and Containers. The Context diagram shows the system at its highest level of abstraction, identifying the actors and external systems. The Containers diagram zooms into the system boundary to reveal the major runtime components and their communication protocols.

1.1 *Context*

Figure 2.1 shows the system context of Souki. It depicts the four actor types and their interactions with the central Souki system, as well as the external services the platform depends on.

The actors are: Consumer, who discovers nearby stores and places orders; Seller, who manages their storefront and fulfills orders; Delivery Person, who claims and completes deliveries; and Administrator, who oversees the platform and monitors AI pipeline health.

Souki integrates with four external services. Cloudinary provides image hosting and CDN delivery for product images. Firebase Cloud Messaging (FCM) handles push notifications to mobile devices. Redis provides in memory caching and rate limiting state. MongoDB Atlas persists all application data and supports geospatial queries and vector similarity search via the $vectorSearch aggregation pipeline.

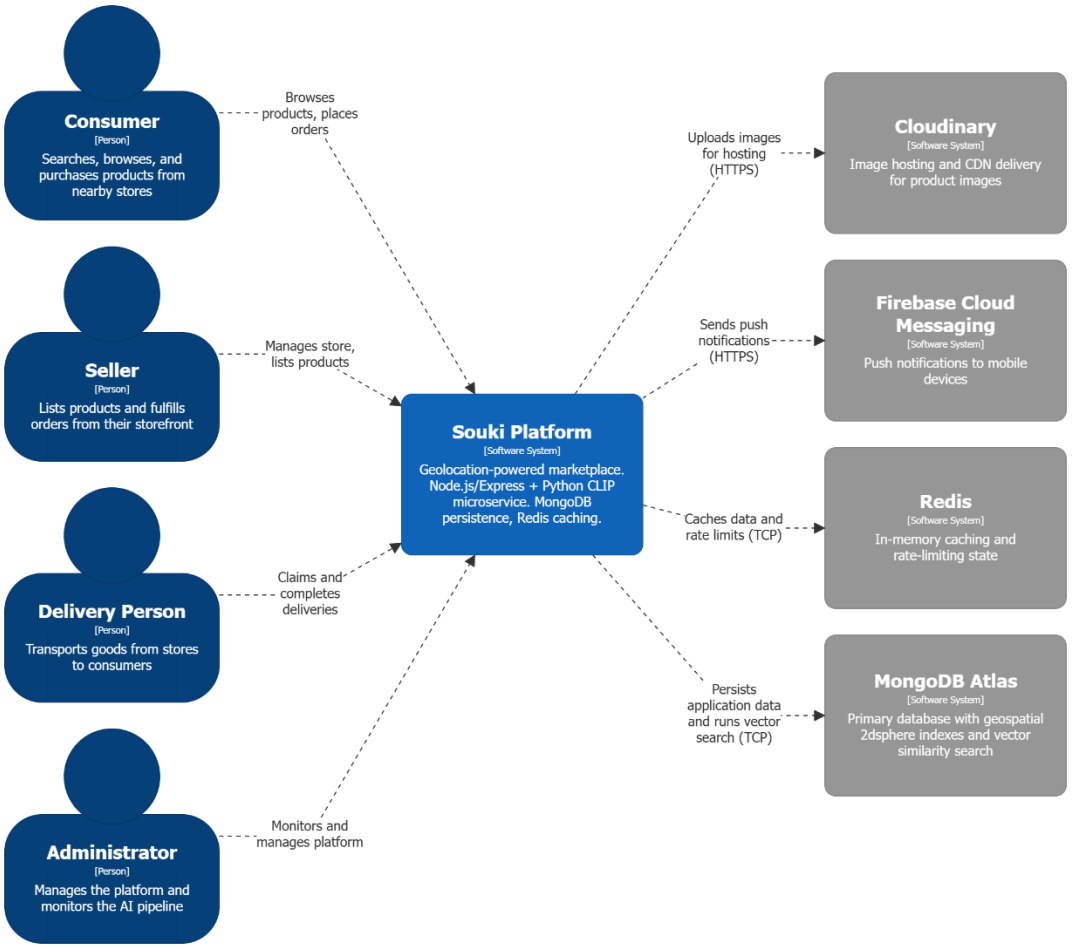

Fig. 2.1: System Context.

1.2 Containers

Functional requirements describe the specific behaviors the system must provide to each actor.

Figure 2.2 zooms into the Souki system boundary and shows its containerized architecture. The system is decomposed into four main containers: the Flutter Mobile Application serving consumers, sellers, and delivery personnel; the Admin Web Dashboard for administrators; the Node.js/Express API Server handling business logic; and the Python CLIP Microservice providing AI powered visual search. Data persistence is managed by MongoDB Atlas, caching by Redis, image hosting by Cloudinary, and push notifications by Firebase Cloud Messaging.

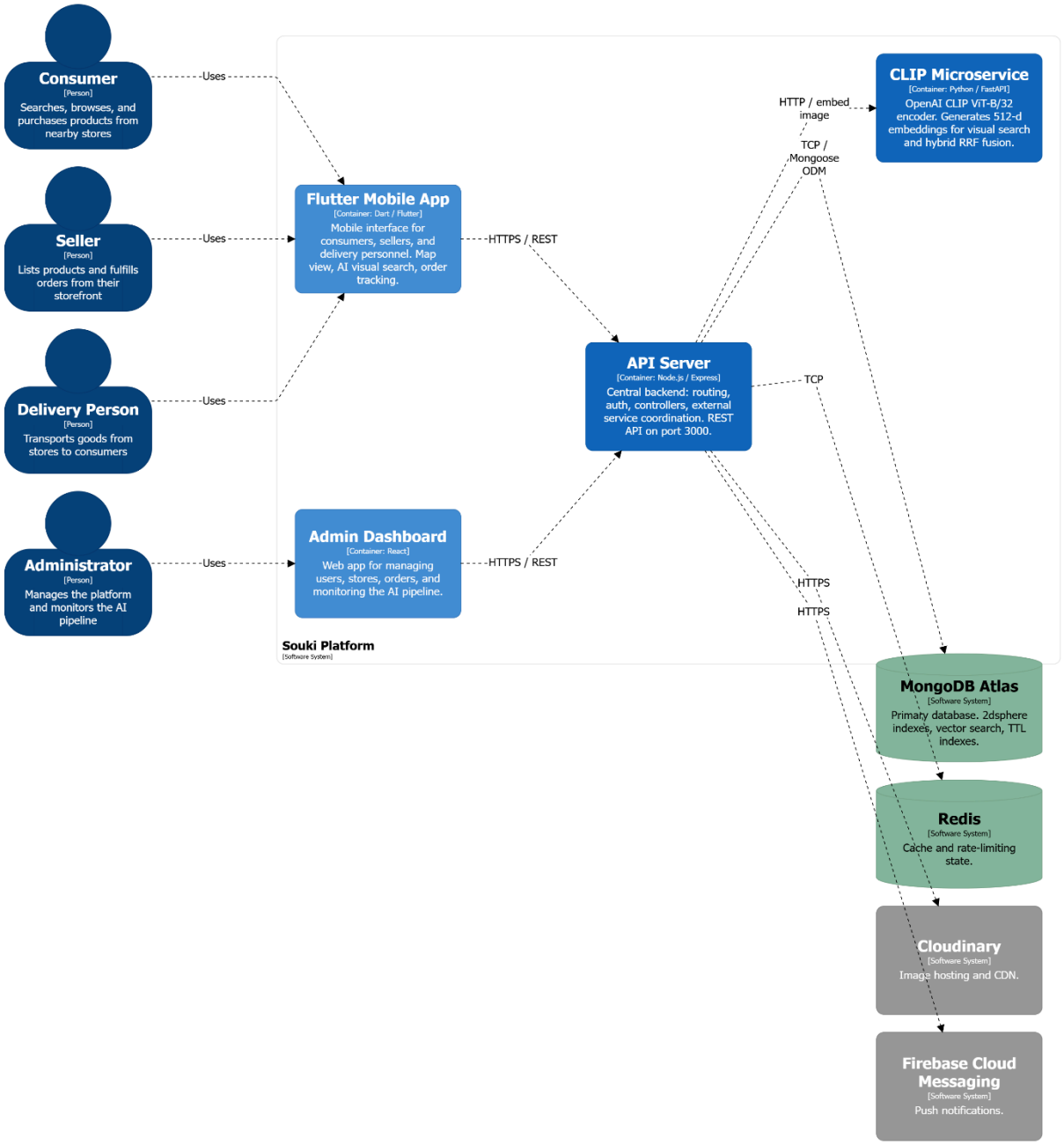

Fig. 2.2: System Containers.

2. Back end Server

The back end server is the core processing layer of Souki. Built on Node.js with the Express framework, it acts as the central mediator between the mobile applications, the MongoDB database, the Redis cache, and the external services. Figure 2.3 shows the internal components of the back end server: the Router that directs incoming HTTP requests, the Middleware pipeline that handles cross cutting concerns, the Controller layer that encapsulates business logic, and the ODM Client (Mongoose) that abstracts database access.

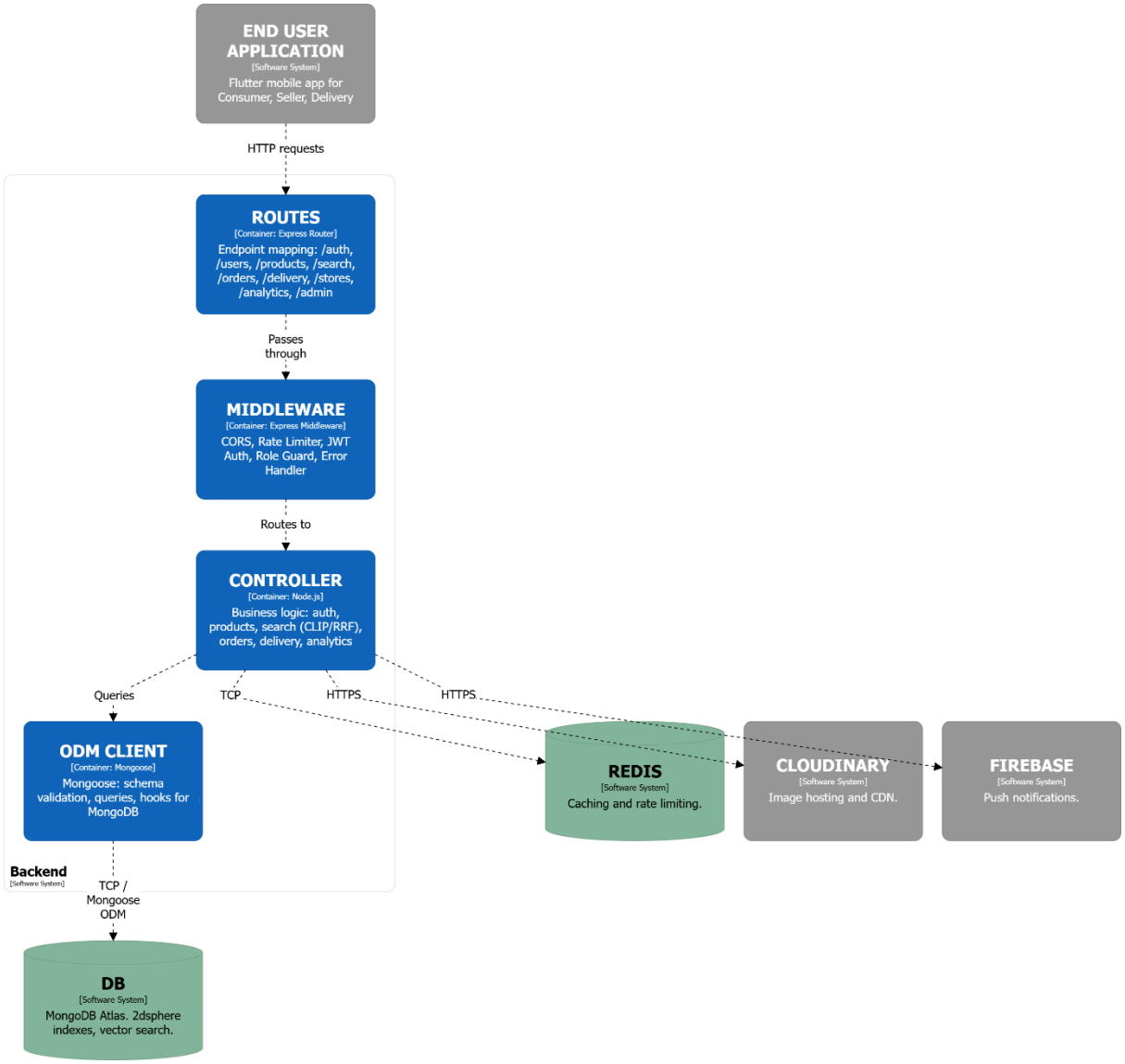

Fig. 2.3: Back end Components.

2.1 *Data model*

Figure 2.4 shows the Class diagram depicting the data model of Souki. It illustrates the various clasess User, Store, Product, Order, Review, Wilaya, and Baladia and their relationships

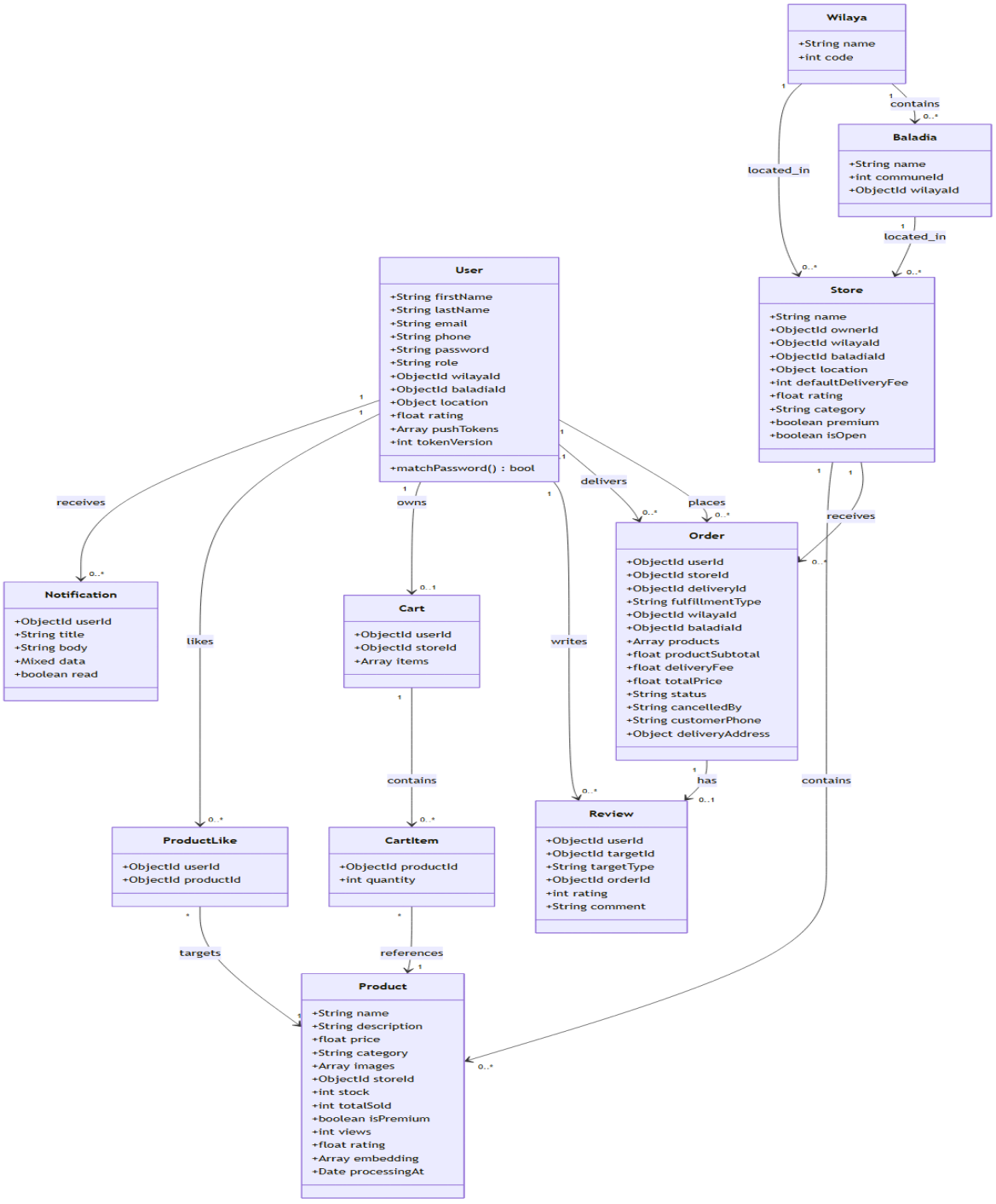

Fig. 2.4: Class diagram

2.2 *Router*

The API server exposes endpoints organized into domain modules. Each module has a URL prefix and groups endpoints by actor permissions. Table 2.1 lists the API endpoint modules.

Module	Prefix	Key Endpoints	Access
Auth	/auth	register, login, logout, change password, refresh	Public
Users	/users	profile, location, push token	Consumer/Seller/Delivery
Products	/products	CRUD, list, stock, similar	Seller
Search	/search	text, image, hybrid, stores	Rate limited
Orders	/orders	create, cancel, confirm, refuse, prepared	Consumer+Seller
Delivery	/delivery	available, accept, mine, complete	Delivery
Stores	/stores	register, update, toggle, list	Seller+Public
Analytics	/analytics	insights, dashboard	Seller
Admin	/admin	users, stores, ai/pipeline	Admin

Table 2.1: API Endpoint Modules.

Public Endpoints

Public endpoints are accessible without authentication and include registration and login routes. Protected endpoints require a valid JWT token with matching role authorization. The router module maps incoming HTTP requests to the appropriate controller functions based on the request method and URL path. Each endpoint group is mounted on its corresponding prefix using Express Router.

Method	Endpoint	Auth	Result
POST	/auth/register	None	Create a new user account
POST	/auth/login	None	Authenticate and return JWT pair
POST	/auth/logout	JWT	Invalidate refresh token
POST	/auth/change password	JWT	Update password
POST	/auth/refresh	Refresh	Issue new access token

Table 2.2: Authentication API Endpoints.

Method	Endpoint	Auth	Result
GET	/products	Public	List products with filters
GET	/products/:id	Public	Get single product details
POST	/products	Seller	Create a new product
PUT	/products/:id	Seller	Update a product
DELETE	/products/:id	Seller	Delete a product
GET	/products/:id/similar	Public	Get visually similar products
PUT	/products/:id/stock	Seller	Update stock quantity

Table 2.3: Product API Endpoints.

Method	Endpoint	Auth	Result
GET	/search/text	Rate limited	Full text search via BM25
POST	/search/image	Rate limited	CLIP visual similarity search
POST	/search/hybrid	Rate limited	Visual + text fused via RRF
GET	/search/stores	Public	Find nearby stores by location

Table 2.4: Search API Endpoints.

Method	Endpoint	Auth	Result
POST	/orders	Consumer	Create order (atomically reserves stock)
GET	/orders	Consumer/Seller	List orders with status filter
GET	/orders/:id	Consumer/Seller	Get order details
POST	/orders/:id/cancel	Consumer	Cancel pending order (restores stock)
POST	/orders/:id/confirm	Seller	Confirm incoming order
POST	/orders/:id/refuse	Seller	Refuse order (restores stock)

POST	/orders/:id/prepared	Seller	Mark as prepared

Table 2.5: Order API Endpoints.

Method	Endpoint	Auth	Result
GET	/delivery/available	Delivery	Browse available deliveries
POST	/delivery/:id/accept	Delivery	Atomically claim delivery
GET	/delivery/mine	Delivery	View assigned deliveries
POST	/delivery/:id/complete	Delivery	Mark delivery completed

Table 2.6: Delivery API Endpoints.

Method	Endpoint	Auth	Result
POST	/stores	Seller	Register a new store
GET	/stores/mine	Seller	Get own store profile
PUT	/stores/mine	Seller	Update store profile
PUT	/stores/mine/toggle open	Seller	Toggle store open/closed
GET	/stores/:id	Public	Get public store info
GET	/stores	Public	List nearby stores

Table 2.7: Store API Endpoints.

Method	Endpoint	Auth	Result
GET	/admin/users	Admin	List all users
PUT	/admin/users/:id/suspend	Admin	Suspend user (increments tokenVersion)
PUT	/admin/users/:id/restore	Admin	Restore suspended user
GET	/admin/stores	Admin	List all stores
PUT	/admin/stores/:id/premium	Admin	Toggle premium subscription
GET	/admin/ai/pipeline	Admin	View AI pipeline health and queue depth
POST	/admin/ai/requeue/:productId	Admin	Re queue failed embedding

Table 2.8: Admin API Endpoints.

2.3 *Controller*

The controller layer encapsulates the business logic of the application. Upon receiving a validated request from the router, the appropriate controller function processes the incoming data, applies business rules, and coordinates interactions with the database and external services.

2. *4 Middleware*

Middleware functions intercept incoming HTTP requests before they reach the controller layer. The Souki middleware stack includes five components applied in a fixed order:

CORS middleware: Restricts origins to a whitelist defined in environment variables.

Rate limiter: Sliding window algorithm with three tiers auth (10 requests per 15 minutes per IP), search (10 requests per 1 minute), and orders (10 requests per 1 minute).

JWT authentication middleware: Validates the token signature and checks the tokenVersion against the stored value. A mismatch returns 401 Unauthorized.

Role based authorization guard: Ensures users can only access endpoints matching their assigned role.

Error handler: Catches all unhandled exceptions and returns structured JSON responses with appropriate HTTP status codes.

2.5 *ODM Client*

All interactions with MongoDB are handled through Mongoose, the Object Document Mapping (ODM) library for Node.js. Mongoose provides schema validation, indexing, query building, and middleware (pre/post hooks) that abstract the specifics of database operations behind a clean interface.

The User model includes a pre save hook that automatically hashes passwords with bcrypt (10 salt rounds). The Product model defines six indexes for query optimization, including a text index on name/description, a 2dsphere index on store location for geospatial queries, and partial indexes on isPremium and embedding related fields for the AI pipeline worker. The Order model includes a pre validation hook that computes totalPrice from productSubtotal and deliveryFee. The Review model enforces the unique compound index that prevents duplicate reviews.

For the CLIP embedding vector search, a dedicated vector search index is defined in MongoDB Atlas on the Product.embedding field using cosine similarity as the distance metric. This index enables efficient $vectorSearch queries that return the nearest matching product embeddings within a given wilaya, drastically outperforming brute force cosine similarity computation for large catalogs.

3. End users Application

The end users application is a Flutter mobile application that serves as the primary interface for consumers, sellers, and delivery personnel. It is organized around role specific experiences while sharing common infrastructure for authentication, push notifications, and geolocation.

3.1. *Use Cases*

This section describes the use cases for each actor of the end users application.

Figure 2.5 shows the Consumer use case diagram. The Consumer actor interacts through eight primary use cases: search by text/image, browse nearby stores on map, create order, cancel pending order, track delivery, confirm pickup, submit review, and manage profile. The search use case extends to both text and image search paths. The create order use case includes stock validation against the Product database

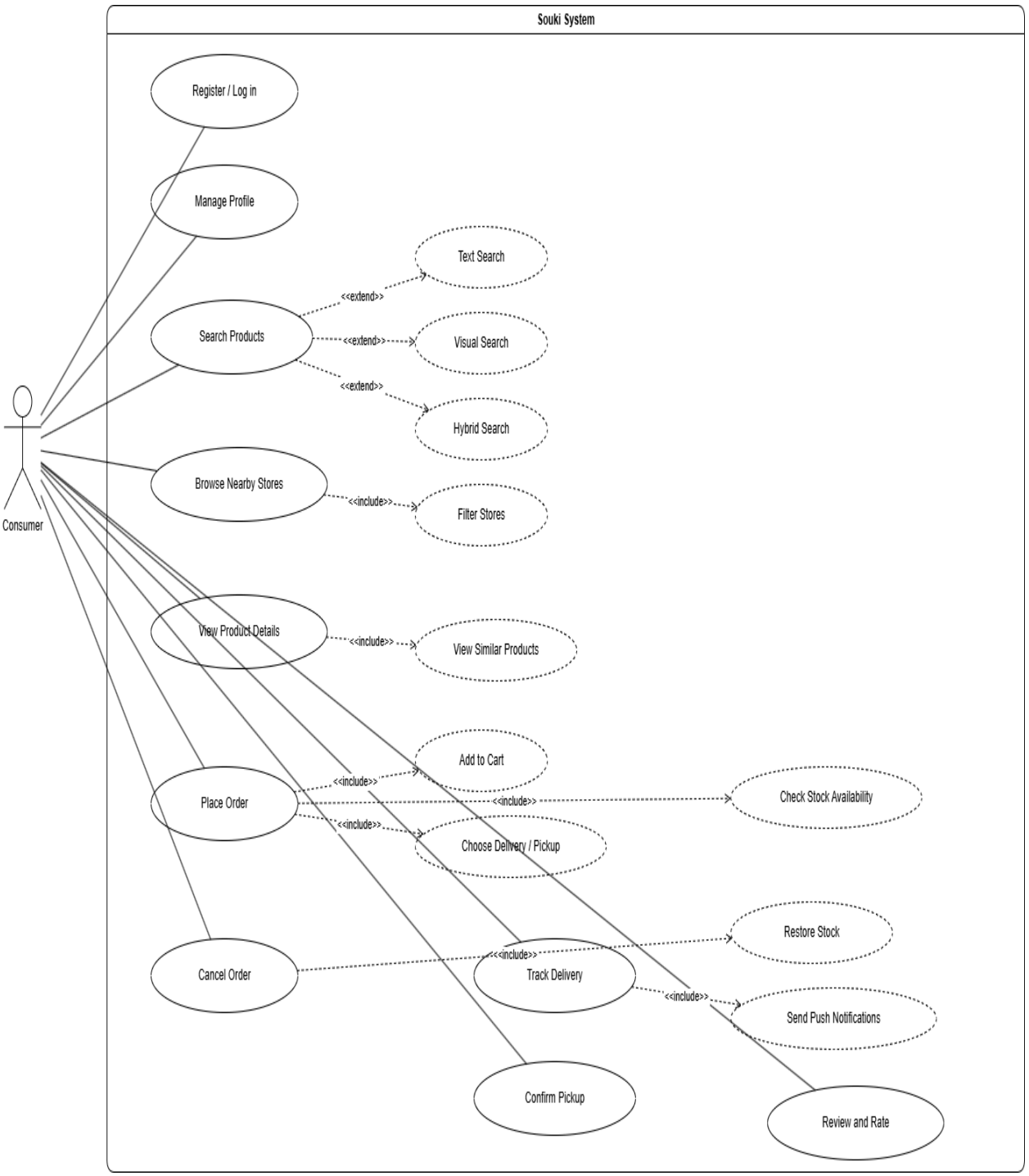

Fig. 2.5: Consumer Use Case Diagram.

Figure 2.6 shows the Seller use case diagram. The Seller actor interacts through seven primary use cases: manage products (create, update, delete), manage inventory, view incoming orders, confirm order, refuse order, mark prepared, and view analytics. The manage products use case is a base that includes create, update, and delete as child use cases.

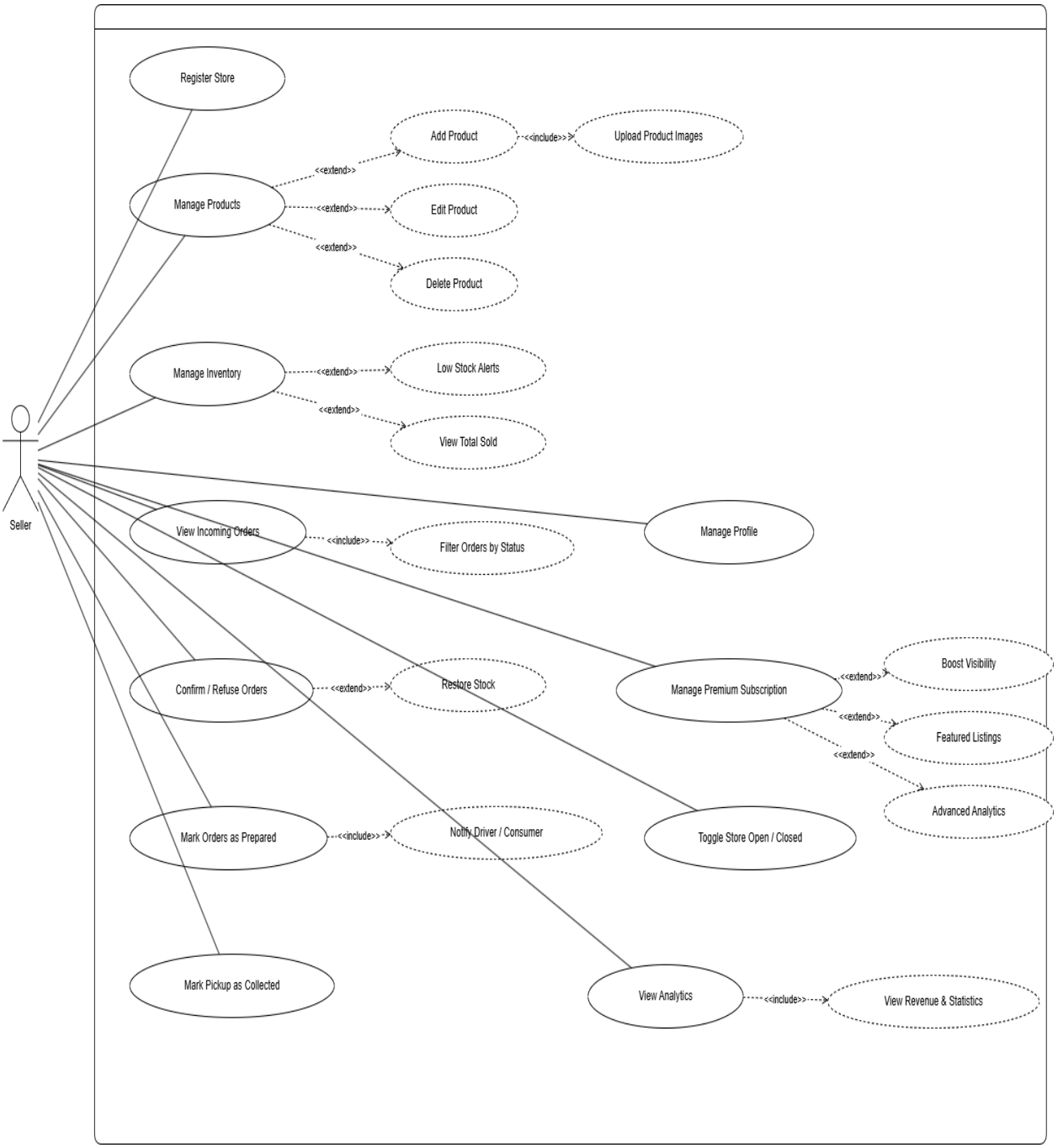

Fig. 2.6: Seller Use Case Diagram.

Figure 2.7 shows the Delivery Person use case diagram. The Delivery actor interacts through four primary use cases: browse available deliveries (filtered by wilaya), accept delivery (atomic claim), complete delivery, and view delivery history.

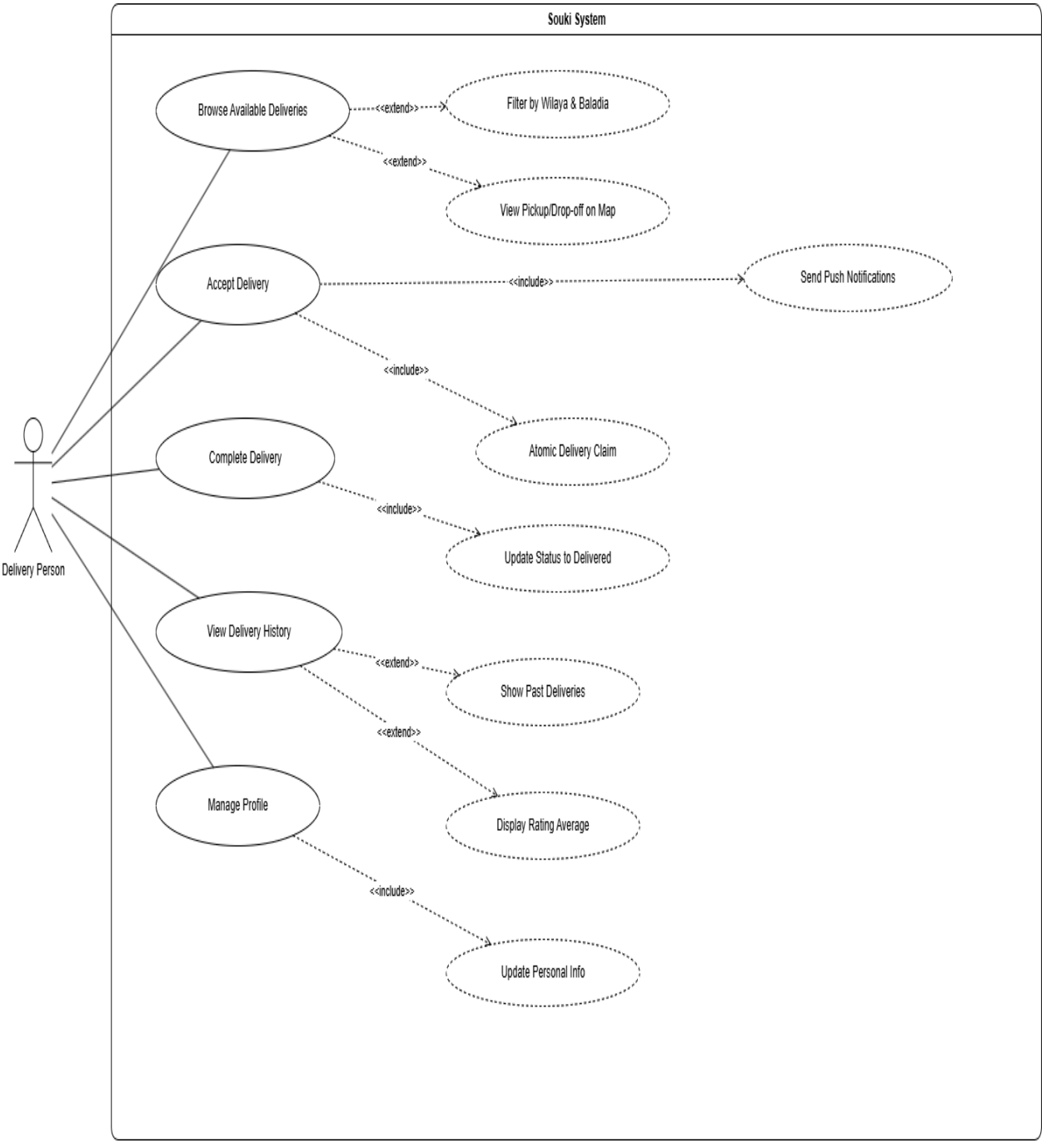

Fig. 2.7: Delivery Person Use Case Diagram.

Figure 2.8 shows the Admin use case diagram. The Admin actor can view and mange all the users, stores , the orders, through the use of the admin dashboard and also check the status of the servers
and the platform statistics.

Fig. 2.8: Admin Use Case Diagram.

3.2. Flow Charts

The following flow charts describe the workflows within the end users application. Each chart models a complete business process from the user's perspective.

Figure 2.9 outlines the process for a seller to register and publish a new product. The seller begins by registering an account and selecting the seller role. After completing the store profile (name, category, location), the seller can add products by uploading images, setting prices, and providing descriptions. The system validates the input, uploads images to Cloudinary, sends the product image to the CLIP microservice for embedding generation, and persists the product document in MongoDB. Finally, the product becomes visible to nearby consumers on the map interface.

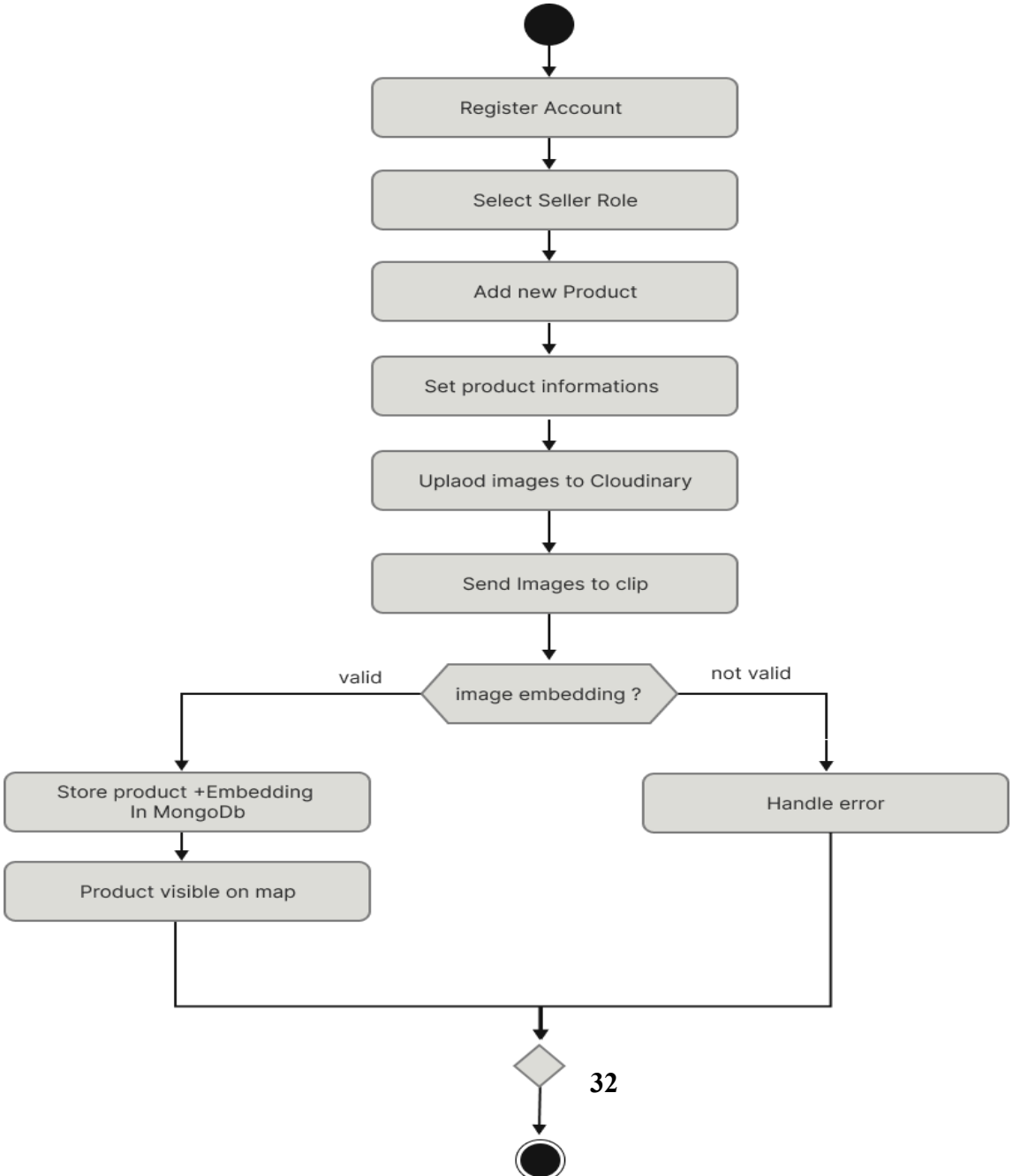

Fig. 2.9: Seller Registration and Product Publishing Workflow.

Review process

Figure 2.10 illustrates the review process after an order reaches a terminal state (delivered or picked_up). The consumer receives a notification prompting them to rate and review the store and/or delivery person. The system validates that exactly one review per target per order is submitted, preventing duplicate reviews.

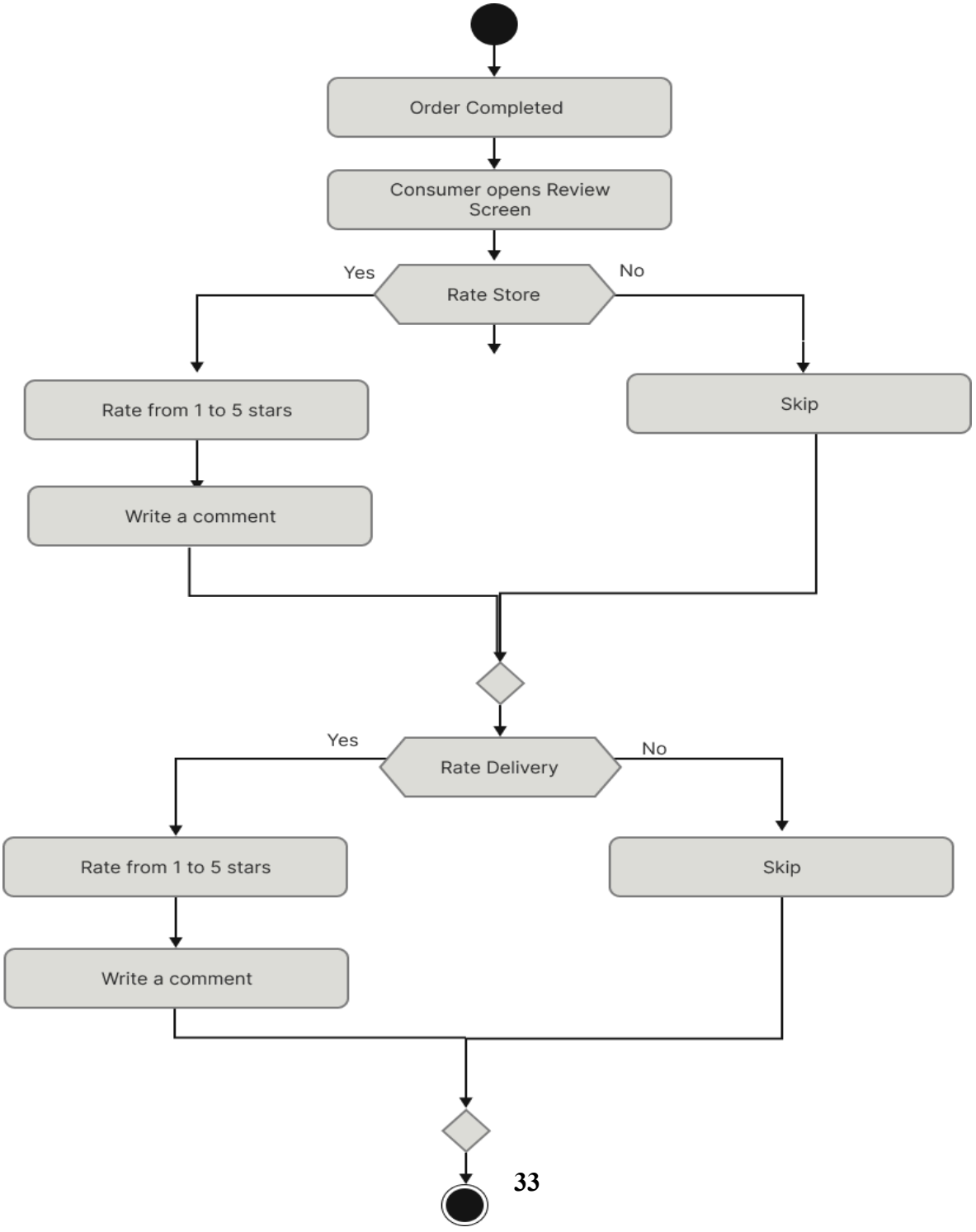

Fig. 2.10: Delivery and Order Review Process.

3.3. Sequence Diagram

The following sequence diagrams illustrate the chronological interactions between actors, the mobile application, the API server, and external services during key platform operations.

Figure 2.11 illustrates the user registration and role selection process. The user submits registration details (email, password, firstName, lastName, phone, role). The API server hashes the password via bcrypt and creates the User document in MongoDB. If the role is "seller", an empty Store document is also created. The server returns a JWT access token and a refresh token. The tokenVersion is initialized to 1, enabling future session invalidation.

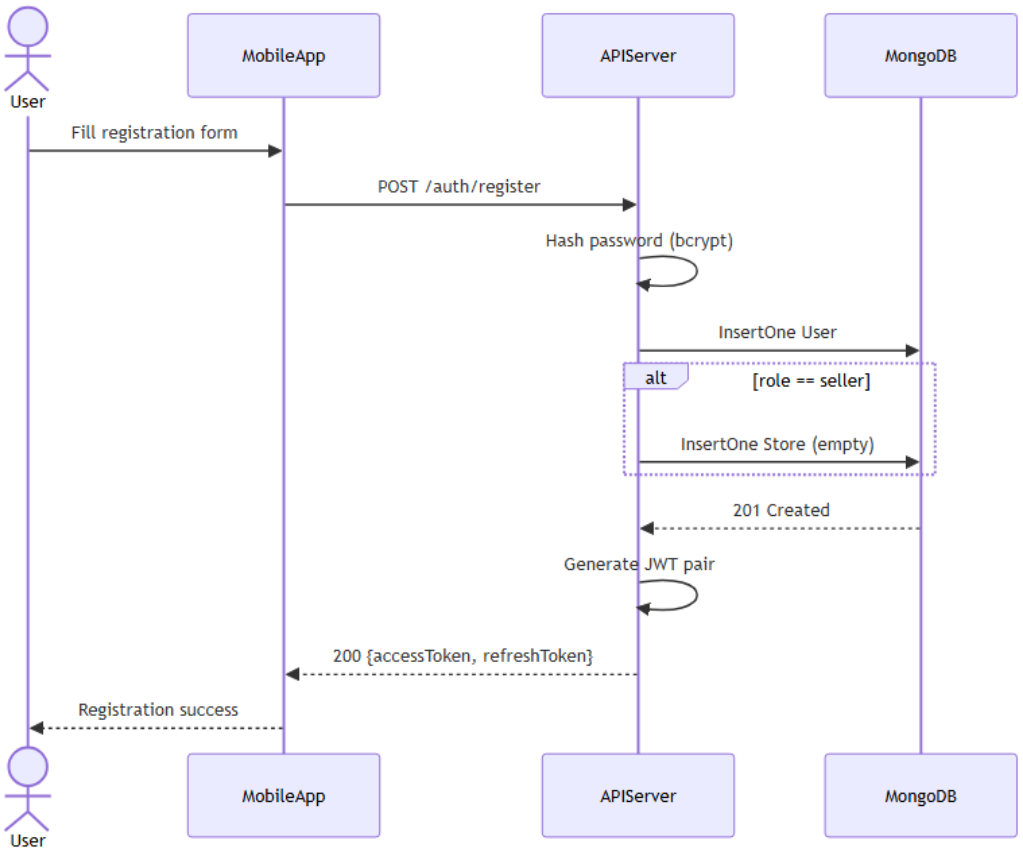

Fig. 2.11: User Registration and Role Selection Process.

Figure 2.11 illustrates the user text search and hybrid search with image and text on the app

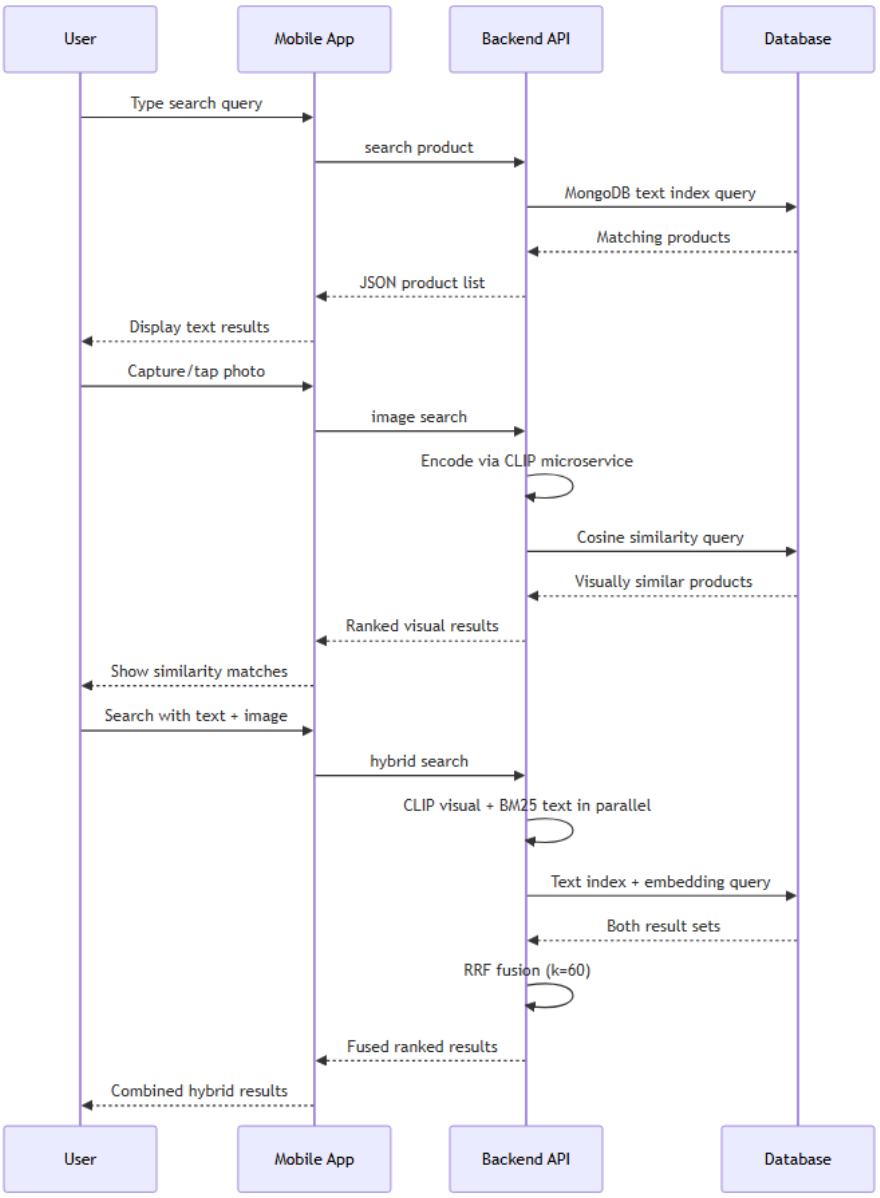

Fig. 2.12: Hybrid Search Sequence Diagram.

The The following sequence diagrams below provides a full view of the order lifecycle across all four actor categories

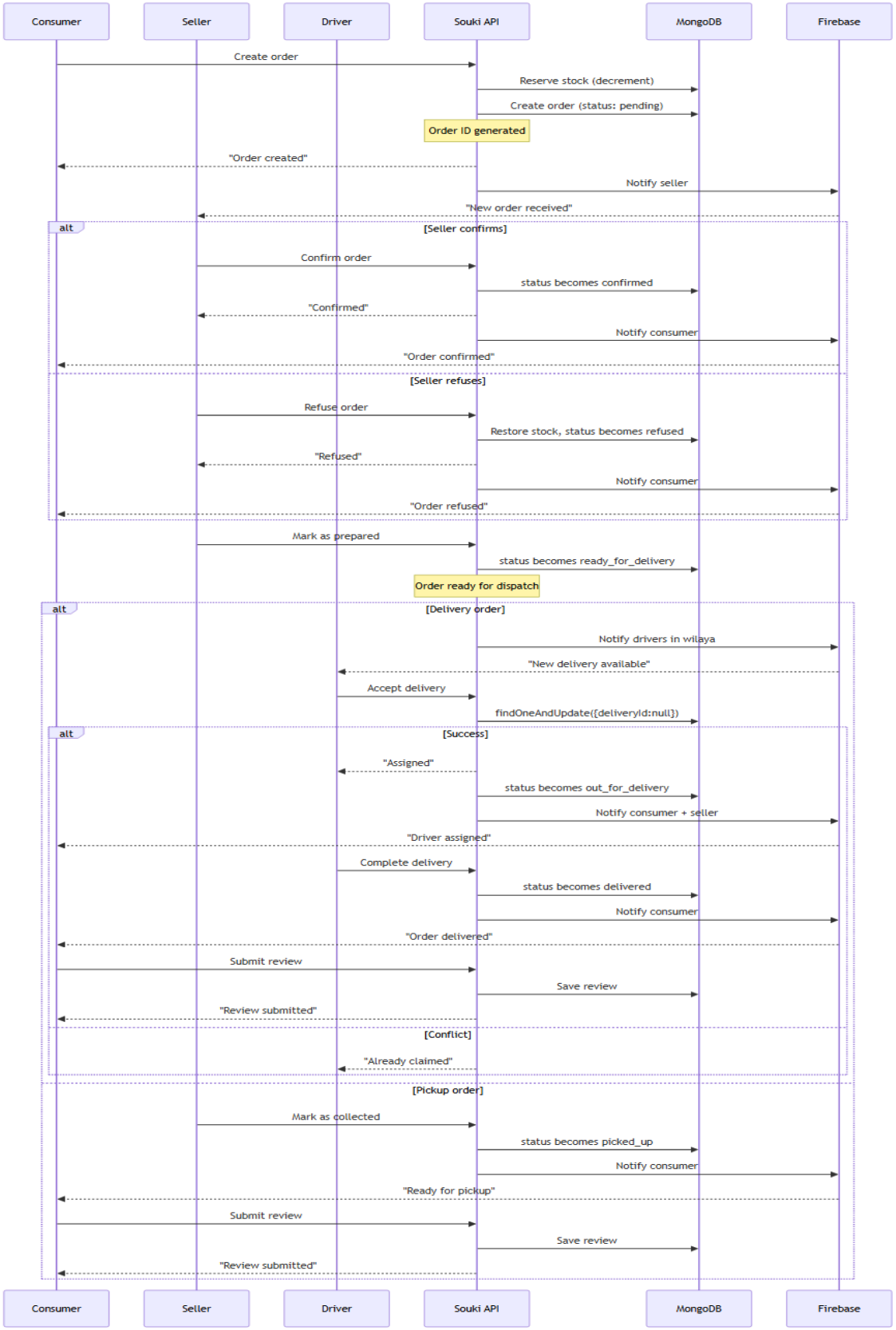

Fig. 2.13: Detailed Order Lifecycle Diagram.

2. Conclusion

This chapter presented the complete design of the Souki platform following a structured software engineering approach. We decomposed the architecture using the C4 model, starting from the system context down to the container level. The back end server was detailed across five dimensions: data model (six principal entities in MongoDB), API routing (nine endpoint modules across four security tiers), controller logic (business rules for stock reservation, delivery claim, and AI search fusion), middleware pipeline (CORS, rate limiting, JWT auth, role guard, error handling), and the ODM abstraction layer via Mongoose.

The end users mobile application was described through page inventories for each actor (consumer, seller, delivery person), use case diagrams capturing the functionalities available to each role and modeling the core business processes (registration, search, order lifecycle, review), and sequence diagrams detailing the chronological interactions between all system participants

CHAPTER THREE

System Implementation and Deployment

INTRODUCTION

In this chapter, we present the technologies and tools used in the development, deployment, and maintenance of the Souki platform. This includes a comprehensive overview of the development environment, the complete technology stack, the deployment services, and the third party integrations. Following that, we present the consumer facing mobile application and the seller and delivery interfaces through a series of annotated screenshots, highlighting the key features and functionalities available to each user type

1. Used Technologies

In this section, we present the modern web and mobile development technologies used to build and operate Souki, including the development environment, the back end and front end stacks, and the authentication, notification, and AI inference services.

1.1. Development Environment

Our development environment consists of the following tools:

Visual Studio Code (VS Code):

An open source source code editor developed by Microsoft. It was used as the primary editor for the Node.js back end codebase, offering integrated error detection, auto completion, and built in Git support.

Android Studio:

The official IDE for Android development, used as the primary environment for building and testing the Flutter mobile application. Android Studio provides the Flutter and Dart plugins, integrated device emulation, and real device debugging.

Postman:

A collaboration platform for API development. Postman was used throughout the project to design, test, and document all back end API endpoints, ensuring correctness of request formats and response structures before mobile integration.

Git and GitHub:

Git was used as the distributed version control system for tracking all changes across the project. GitHub served as the cloud based hosting repository, enabling branch management and a complete history of the codebase.

MongoDB Compass:

A graphical user interface for MongoDB used to inspect, query, and visualize the database during development. Compass was particularly useful for verifying geospatial indexes and inspecting the embedding vectors stored by the AI pipeline.

1.2. Development Stack

1.2.1 Back end Stack

The back end of Souki is built using the following technologies:

Node.js: A JavaScript runtime built on Chrome's V8 engine. Its event driven, non blocking I/O model is well suited to a marketplace workload with many concurrent connections, where the server spends most of its time waiting on database results.

Express.js: A minimal and flexible Node.js web application framework providing structured routing and middleware. Express handles all HTTP request routing, authentication middleware, and error handling in Souki's back end server.

MongoDB: A document oriented NoSQL database selected for its native geospatial support through the 2dsphere index and $nearSphere operator, its flexible document model for heterogeneous product categories, and its efficient storage of 512 dimensional embedding arrays.

Mongoose: An Object Document Mapping library for MongoDB and Node.js providing schema level validation, model abstraction, and middleware hooks that enforce data integrity rules such as atomic stock reservation and tokenVersion based session invalidation.

Redis (via Upstash): An in memory data structure store used as a caching layer for frequently accessed and rarely changed data such as category listings and wilaya reference data, reducing response latency on read heavy endpoints.

JSON Web Tokens (JWT): Used for stateless user authentication. Each JWT encodes the user's identifier, role, and a tokenVersion field. Server side logout is enforced by incrementing the tokenVersion in the database, immediately invalidating all outstanding tokens.

1.2.2 Mobile Front end Stack

The Souki mobile application is built using the following technologies:

Flutter: An open source UI toolkit developed by Google for building natively compiled applications from a single codebase for iOS and Android. Flutter's own rendering engine ensures a visually consistent interface across platforms.

Dart: The strongly typed programming language used by Flutter. Dart's asynchronous programming model, null safety support, and hot reload made it well suited for building a responsive and maintainable mobile application.

BLoC / Cubit (Business Logic Component): The state management architecture used throughout the application. BLoC separates UI rendering from business logic through event driven Cubits, making individual components independently testable and the application state predictable.

Google Maps Flutter: The Flutter plugin used to render the interactive map interface for geolocation based product and store discovery. It integrates with the device's GPS and renders store markers based on proximity query results from the back end.

1.3. Deployment Services

The following services were used to deploy and operate the production environment:

Railway: A cloud deployment platform used to host the main Node.js back end server, providing automatic deployments on Git push, environment variable management, and built in logging.

MongoDB Atlas: The cloud hosted MongoDB service used for the production database. Atlas provides automated backups, built in monitoring, and native vector search capabilities through Atlas Vector Search, the primary similarity computation backend for the AI visual search module.

Render: Used to deploy the Python CLIP microservice as a containerized web service. This service accepts image data, runs it through the ViT B/32 CLIP model using ONNX Runtime, and returns the 512 dimensional embedding vector.

1.4. Third party Services

Souki integrates the following external services for specialized platform capabilities:

Cloudinary: A cloud based media management platform used to store and deliver product and store images with automatic optimization and CDN delivery, ensuring fast loading across varying network conditions.

Firebase Cloud Messaging (FCM): Google's cross platform push notification service, used to send real time notifications to consumers, sellers, and delivery personnel at each order state transition, replacing the ad hoc WhatsApp coordination characteristic of current Algerian local commerce.

OpenAI CLIP (ViT B/32): OpenAI's Contrastive Language Image Pretraining model used to generate 512 dimensional embedding vectors for product images. CLIP embeddings enable semantic visual search through cosine similarity computation between a query image and all indexed product embeddings within the consumer's geographic area.

2. Presentation of the Application

The Souki mobile application serves three distinct actor groups: consumers, sellers, and delivery personnel. Each group accesses the platform through a role specific interface. The following subsections present the key screens and functionalities through annotated screenshots.

2.1. Authentication and Onboarding

The application entry point presents the Souki splash screen with the platform logo and tagline, alongside three navigation options: Sign In, Create Account, and Continue as Guest. This design allows users to explore the platform before committing to registration, reducing the initial adoption barrier.

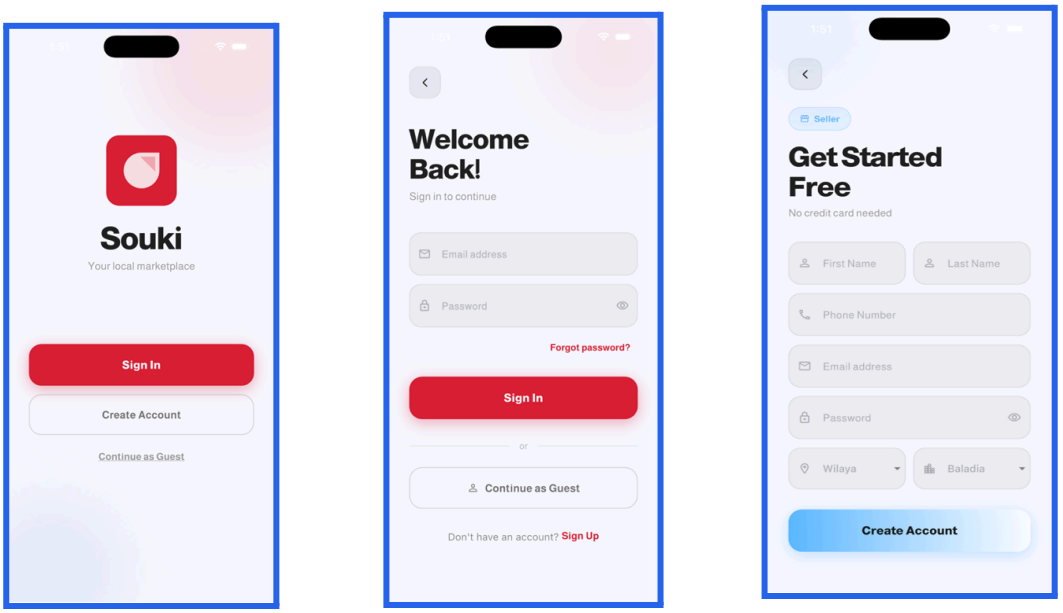

Fig. 3.3: Sign Up Screen.

The sign in screen collects the user's email and password through clearly labeled input fields. A password visibility toggle and a forgot password link address the most common authentication friction points. New users are directed to registration through the sign up link at the bottom.

Upon successful registration, new users are guided through a role selection screen that presents the three roles Buyer, Seller, and Delivery as full screen cards in a swipeable carousel, each with a distinct visual identity and a short description of the associated platform experience.

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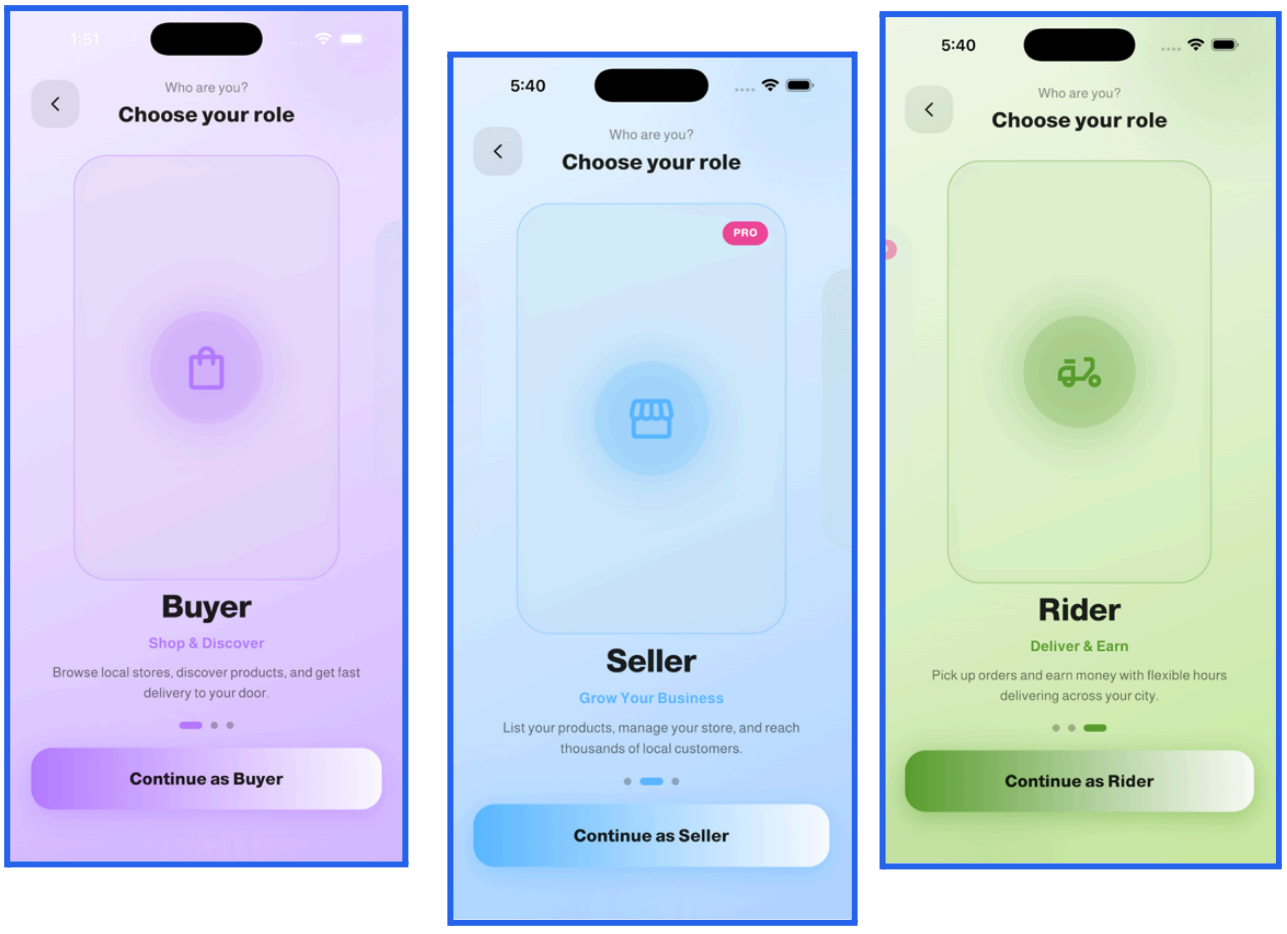

Fig. 3.4: Role Selection Screen.

2.2. Consumer Interface

The main consumer home screen serves as the central hub for product and store discovery. It displays the user's selected wilaya alongside a smart search bar supporting both text based and AI powered visual search. A promotional banner carousel highlights featured listings, followed by category quick access icons and a popular products grid. All content is filtered to the consumer's selected administrative region.

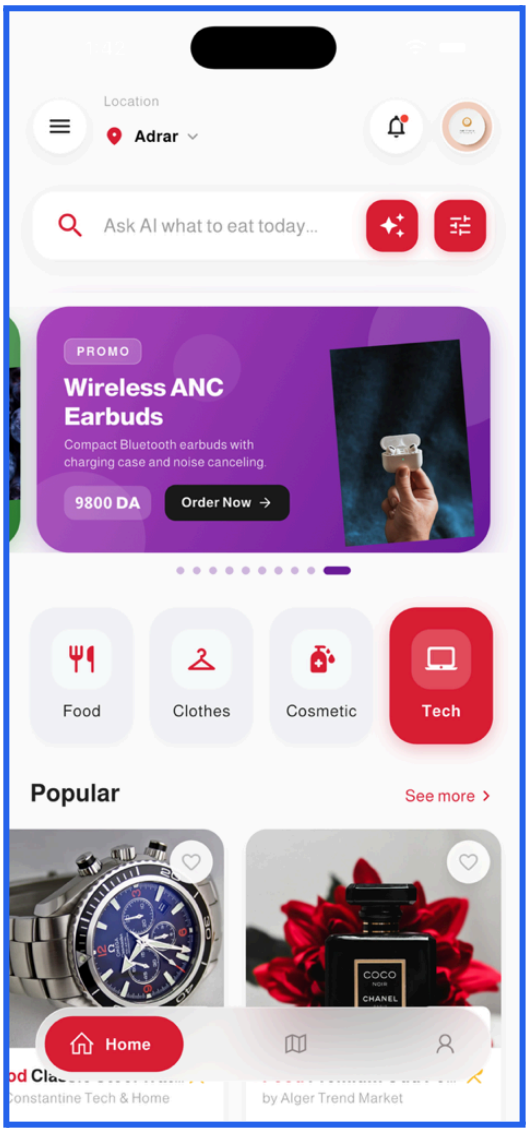

Fig. 3.5: Consumer Home Screen.

The store profile page provides a comprehensive view of a seller's presence on the platform, displaying the store name, category, verification status, follower count, product count, and aggregate rating. A tabbed navigation section allows consumers to browse the store's new arrivals, best sellers, trending products, and customer reviews.

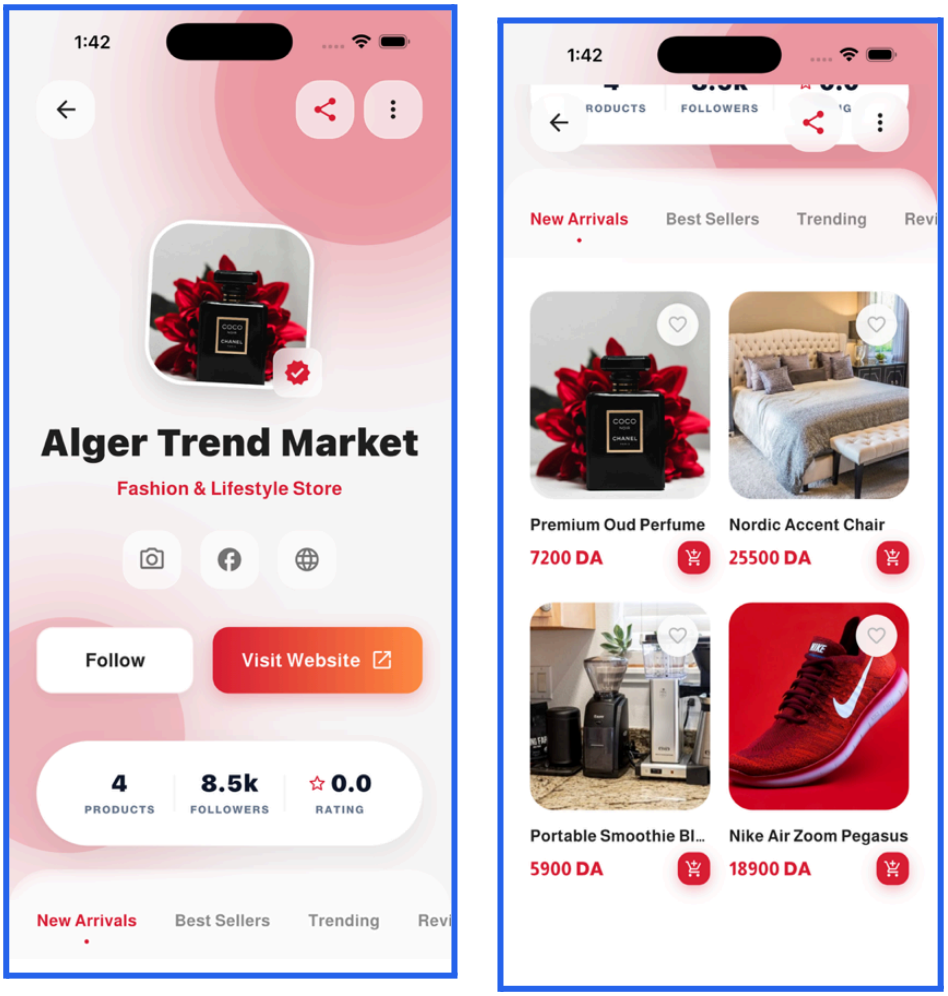

Fig. 3.6: Store Product Listings.

The product detail page presents all information required for a purchase decision. A full screen image carousel occupies the upper portion of the screen with share and save actions overlaid. Below the image, the product name, location, description, and rating are displayed.

Aproduct specifications panel provides price, available stock, total units sold, view count,

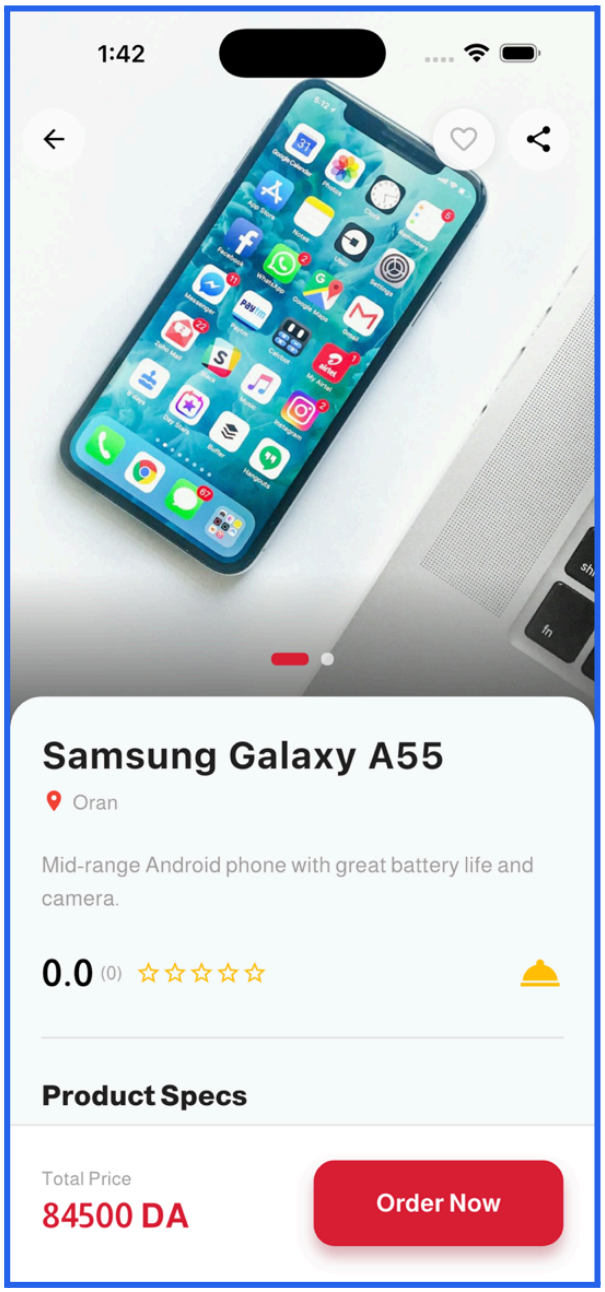

Fig. 3.7: Product Specifications Panel.

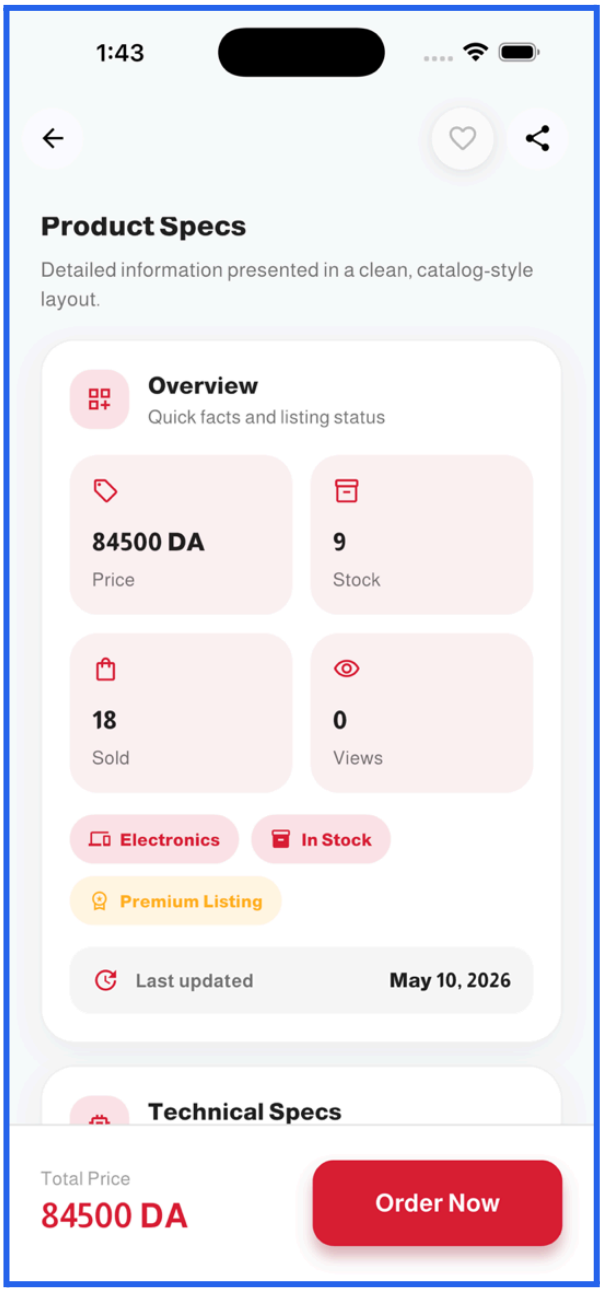

Fig. 3.8: Product Specifications Panel.

The map discovery interface allows consumers to locate nearby stores in an interactive geospatial view. Stores are represented as markers positioned according to their registered GPS coordinates. The interface supports panning and zooming within the selected wilaya and displays a store card upon marker selection, allowing consumers to navigate directly to the store profile.

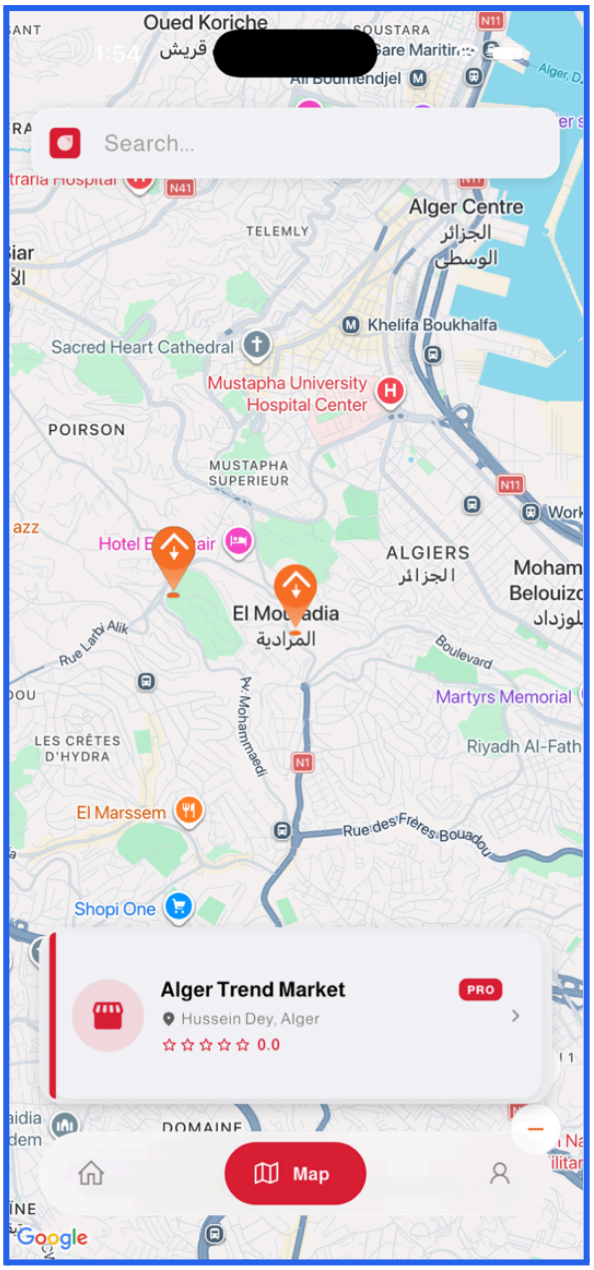

Fig. 3.9: Map Discovery View.

once the system finishes processing the query image, it displays an "Analysis Complete" confirmation. Below the analyzed image, the interface presents a badge indicating the total number of visually similar products found within the consumer's geographic area. The matched items are then displayed as scrollable product cards, complete with the product name, store name, price, and current rating, allowing the consumer to seamlessly transition from visual discovery to purchasing.

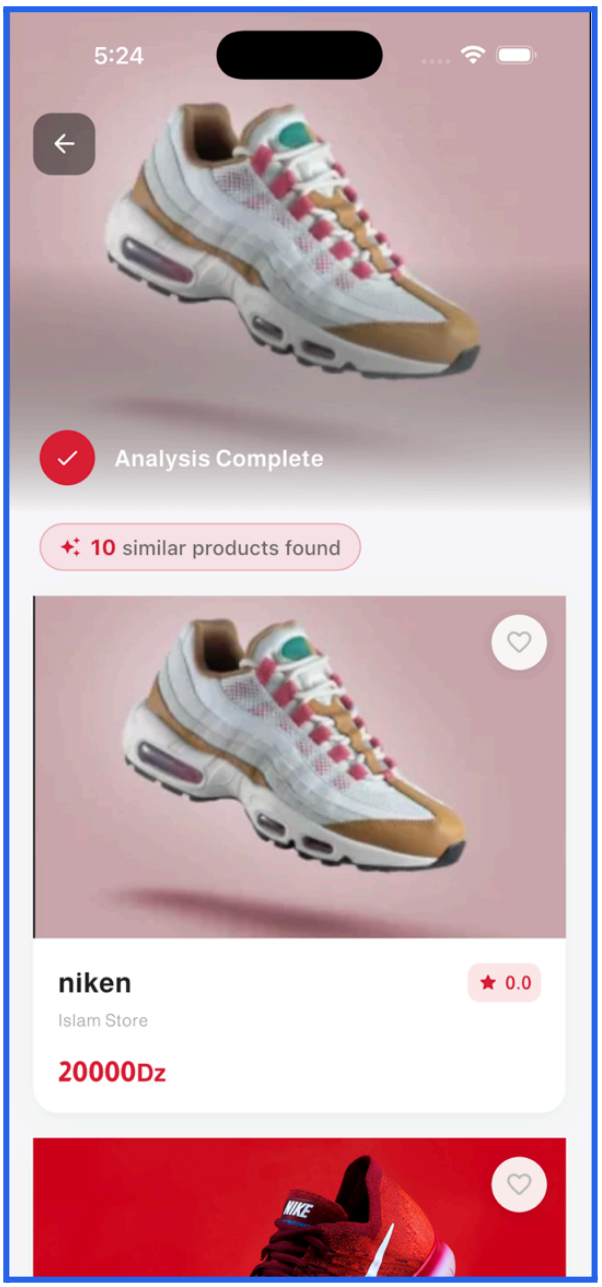

Fig. 3.10: AI Visual Search.

To provide consumers with full visibility over their transactions, the platform includes a dedicated order management interface. The "My Orders" screen empowers users to track their entire purchase history and monitor active transactions. Orders are presented in a scrollable list and can be filtered by status tabs (e.g., Pending, Refused, Confirmed). Each card displays the unique order reference, store name, transaction date, product quantity, and total cost in Algerian Dinar (DA). Contextual visual badges provide real time updates on fulfillment stages, such as "Ready for pickup," "Picked up," or "Out for delivery," keeping the consumer fully informed without requiring direct communication with the seller.

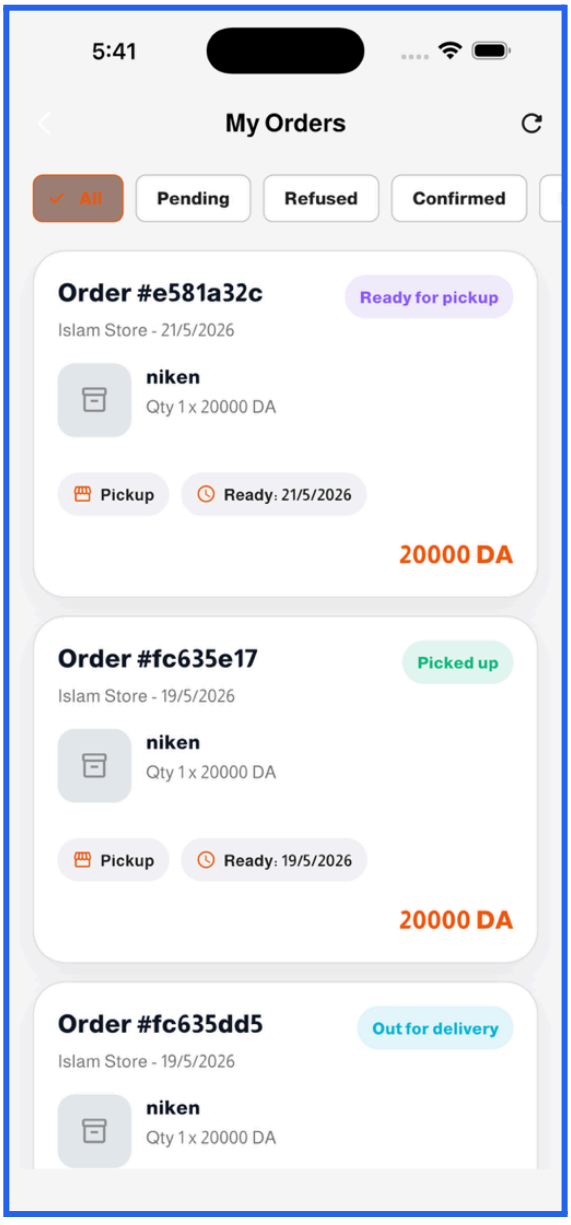

Fig. 3.11: My Orders and Status Tracking Screen.

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To streamline communication and eliminate reliance on external messaging apps, the application features a centralized Notification Center accessible to both consumers and sellers. This screen aggregates automated push notifications triggered by the order lifecycle state machine. Users receive time stamped alerts for critical events—such as "Delivery assigned," "Order delivered," or system welcomes—complete with clear visual icons that quickly convey the notification's context.

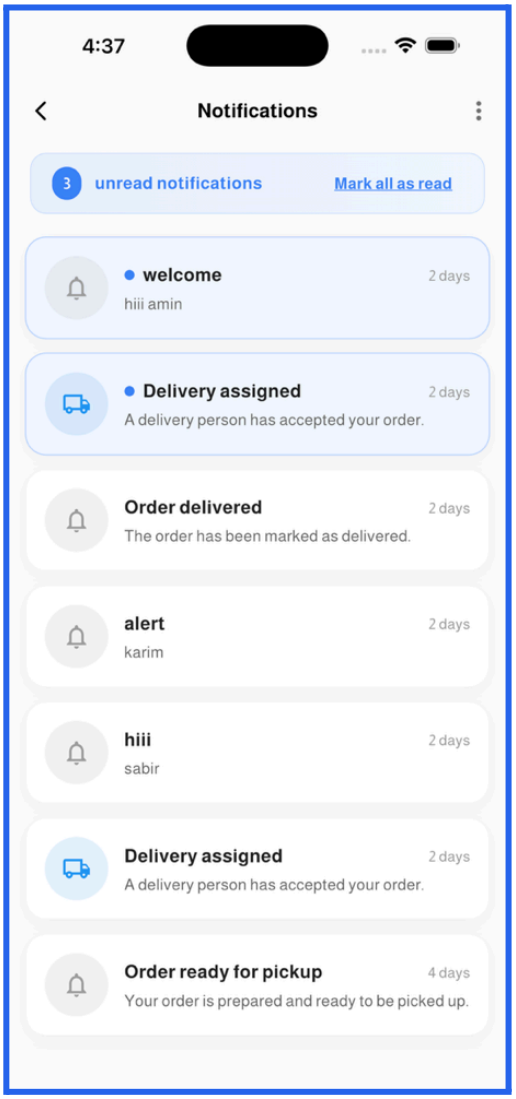

Fig. 3.12: Shared Notification Center Interface.

2.3. Seller Interface

Sellers access their account and store management features through a dedicated profile section. The profile page displays the seller's registered name, email, phone number, and wilaya and baladia location. An open/closed store toggle is available directly from this screen. From the general

settings panel, sellers can also configure language preferences, appearance theme, and location information.

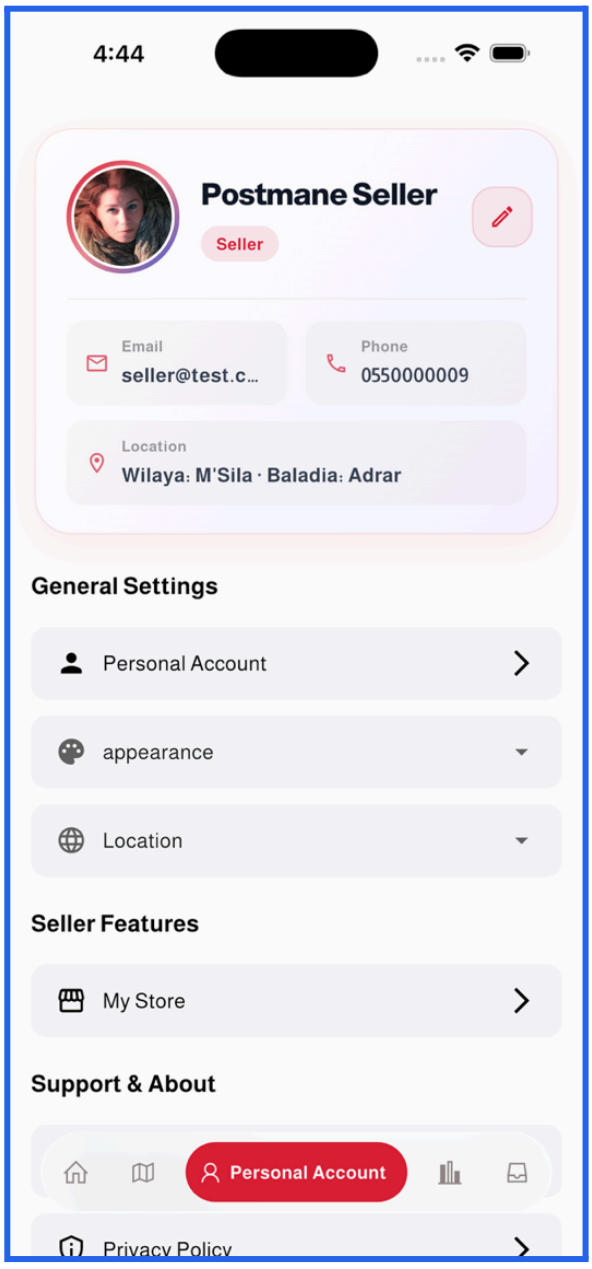

Fig. 3.13: Seller Profile and Settings.

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The store product management interface allows sellers to maintain their product catalog by adding, editing, and removing listings.

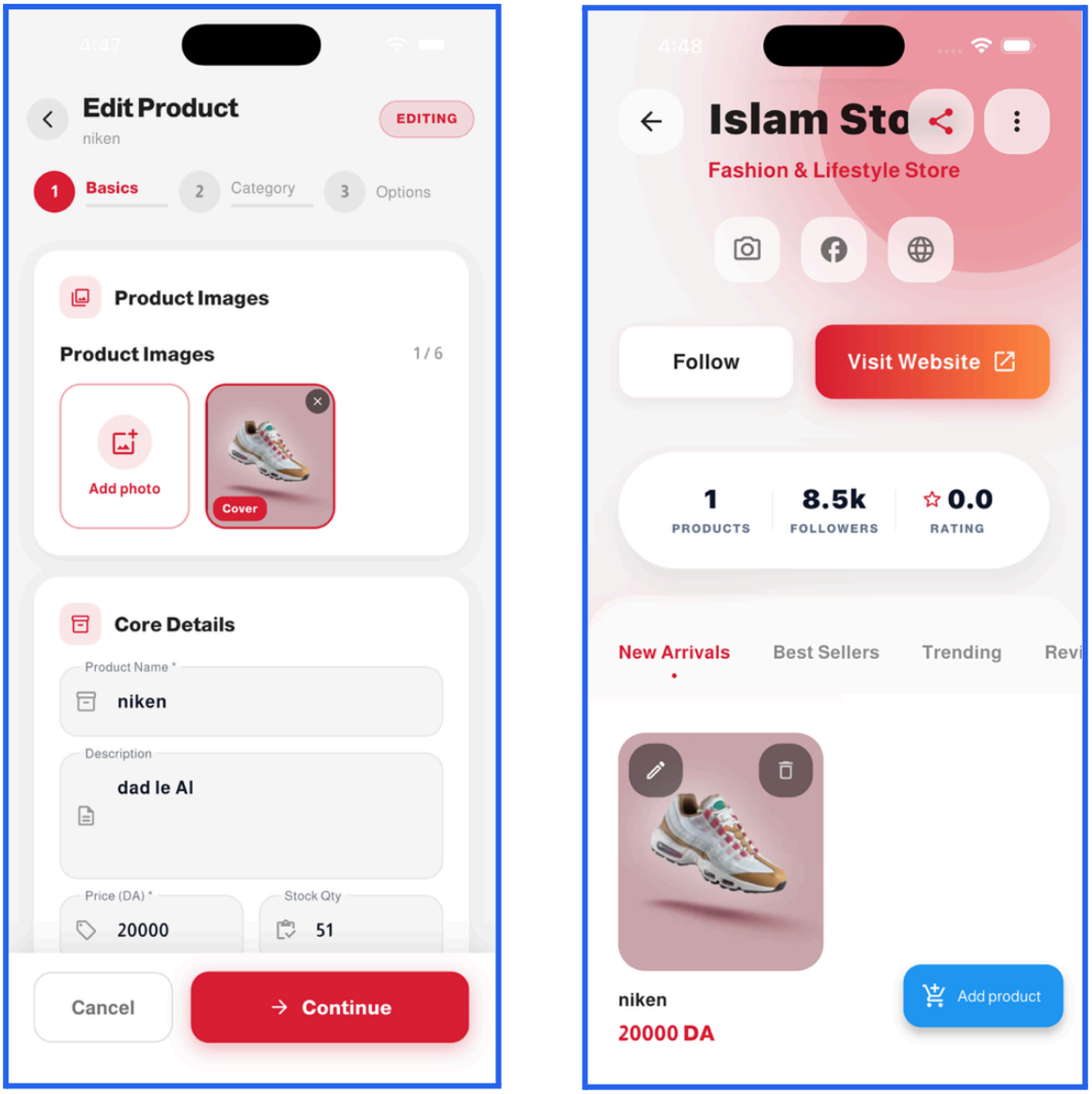

Fig. 3.14: Seller Product Management.

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Upon logging in, store owners are presented with a comprehensive Dashboard summarizing their operational metrics. High contrast cards display "Total Revenue" and "Total Orders" for immediate financial visibility. An "Insights & Highlights" section identifies top performing products, detailing units sold alongside remaining stock levels. Furthermore, a

detailed "Order Status" breakdown provides a numerical snapshot of the daily workload, categorizing active orders into Delivered, Refused, Picked Up, Ready for Pickup, and Out for Delivery.

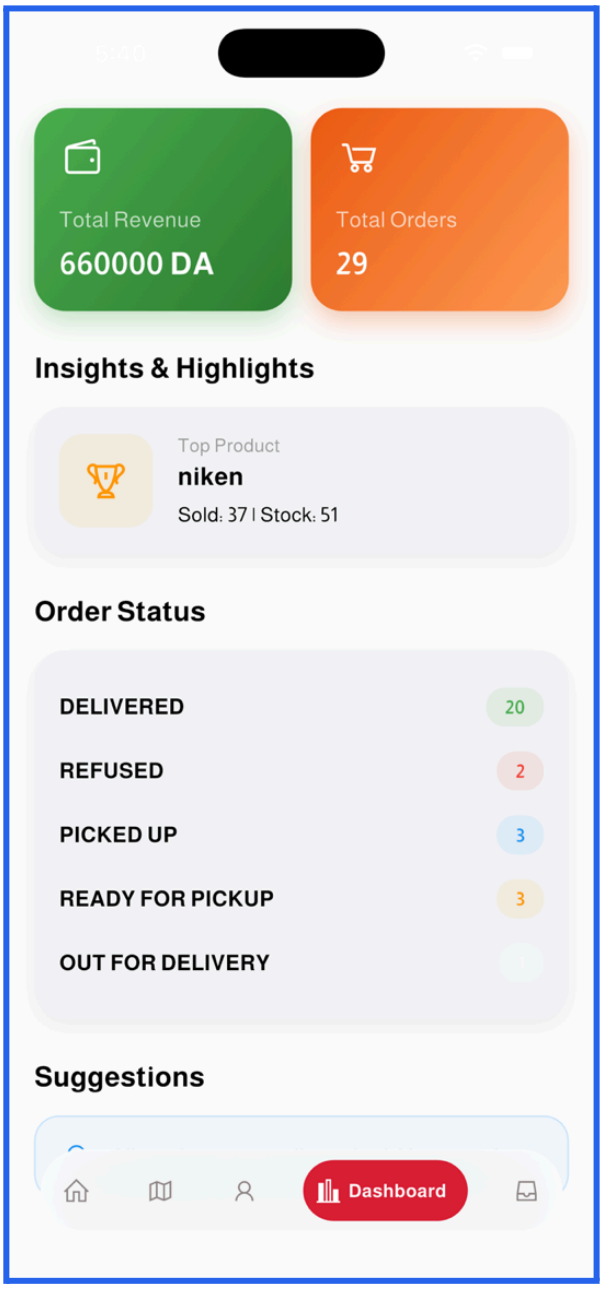

Fig. 3.15: Seller Dashboard and Performance Metrics.

Sellers manage active requests through the "Incoming Orders" interface. This screen features filtering options (All, Pending, Refused, Confirmed) to organize the fulfillment workflow efficiently. Order cards detail the consumer's name, requested items, transaction date,

and financial total. They also include direct action buttons to update the status (e.g., confirming a "Pickup") and a quick dial button for immediate customer contact if clarification is needed. Each action triggers a real time push notification to the relevant consumer.

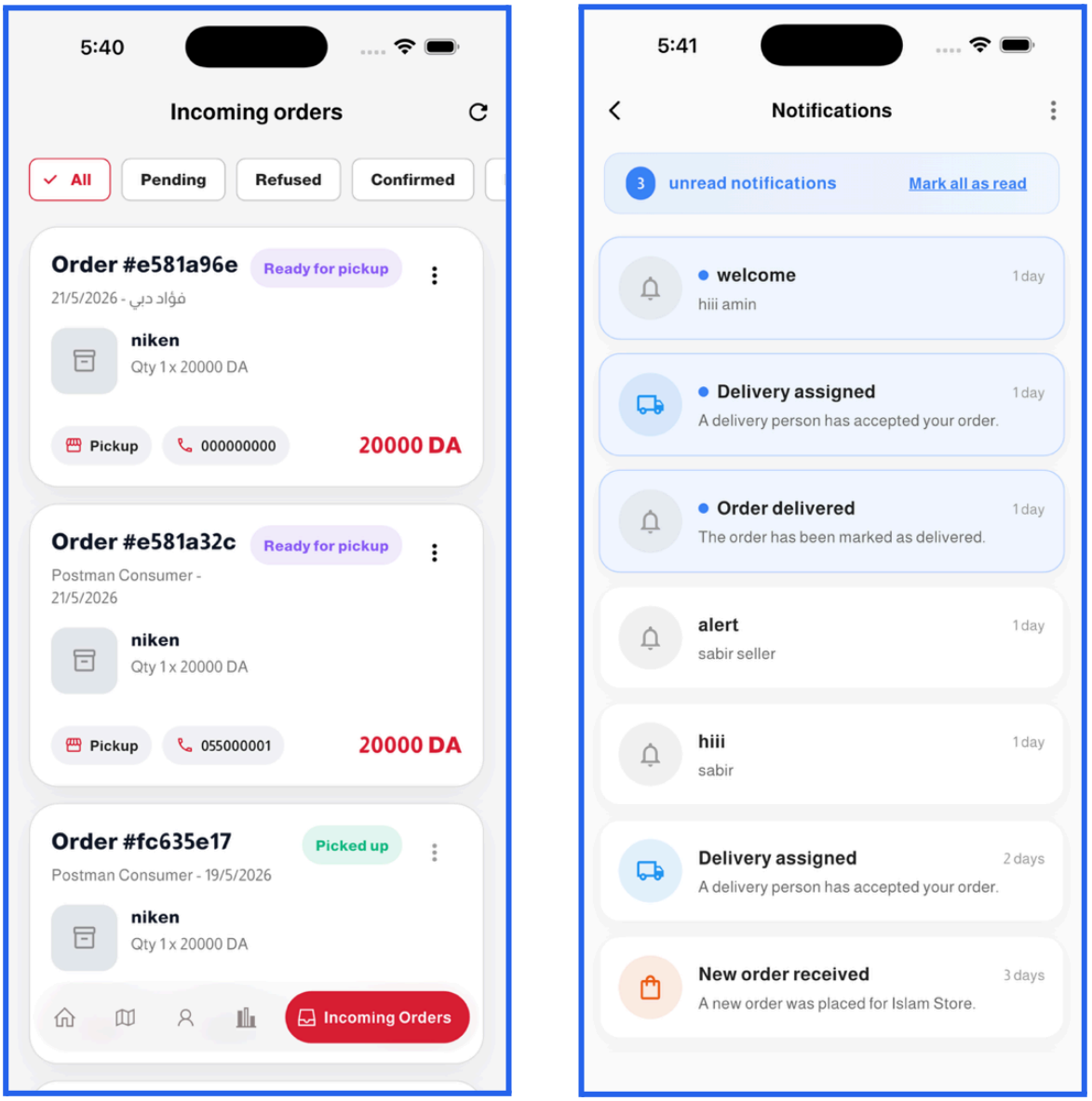

Fig. 3.16: Seller Notification Screen.

2.4. Delivery Personnel Interface

The delivery module provides a dedicated task management interface. The main screen presents a summary dashboard showing available, active, and completed delivery counts. The current active delivery is prominently displayed with the order reference, total value, status, and drop off GPS

coordinates. Two primary actions are available: opening a navigation map and marking the delivery as complete. Available tasks can be atomically claimed, with the platform ensuring only one driver can successfully claim each task.

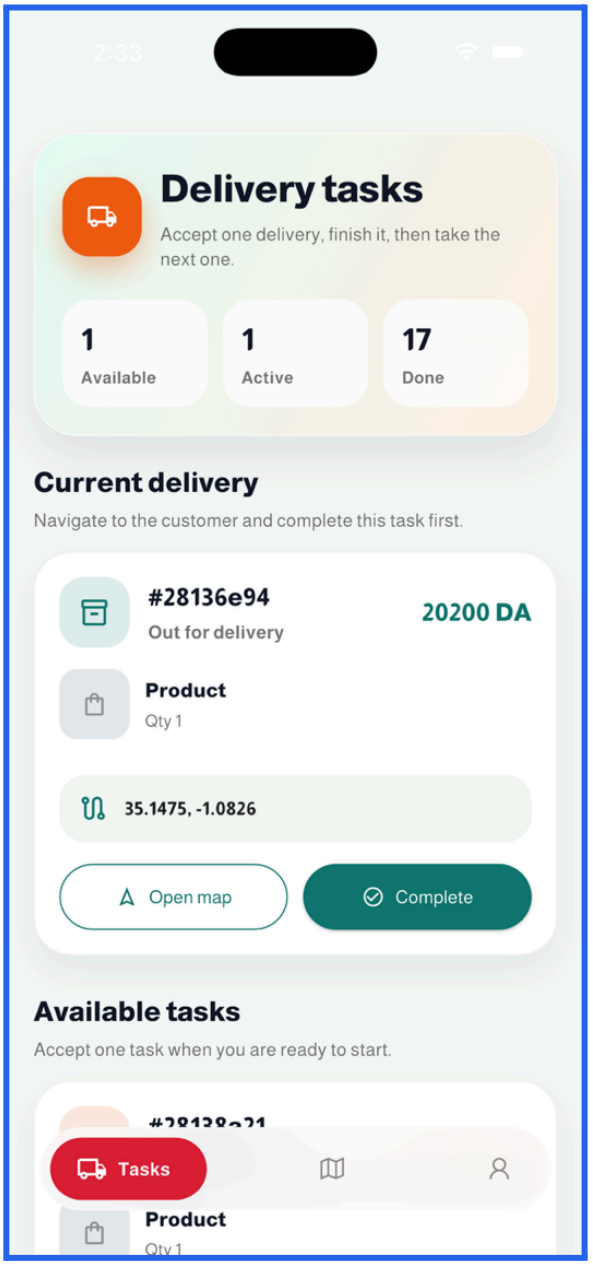

Fig. 3.17: Delivery Tasks.

The interface supports both light and dark display modes. The dark mode variant provides improved visibility in low light conditions relevant for evening deliveries, while the layout, information hierarchy, and action controls remain identical across both themes.

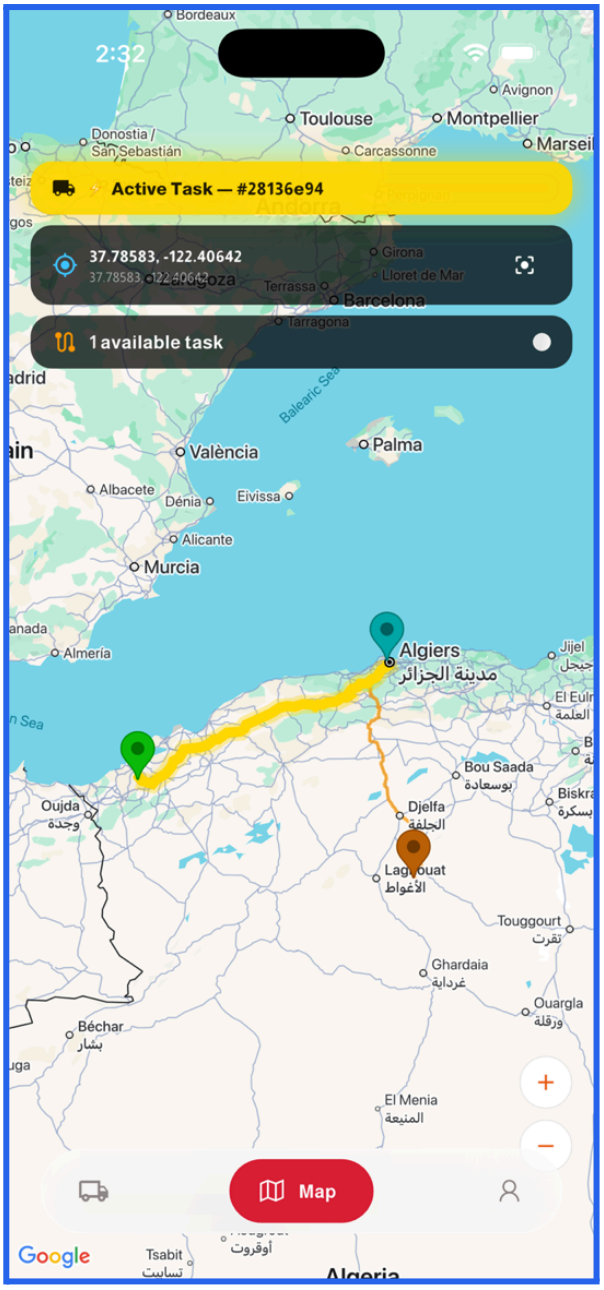

Fig. 3.18: Delivery Map Navigation View.

The delivery map view provides navigation guidance from the seller's pickup location to the consumer's delivery address. Upon marking an order as complete, the delivery person's reputation score is updated based on the consumer's rating, visible on the delivery profile screen.

2.5. Administrator Dashboard

In addition to the mobile applications, the Souki platform includes a robust, web based administrative dashboard designed to provide system administrators with complete oversight and control over the marketplace ecosystem.

Platform Overview:

The main dashboard landing page provides a high level statistical snapshot of the marketplace. Administrators can monitor total registered users, total stores (including premium accounts), total products across the platform, and the number of currently active stores. A bar chart visually breaks down user demographics across Consumer, Seller, Delivery, and Admin roles.

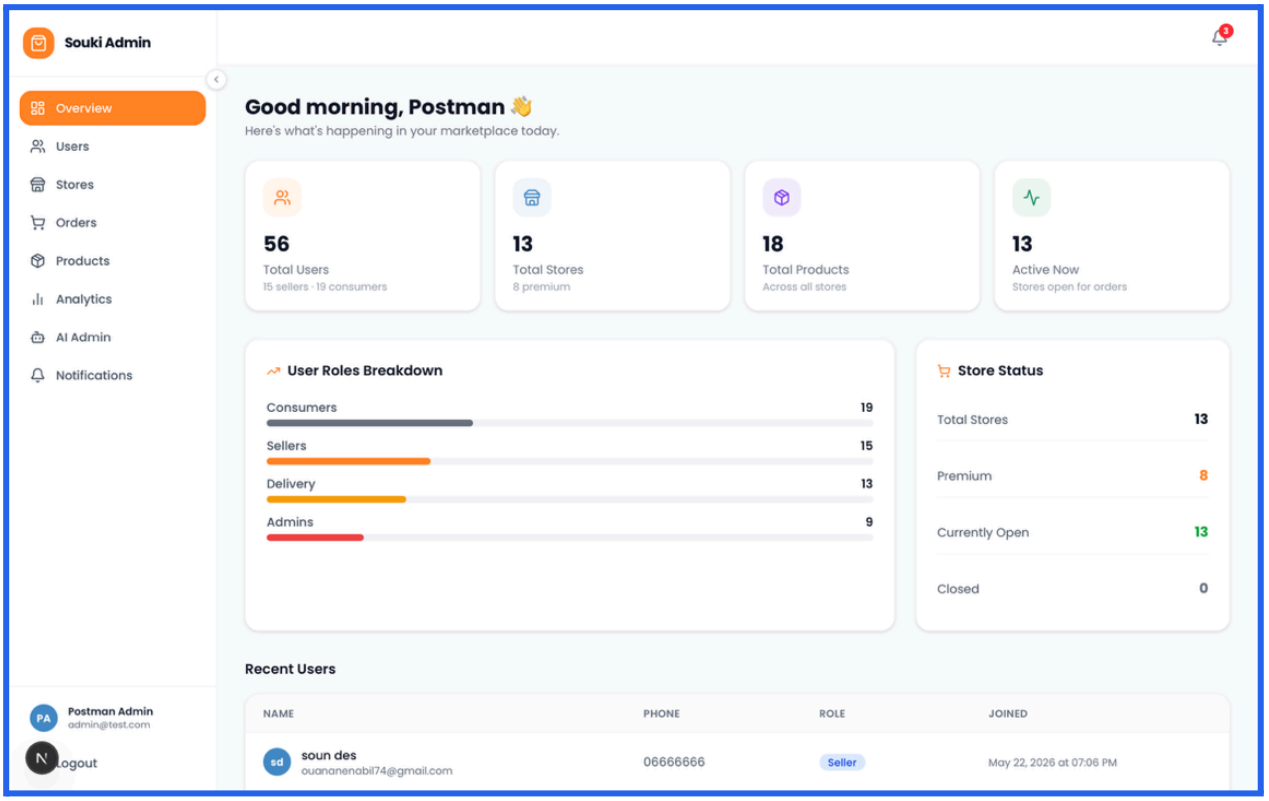

Fig. 3.19: Administration Dashboard Overview.

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User Management:

The Users management interface allows administrators to view and filter all registered platform participants. The data table displays contact information, joined dates, and current roles. A dedicated "Change Role" dropdown enables administrators to quickly update a user's permissions directly from the dashboard, facilitating seamless account corrections.

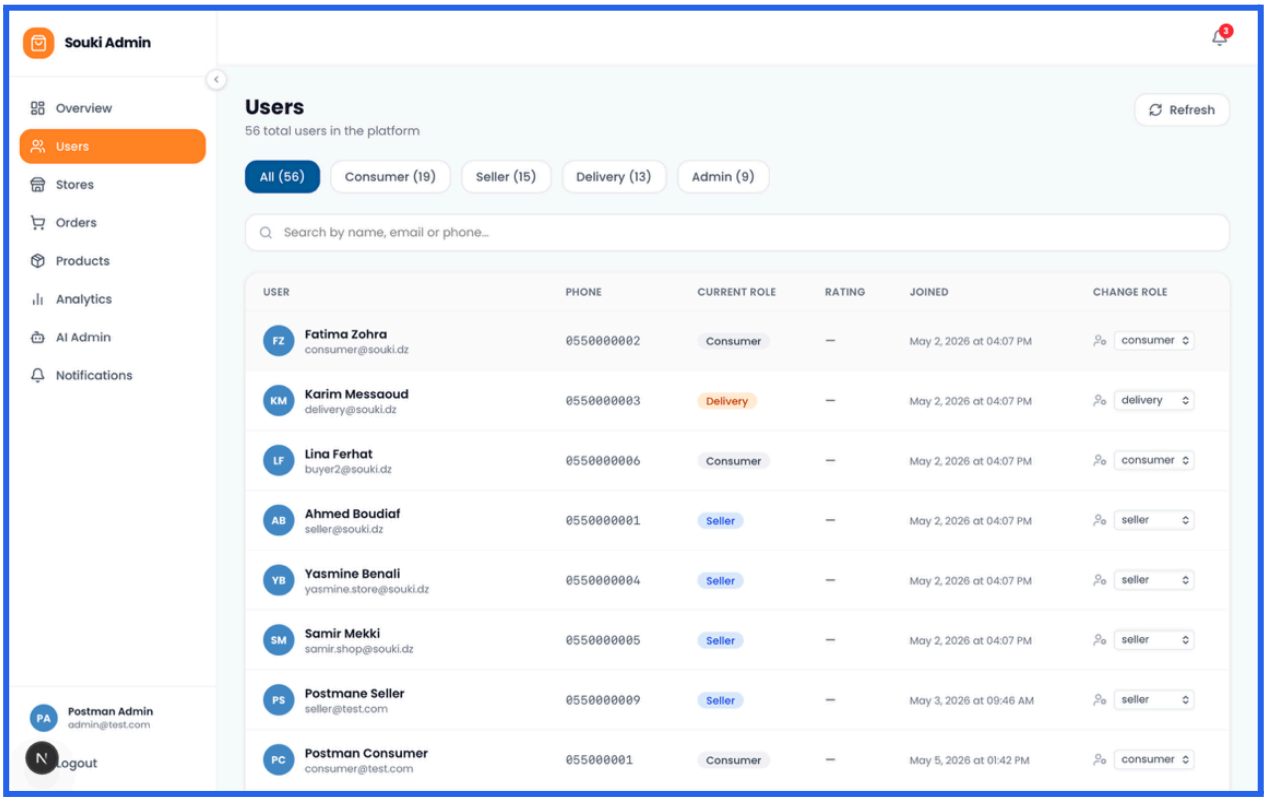

Fig. 3.20: Administrative User Management Interface.

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Store Moderation:

The Stores panel offers centralized oversight of all vendor storefronts. Administrators can track store status (Open/Closed), default delivery fees, and creation dates. This interface includes actionable buttons to manually grant or remove "Premium" status, allowing fine grained control over store privileges and platform monetization.

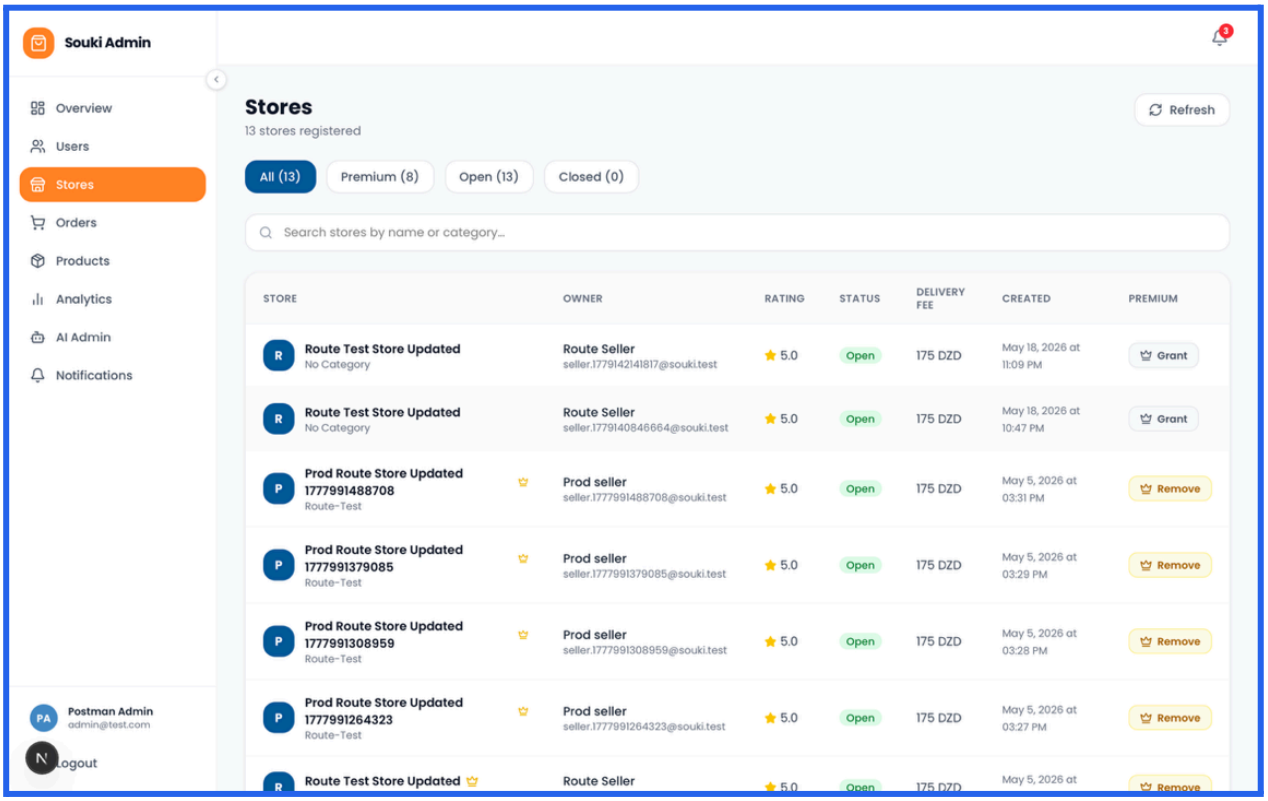

Fig. 3.21: Store Moderation and Premium Tier Management.

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Broadcast Notifications:

The system includes a Broadcast Notifications module that empowers administrators to dispatch platform wide or targeted alerts. Using Firebase Cloud Messaging, admins can send custom titles and messages to specific audience segments (e.g., All Users, Delivery Riders, Sellers, Consumers) to announce maintenance, updates, or promotions. An inbox view tracks previously dispatched alerts.

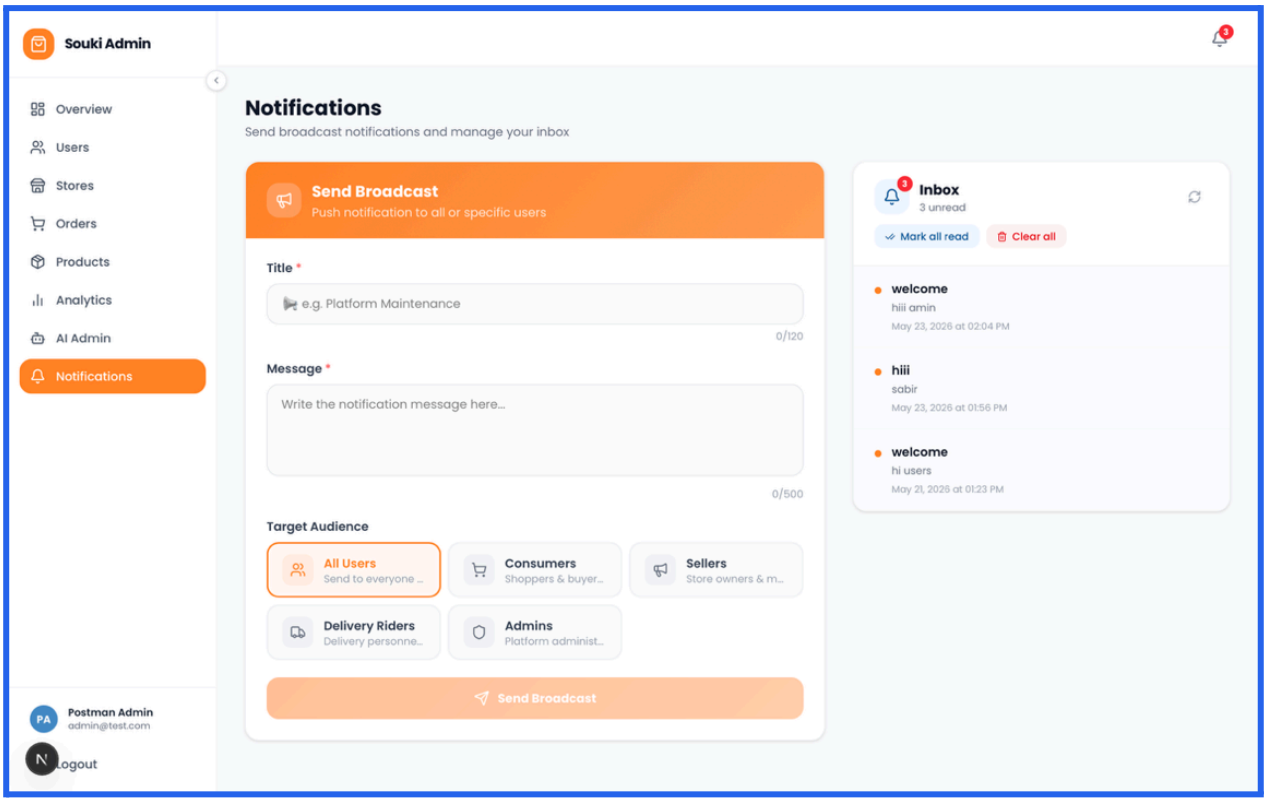

Fig. 3.22: Broadcast Notification Management Tool.

CONCLUSION

In conclusion, this chapter has provided an overview of the technologies and tools used in the development, deployment, and maintenance of our system. We have detailed the development environment, the back end and front end stacks, and various deployment, authentication,
and image storage services. Additionally, we have introduced the user interfaces for both
end users and administrators, highlighting key features and functionaliti

CHAPTER FOUR

Business and Entrepreneurial Study

PART 1 MARKET STUDY

INTRODUCTION

Building a product that works technically is only half the challenge. The other half is understanding the market well enough to know whether the product can sustain itself commercially and grow into something lasting. This part examines the environment in which Souki operates: the political, economic, social, and technological forces that shape the Algerian digital economy; the specific segments that the platform targets; and the competitive landscape it must navigate. The analysis draws on publicly available data from Algerian regulatory bodies, the Office National des Statistiques, and market research sources to ground the assessment in verifiable figures rather than assumptions.

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1. PESTEL ANALYSIS

1.1. Political

The Algerian government has designated the digital economy as a national development priority. The Startup Algeria initiative, of which this project is a part through the Startup 1275 programme, represents a concrete institutional commitment to supporting technology ventures built by Algerian students and entrepreneurs. The Ministry of Knowledge Economy has formalized a regulatory framework for e commerce through Law 18 05, establishing the legal basis for electronic transactions, consumer rights in digital commerce, and seller obligations. The fintech ecosystem has also opened progressively: Algerie Poste has extended its CCP mobile payment service to allow third party application integration, which provides Souki with an accessible payment channel without requiring users to hold conventional bank cards.

On the risk side, data protection obligations under Law 18 07 require explicit user consent for personal data collection and impose data localisation requirements for sensitive categories.

Any platform operating at scale must budget for compliance overhead, particularly as the regulatory environment is still maturing and may introduce additional requirements in the medium term.

1.2. Economic

Algeria is the largest economy in North Africa by nominal GDP, estimated at approximately USD 240 billion in 2023. The country's GDP per capita, around USD 3,800, places it in the lower middle income bracket, but this aggregate obscures significant urban purchasing power, particularly in Algiers, Oran, Constantine, Sétif, and Annaba. The informal economy is estimated to account for 40 to 50 percent of total economic activity, and it is precisely this segment local sellers operating outside formal digital infrastructure that represents Souki's primary supply side.

Cash on delivery remains the dominant transaction method in Algerian e commerce, accounting for over 90 percent of orders on most existing platforms. This is a critical design constraint that Souki turns into an advantage: because the platform does not require buyers to hold bank cards or digital wallets, the accessible market is far larger than card based payment platforms can reach. Souki's monetisation model is also specifically designed for this environment revenue comes from seller and delivery worker subscriptions, not from transaction commissions that would require payment infrastructure the market does not yet support uniformly.

1.3. Social

Algeria has a young and mobile first population. The median age is approximately 29 years, and smartphone penetration has reached roughly 65 percent of the population, with the highest usage concentrated in the 18 to 40 age cohort. WhatsApp and Facebook are the dominant social platforms, with active daily usage rates among the highest in the Arab world. This social media intensity is directly relevant to Souki's deep link commerce model: the mechanism only generates value if sellers have active social audiences to share with, and the data confirms they do.

Local commerce culture in Algeria is built on familiarity and trust people prefer to buy from sellers they know, or from sellers who have been recommended by someone they trust. Souki's buyer reliability scoring system and seller verification badge are deliberately designed to

translate this cultural expectation into a digital signal, making a previously invisible reputation legible within the platform.

1.4. Technological

4G LTE coverage now extends to most of Algeria's 58 wilayas, and fibre optic infrastructure is expanding in major urban centres. Mobile data costs have decreased significantly following competition between the three main operators: Mobilis, Djezzy, and Ooredoo. These conditions make a mobile first platform viable at scale without requiring users to have home broadband access. The CLIP powered visual search system is particularly well suited to this context: it allows users to search by photographing an object rather than typing a product name in French or Standard Arabic, which many users are not comfortable doing in formal written language.

The main technological constraint is the absence of mature payment infrastructure for online merchants. Souki addresses this by keeping buyer side transactions off platform in the initial phase, relying on cash on delivery. Seller subscription payments can be collected through bank transfer, CCP mobile, or in person payment through a city representative a model that several Algerian SaaS businesses already use successfully.

1.5. Environmental

Environmental considerations are not a primary driver of short term platform dynamics, but they do present a positive narrative. By enabling local delivery from nearby stores rather than centralized warehouses, Souki reduces the average distance travelled per order and the associated carbon footprint. This is relevant both for government partnership discussions and for the platform's positioning within the Startup Algeria programme, which increasingly emphasizes sustainable impact alongside economic metrics.

1.6. Legal

The platform operates within the legal framework established by Law 18 05 on electronic commerce and Law 18 07 on personal data protection. The seller verification badge aligns with Law 18 05 requirements for seller identity disclosure in digital transactions. JWT based authentication and bcrypt password hashing satisfy the security obligations of Law 18 07. The driver atomic claim system and order lifecycle state machine ensure that transaction records are complete and auditable in the event of a dispute.

2. MARKET SEGMENTATION AND TARGET MARKET

Souki operates across three distinct user segments, each with different adoption drivers, value expectations, and willingness to pay. Understanding the characteristics of each segment is essential for designing effective onboarding flows, pricing structures, and retention mechanisms.

Table 4.1: Market Segmentation by User Type.

Segment	Profile	Estimated Size	Primary Adoption Driver
Consumers	Urban, 18 45, smartphone users, buying from local stores	~8 million potential users	Lower friction, proximity discovery, trusted sellers
Sellers	SMEs, artisans, local shops active on social media	>3 million formal/informal traders	Fake order protection, social commerce, analytics
Delivery Workers	Independent, 20 35, motorbike owners	~50,000 in target cities	Structured task income, premium visibility tools

3. TOTAL ADDRESSABLE MARKET (TAM / SAM / SOM)

Market sizing follows the top down approach, starting from the total Algerian digital commerce and advertising market and narrowing progressively to Souki's realistic capture over a five year horizon.

Table 4.2: TAM / SAM / SOM Analysis.

Market Level	Definition	Estimated Value (DZD)
TAM Total Addressable Market	Total Algerian digital commerce and digital advertising market, including all platforms and categories	~70 billion DZD/year

SAM Serviceable Addressable Market	Mobile first marketplace segment, multi city, SME sellers, local delivery integration	~11 17 billion DZD/year
SOM Serviceable Obtainable Market	Souki's realistic 5 year capture, based on 60 cities and modelled subscriber volumes	~638 million DZD (Year 5)

4. PORTER'S FIVE FORCES

Porter's Five Forces framework is used to assess the competitive intensity of the market Souki enters and to identify where the platform's structural advantages are most durable.

Table 4.3: Porter's Five Forces Analysis.

Force	Assessment	Strategic Implication
Threat of New Entrants	Moderate software development is accessible, but network effects create barriers once a city reaches critical mass	Build seller density in pilot cities as fast as possible to create switching costs
Bargaining Power of Sellers	Moderate sellers can use Ouedkniss or direct Instagram, but Souki offers unique value unavailable elsewhere	Free tier (50 products) ensures low barrier to entry and reduces switching incentive
Bargaining Power of Consumers	Low to moderate consumers have platform alternatives but low loyalty to any single one	Buyer reliability score and seamless deep link experience create measurable stickiness
Threat of Substitutes	Moderate WhatsApp commerce and Ouedkniss remain viable alternatives for basic transactions	Deep links make Souki the conversion layer on top of social media rather than a competitor to it
Competitive Rivalry	Currently low in targeted segment no direct competitor combines all three core innovations	First mover advantage window is open; prioritize city by city lock in before well funded entrants appear

5. SWOT ANALYSIS

Table 4.4: SWOT Analysis.

	Positive	Negative
Internal	Strengths: founder developers (zero outsourcing cost), unique buyer reliability score, asset light model, deep link virality, low CAPEX, full ownership of codebase	Weaknesses: no existing user base, two person team, MVP not yet commercially launched, no brand recognition
External	Opportunities: fast growing e commerce market, Startup Algeria digital agenda, 60 city expansion potential, Yassir validated delivery worker pool, no direct competitor combining all three innovations	Threats: regulatory uncertainty in digital commerce, incumbent platforms with brand recognition, economic volatility, risk of well funded new entrant copying the model

6. GO TO MARKET STRATEGY

The launch strategy is built around a city by city rollout starting in five pilot cities: Setif, Algiers, Oran, Constantine, and Annaba. These cities were selected for their commercial density, smartphone penetration, and our pre existing networks among local merchants. Rather than attempting national coverage immediately, concentrating resources in five cities allows us to achieve the seller density required to make the geo boost slots commercially attractive within the first six months.

The initial acquisition effort focuses entirely on sellers, not consumers. This is a deliberate inversion of the typical marketplace launch playbook. A seller who joins Souki and lists their products immediately begins promoting those products on WhatsApp and Facebook through deep links. Every click from a non user is an app install prompt. This makes sellers the primary acquisition channel for consumers at zero marginal cost to the platform. The target for

the first six months post launch is 500 sellers and 200 active delivery workers across the five pilot cities.

Revenue activation begins once seller density within each city reaches the threshold that makes the boost slot auction competitive. Below this threshold, boost slots are offered at the minimum price floor. Above it, competitive bidding drives the average slot price higher and makes the boost service meaningfully valuable for sellers who are investing in their digital visibility.

CONCLUSION

The market analysis confirms that the conditions for Souki's commercial launch are structurally favourable. Algeria's growing digital economy, the significant underservice of its SME seller segment, and the demonstrable absence of any competitor addressing the combination of trust mechanisms, social commerce infrastructure, and local advertising create a clear opening. The financial case for this market position is developed in Part 2.

PART 2 BUSINESS MODEL AND FINANCIAL PLAN

INTRODUCTION

Part 2 translates the market opportunity identified in Part 1 into a structured business model and five year financial projection. It begins with the Business Model Canvas, which provides a concise summary of how Souki creates, delivers, and captures value. The chapter then details each revenue stream with its underlying unit economics and assumptions, presents the resulting income and cost projections, and closes with a risk matrix and a deployment roadmap.

1. STARTUP PRESENTATION

Table 4.5: Souki Startup Identity Sheet.

Field	Detail
Project Name	Souki Local Algerian Marketplace
Founders	Islam Debbi and Brahimi Karim
University	Universite Mohamed Boudiaf, M'sila
Programme	Startup 1275, Faculty of Mathematics and Computer Science
Technology	Flutter + Node.js/Express + MongoDB + Docker
Development Stage	MVP in active development
Planned Launch	5 pilot cities: Setif, Algiers, Oran, Constantine, Annaba
Legal Structure	EURL (to be incorporated upon commercial launch)

2. BUSINESS MODEL CANVAS

Key Partners

Souki's key partner network includes local seller communities and wilaya level market associations, which allow us to onboard over 200 sellers per week in each new city without paid

advertising. Google provides the Maps API, Firebase notification infrastructure, and the Play Store distribution channel. Apple provides the App Store channel. Telecom operators Mobilis, Djezzy, and Ooredoo partner for OTP based phone verification. Algerie Poste provides one of the subscription payment collection channels for sellers operating outside the banking system.

Key Activities

The three core operational activities are: daily seller acquisition, which drives all other growth because each new seller brings their existing customer base; continuous platform development and maintenance, ensuring the delivery pipeline, buyer score engine, and boost system run reliably; and managing the city level boost slot calendar, which is the primary revenue generating mechanism from Year 1.

Key Resources

The founding team is the most important resource. Both founders are the platform's developers, which eliminates technical outsourcing costs entirely and allows for rapid iteration. Additional resources include the codebase and its deployment infrastructure, a small local office in Setif, and a first year marketing budget allocated specifically for city launch campaigns.

Value Propositions

For sellers: the buyer reliability score directly addresses the fake order problem that is the most cited barrier to digital selling in Algeria. The deep link mechanism makes their existing social media audience actionable for in app purchases. The geo boost service gives them a city targeted advertising option that national platforms structurally cannot offer.

For consumers: a geographically relevant local marketplace where sellers are verified and products are from nearby stores. Deep links eliminate navigation friction, making the path from a WhatsApp forward to a completed order a single tap. For delivery workers: a structured daily task pipeline with a freemium to premium upgrade path that rewards commitment and consistency.

Revenue Streams

Four distinct streams, each targeting a different actor and a different willingness to pay. They are described in full in Section 3.

Cost Structure

The cost structure is predominantly fixed in the early stage: office rent and founder compensation are the largest recurring items. Variable costs Firebase, Google Maps API, cloud hosting, SMS/OTP charges scale with user volume but represent a structurally small fraction of revenue once the platform reaches city level operating scale. Marketing is treated as a growth investment rather than a running cost, with spending concentrated around each new city launch.

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3. REVENUE MODEL

Souki generates revenue through four independent streams, each designed to align pricing with the value delivered to each user type. All prices are set at the minimum threshold specified in the project requirements; increases are planned after the first six to twelve months once sufficient user base density justifies them.

3.1. Stream 1 Geo Targeted Product Boost

When a seller wants to boost their product to increase visibility, they must pay a daily rate. Each day has its own price, which fluctuates between 400 to 2000 DZD depending on demand and city size. Algeria has over 60 cities, and our operational model targets more than 20 highly active commercial hubs. Each of these active cities can sustain at least 10 boosted products per day. The slot allocation algorithm assigns the top-scoring bids each night for the following day, scoring each bid on a combination of bid amount, seller reliability score, and product category relevance to current city search patterns. The ramp is modelled conservatively: 5 active cities in Year 1, scaling to 60 cities with an average fill rate of 90 percent by Year 5.

3.2. Stream 2 Store Validation Badge and Review Feature

Sellers pay 2,000 DZD per month to activate their store's verified badge and unlock the customer review module. The badge signals to consumers that the seller's identity and store

location have been confirmed by the platform, directly addressing the trust deficit identified in Chapter One. This stream is highly predictable once activated: sellers who subscribe are commercially

motivated to retain the badge because losing it visibly downgrades their store in consumer perception. Projected churn is below 20 percent annually.

3.3. Stream 3 Extra Delivery Task Blocks

Delivery workers on the free tier receive five task assignments per day at no cost. Beyond this threshold, additional blocks of five tasks are priced at 50 DZD per block, equivalent to 10 DZD per task. Workers who need more than fifteen tasks per day purchase additional blocks at the same unit rate. This stream scales linearly with the number of active delivery workers and benefits from the validated pool of over 15,000 independent delivery workers already operating on existing platforms in Algeria.

3.4. Stream 4 Premium Delivery Subscription

For 2,000 DZD per month, delivery workers unlock the Premium tier, which includes simultaneous multitask mode, a verified worker badge visible on their public profile, and direct in app callability from consumers. The Premium tier targets workers who use Souki as their primary income source and for whom the additional earning potential from multitasking and direct consumer access represents a clear return on investment relative to the subscription cost.

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4. FIVE YEAR FINANCIAL PROJECTIONS

The following projections are based on conservative ramp assumptions. Year 1 includes six months of development (zero revenue) followed by six months of commercial operations starting in five pilot cities. All figures are in Algerian Dinars (DZD). Costs include direct cloud and API costs, payroll for the founding team and progressively hired staff, and operating expenses including rent, marketing, and legal fees.

Table 4.6: Five Year Financial Summary (DZD).

Indicator	Year 1	Year 2	Year 3	Year 4	Year 5
Product Boost Revenue	2,700,000	27,375,000	89,425,000	146,000,000	197,100,000
Store Validation Revenue	1,800,000	12,000,000	36,000,000	72,000,000	120,000,000

Extra Delivery Tasks	1,500,000	14,400,000	60,000,000	150,000,000	225,000,000
Premium Delivery	600,000	4,800,000	19,200,000	48,000,000	96,000,000
TOTAL REVENUE	6,600,000	58,575,000	204,625,000	416,000,000	638,100,000
Total Direct Costs	380,000	930,000	2,200,000	4,560,000	6,960,000
Gross Profit	6,220,000	57,645,000	202,425,000	411,440,000	631,140,000
Payroll	1,373,040	2,746,080	7,028,640	12,481,920	19,296,000
Operating Expenses	1,153,000	2,317,000	5,622,000	10,746,000	16,952,000
EBITDA	3,693,960	52,581,920	189,774,360	388,212,080	594,892,000
EBITDA Margin	56.0%	89.8%	92.7%	93.3%	93.2%
Net Profit (after tax)	2,649,646	38,910,621	140,433,026	287,277,139	440,420,480

The high EBITDA margins from Year 2 onward are characteristic of software based marketplace businesses: the infrastructure cost of adding a new city is near zero, and each new seller and delivery worker subscriber is pure incremental revenue against a largely fixed cost base. The main cost growth drivers are marketing spending for city expansion campaigns and payroll as the team scales to support an increasingly large user base across multiple cities.

The initial capital requirement is 384,700 DZD, covering hardware, developer accounts, and office setup. This is recovered within the first two months of revenue operations. The platform reaches positive cumulative cash flow well within Year 1, making external funding optional rather than essential for the initial phase of the business.

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5. RISK ANALYSIS

Table 4.7: Risk Matrix.

Risk	Probability	Impact	Mitigation
Low seller adoption in pilot cities	Medium	High	Personal network onboarding in Month 1; first 50 products free; seller referral incentive programme

High delivery worker churn	Medium	Medium	Free tier ensures zero financial barrier to entry; premium ROI is clear for high volume workers
Regulatory change on digital commerce	Low	High	Legal review before commercial launch; EURL incorporation; ongoing compliance monitoring
Technical scalability at rapid growth	Low Medium	Medium	Stateless Node.js API supports horizontal scaling; MongoDB Atlas auto scaling; Docker based deployment
Competition from well funded new entrant	Low (Y1 Y2)	High	Build city level network effects fast; deep link attribution creates seller switching cost
Cash on delivery fraud (buyer side)	Medium	Medium	Buyer reliability score is the primary mitigation; score threshold can be raised per seller

6. DEPLOYMENT ROADMAP

Table 4.8: Platform Deployment Roadmap.

Period	Milestone	Target KPIs
Months 1 2	MVP core: authentication, product listing, order lifecycle, buyer score display on Android	Internal testing; 0 commercial users
Months 3 4	Deep link system (Android), seller dashboard, delivery task system (free tier), payment flow	50 beta sellers in Setif
Months 5 6	Geo boost engine, premium delivery subscription, iOS Universal Links, App Store and Play Store submission	App approved and live on both stores
Month 7	Commercial launch: Setif, Algiers, Oran, Constantine, Annaba	500 sellers, 200 delivery workers, 1,000 consumers
Months 8 12	Expand to 15 cities; activate all revenue streams; begin nightly boost allocation	1,500 sellers, 600 delivery workers, 50+ paying boosters
Year 2	35 cities; hire 3 additional team members; 1,500 validated sellers, 800 premium delivery workers	Monthly revenue > 4.5M DZD

Years 3 5	60 cities; full national coverage; B2B feature introduction; potential Series A fundraising	Revenue > 200M DZD/year

CONCLUSION

The business model and financial analysis demonstrate that Souki is economically viable, with a capital requirement that is unusually low for a multi city marketplace platform, a clear path to profitability within the first year of operations, and a revenue structure that scales efficiently as the platform expands geographically. The four revenue streams are independent: a seller who does not use the boost service still generates revenue through store validation, and a delivery worker who does not subscribe to premium still generates revenue through extra task purchases. This independence makes the model resilient to slow adoption in any one monetization channel.

Taken together, the technical work described in Chapters One through Three and the business study presented in this chapter make the case for Souki as both a sound engineering project and a commercially viable startup. The platform addresses a real and measurable problem in a growing market, uses technically grounded innovations to solve it, and has a financial model that rewards successful execution without requiring large upfront investment. The work remaining before commercial launch is substantial but well defined.

GENERAL CONCLUSION

This project set out to build a mobile marketplace that actually fits how local commerce works in Algeria geolocation first, language flexible, and integrated end to end. The result is Souki, a platform that connects consumers, local sellers, and delivery drivers within a single system.

Chapter One mapped the problem. Local trade in Algeria still runs mostly through physical stores, word of mouth, and Facebook groups. Existing platforms either ignore proximity entirely or lack the tools small sellers actually need. That gap shaped every design decision that followed.

Chapter Two translated those requirements into a concrete architecture. Six data entities, four actor roles, a layered back end, and a role specific Flutter application. The order lifecycle state machine with atomic stock reservation, push notifications at every transition, and a delivery claim mechanism that prevents two drivers from grabbing the same task came out of that design work.

Chapter Three covered what was actually built. The stack Node.js, MongoDB, Redis, Flutter was chosen deliberately for a geospatial and AI heavy workload. The most technically interesting piece is the visual search pipeline: CLIP encodes every product image into a 512 dimensional vector, and at query time a hybrid of cosine similarity and BM25 text scoring, fused through Reciprocal Rank Fusion, returns ranked results in under 300 milliseconds. A user can photograph any object and find it nearby, no text required.

The platform is deployed and functional. That said, some things are worth improving. Embedding generation is currently synchronous; moving it to an async worker queue would make product uploads faster and more resilient. Payment is cash on delivery only integrating BaridiMob or CIB would be a meaningful next step for the Algerian market. And a recommendation layer built on purchase history would make product discovery smarter over time.

Overall, Souki shows that thoughtful engineering not just building features, but choosing the right data model, the right concurrency primitives, and the right AI pipeline can turn a real local problem into a working product.

References

[1] UNCTAD, "Algeria: eTrade Readiness Assessment." [Online]. Available: https://unctad.org/publication/algeria-etrade-readiness-assessment

[2] Ouedkniss, "Online Classifieds Platform," [Online]. Available: https://www.ouedkniss.com

[3] GeoCLIP Paper: "Title of Paper," in NeurIPS, 2023. [Online]. Available: https://proceedings.neurips.cc/paper_files/paper/2023/file/1b57aaddf85ab01a2445a79c9edc1f4b-Paper-Conference.pdf

[4] Shop The Look: "Shop the Look: Building a Large-Scale Visual Shopping System at Pinterest." [Online]. Available: https://scispace.com/papers/shop-the-look-building-a-large-scale-visual-shopping-system-1pyro4lo35

[5] A. Dosovitskiy, L. Beyer, A. Kolesnikov, et al., "An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale," in Proc. Int. Conf. Learn. Representations (ICLR), 2021.

[6] OpenAI, "CLIP — Contrastive Language–Image Pre-training," GitHub repository. [Online]. Available: https://github.com/openai/CLIP

[7] G. V. Cormack, C. L. A. Clarke, and S. Büttcher, "Reciprocal Rank Fusion Outperforms Condorcet and Individual Rank Learning Methods," in Proc. 32nd Int. ACM SIGIR Conf., Jul. 2009, pp. 758–759.

[8] MongoDB Inc., "Geospatial Queries and Atlas Vector Search — MongoDB Manual." [Online]. Available: https://www.mongodb.com/docs/