

BioBrief: Food Scanner

Executive Summary

The contemporary food landscape in Romania is characterized by a critical dichotomy: while consumers have access to an unprecedented variety of domestic and imported food products, they simultaneously face a crisis of nutritional transparency. As the volume of imported packaged foods reaches historic highs—exceeding €11 billion in 2024—the Romanian consumer is increasingly alienated from the origins and composition of their diet. This alienation is compounded by a pervasive, culturally specific anxiety regarding food additives (colloquially known as "E-uri") and a rising public health burden of diet-related non-communicable diseases.

The primary problem facing the target user is the fundamental opacity of modern food products. While EU regulations mandate the listing of ingredients, they do not mandate *clarity*. A product may list "Mechanically Separated Meat," "Sodium Nitrite," and "Polyphosphates," but the average consumer cannot instantly synthesize this list to determine the long-term health impact.

This phenomenon creates a "Black Box" effect. The consumer sees the package—often designed with bright colors, pastoral imagery, and health claims like "Natural" or "Whole Grain"—but remains ignorant of the nutritional reality inside. This disconnect is particularly dangerous in the context of Ultra-Processed Foods (UPFs). Research indicates that UPFs are hyper-palatable, energy-dense, and nutrient-poor, contributing significantly to the obesity epidemic. In Romania, where childhood obesity is a growing concern, the inability to identify UPFs quickly is a public health failure.

The value proposition of BioBrief is rooted in a deep understanding of the friction points within the modern food environment. These problems are multifaceted, ranging from cognitive overload to infrastructural limitations. To address the "Black Box" of nutrition, BioBrief has built a robust technological ecosystem that functions as a layer of augmented intelligence over the physical product. The solution is not just "scanning"; it is the synthesis of identification, interpretation, and recommendation.

The application employs a multi-modal approach to identifying products, ensuring that users are never left without data. Having multiple scan options, ranging from AI Augmented label scanning to barcode scanning and offline fallbacks, the application does not fail to scan products in any environment.

The user base has scaled to over 100,000 Monthly Active Users (MAU) and 250,000 downloads, driven by three primary personas: the "Bio-Protector Parent" seeking to shield children from allergens and additives; the "Lifestyle Optimizer" utilizing data for caloric and

macronutrient precision; and the "Medical Manager" navigating specific dietary pathologies.

The application delivers immediate value by reducing the time required for label analysis from minutes to seconds, effectively "nudging" users toward healthier choices through color-coded choice architecture. Long-term, the aggregation of such consumer power has the potential to force market reformulation, as manufacturers respond to the collective rejection of products with poor nutritional scores. The platform's success, driven by a solo developer using a hybrid cloud strategy and influencer-based growth ("Premium for Creators"), presents a sustainable model for digital health innovation in emerging markets.

Problem Statement

The fundamental problem that BioBrief addresses is the cognitive friction associated with healthy eating in an industrial food environment. This friction manifests at three distinct stages of the consumer journey: Identification, Interpretation, and Action.

The primary hurdle is the opacity of the food label. Manufacturers utilize "clean labeling" strategies to obscure the true nature of their products, using alternative names for sugar (dextrose, maltodextrin, barley malt syrup) or grouping additives under broad categories.⁸ For a Romanian consumer, particularly one managing a condition like diabetes, hypertension, or gluten intolerance, this opacity is dangerous. The mental effort required to scan a list of 30 ingredients, identify potential threats, and recall their specific health impacts is cognitively prohibitive during a routine shopping trip. The problem is exacerbated by the physical nature of labels: often printed in microscopic fonts, wrapped around crinkled packaging, or covered by promotional stickers.

Global competitors typically rely on EAN/UPC databases. If a barcode exists in the database, the user gets a result. If it does not (which is common for local Romanian brands, "house brands" of supermarkets, or artisanal products), the user hits a dead end. This "database dependency" is a major point of failure. These apps require perfect barcodes and perfect internet—luxuries often absent in the Romanian retail reality. Institutional apps require bureaucratic logins and lack lifestyle integration.

The market is segmented into the Global Giant (Yuka), the Institutional Authority (InfoCons), and Niche Competitors (NutriSmart).

Table 1 Comparison between food scanning applications

Feature Dimension	BioBrief	Yuka	InfoCons	NutriSmart
Primary Input	Barcode + OCR	Barcode Only	Barcode + QR	Barcode Only

Mechanism	(Text Scan)			
Offline Capability	Full Offline (Core Architecture)	Paid Tier Only	Requires Internet	Partial
Database Coverage	Optimized for Romanian Local Brands	Global (Gaps in RO)	Global/EU Safety Data	Global/Mixed
Generative AI	Fridge-to-Recipe Generation	None	None	None
User Onboarding	Frictionless (No mandatory login)	Frictionless	High Friction (Login Required)	Frictionless
Primary Value Prop	"Cook & Eat Healthy" (Lifestyle)	"Buy Healthy" (Shopping)	"Buy Safe" (Compliance)	"Avoid Allergens" (Medical)
Pricing Model	Freemium + Ad-supported	Freemium	Donation/NGO	Freemium

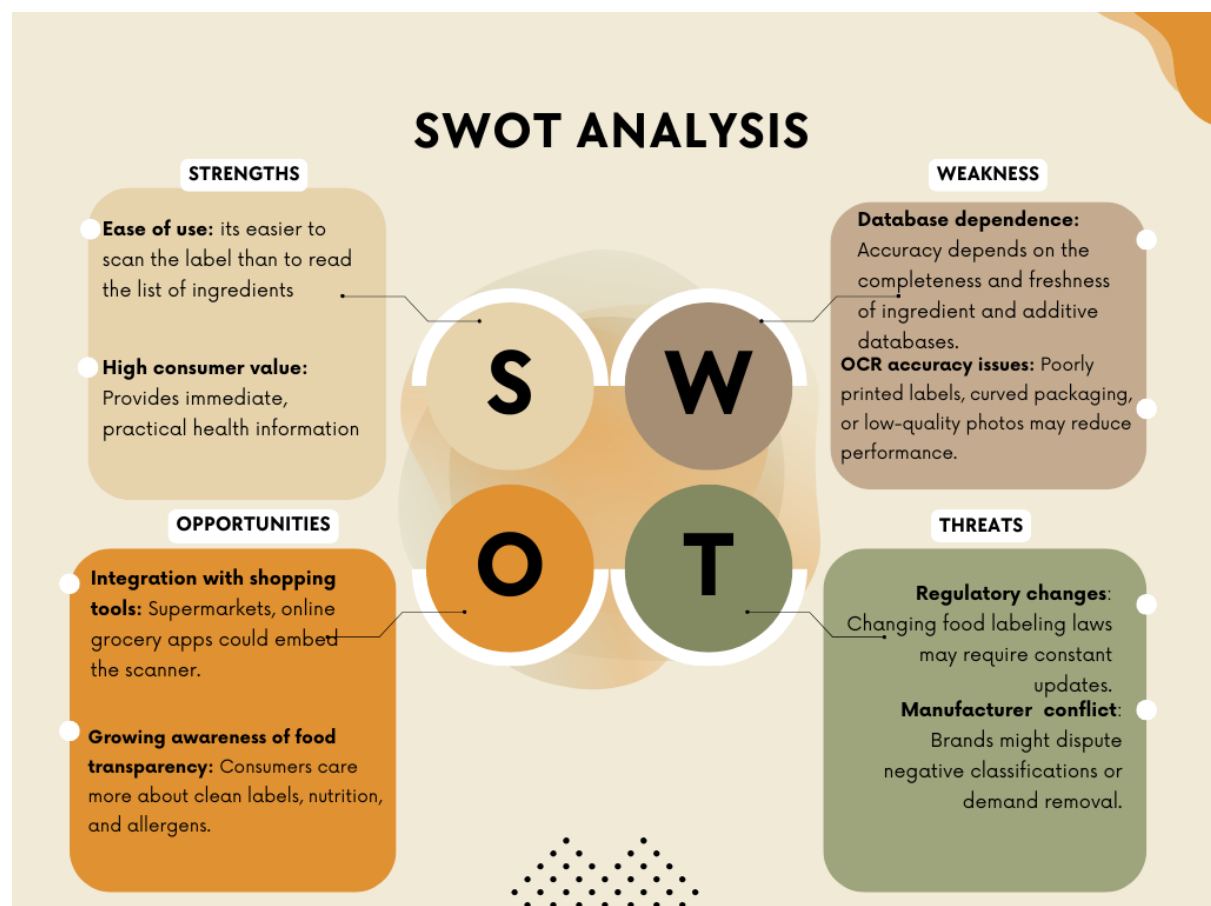


Figure 1 SWOT Analysis Food Scanner

Public surveys

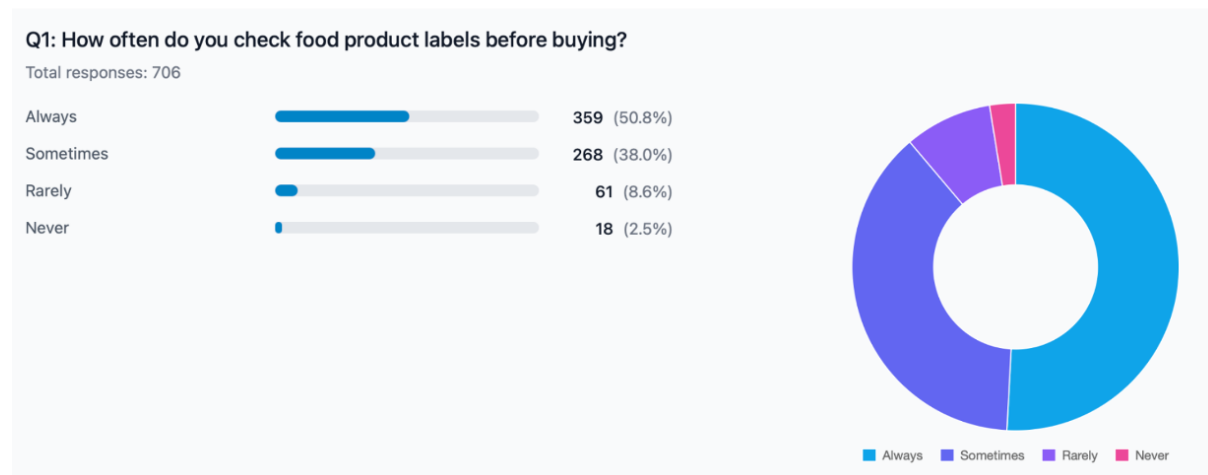


Figure 2 Food Scanner - Survey Q1

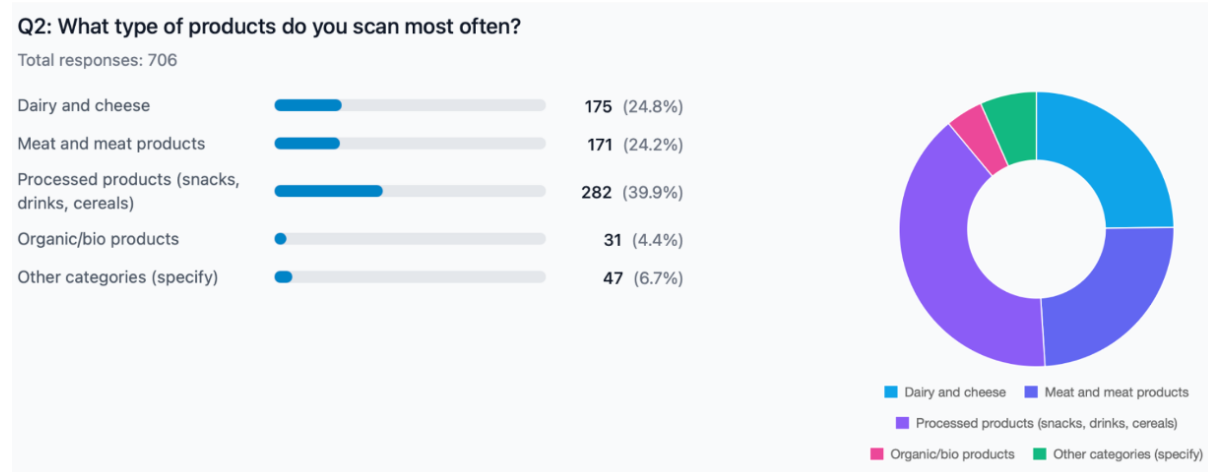


Figure 3 Food Scanner - Survey Q2

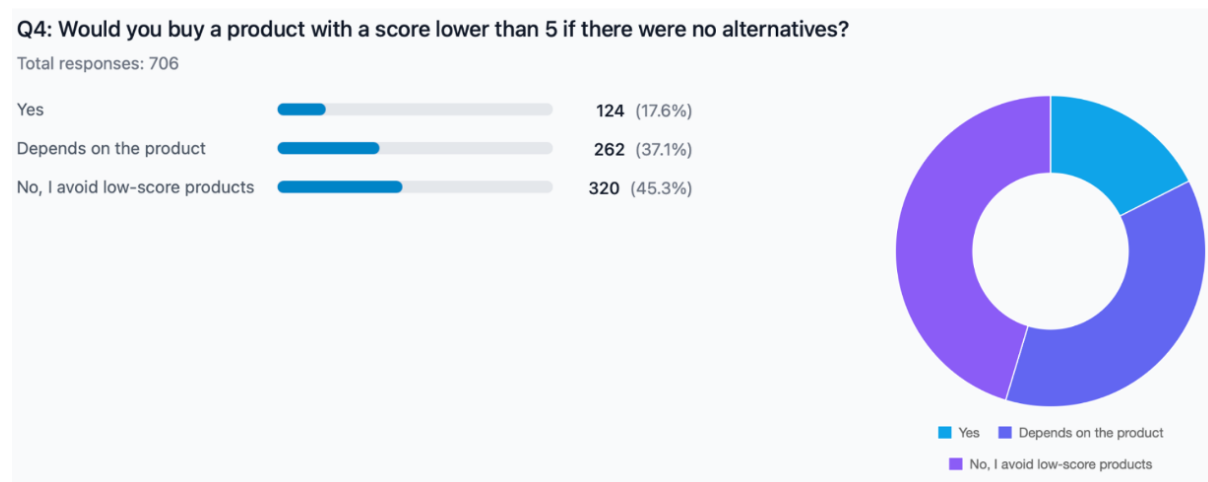


Figure 4 Food Scanner - Survey Q4

Proposed Solution

The application, BioBrief (BioBrief: Food Scanner), serves as a sophisticated bio-analytical tool for digital food transparency. What the System Does

The app utilizes a "hybrid" ingestion engine to provide real-time health risk assessments for food products:

- **Data Ingestion:** Users scan a product label using a quad-modal input system, primarily Barcode Scan (Mode 1) for deterministic lookup from a database and Optical Character Recognition (OCR) (Mode 2: Label Scanner) for raw text extraction and Natural Language Parsing of ingredient lists. A separate Nutritional Table Scanner (Mode 3) digitizes macro-nutrient values.
- **Identification and Analysis:** The app cross-references the scanned information (ingredients, additives, nutritional values) against a health ontology, which is likely based on bodies like the European Food Safety Authority (EFSA). It decodes complex chemical names and E-numbers into human-readable information.
- **Risk/Warning Rating:** It generates a color-coded "Risk/Warning Rating" to provide instantaneous feedback. This is a composite score weighted by Nutritional Density (e.g., fiber, protein vs. sugar, saturated fat) and the presence of high-risk Additives and Processing Level (e.g., ultra-processed markers).

Key Features

- **Label Scanning (OCR + Barcode):** The Hybrid (Barcode + OCR) core technology is the app's main competitive edge, ensuring coverage even for local or new products not yet indexed in global barcode databases, thus addressing the "Cold Start" problem. The app also features a Full Offline Mode for reliability in low-signal environments like supermarkets.
- **Allergen Detection (based on user profile):** This critical safety feature allows users to create a dynamic profile of sensitivities (e.g., Gluten, Peanuts). When a product is scanned, the ingredient list is cross-referenced against this profile, and a critical warning is issued if an allergen is detected, overriding the general health score.
- **Ingredient Explanations:** The app decodes regulatory codes into "Ingredient Explanations," translating complex E-numbers and chemical names into understandable risk assessments for the user.
- **Historical Tracking (recent scans, favorites):** The "History of scanned foods" feature retains a dietary audit trail, allowing users to review their consumption patterns over time and enabling the app to provide longitudinal behavioral analysis and integrate with the Calorie Calculator.
- **Generative AI:** An additional key feature is "Recipe Magic: Scan to Create," which uses computer vision to identify raw ingredients photographed by the user and feeds them into a Large Language Model (LLM) to generate healthy, personalized recipes that avoid the user's specific allergens. This transforms the app from a passive scanner into an active lifestyle planner.

Target Audience & Market Opportunity

To accurately define the market opportunity and target audience for BioBrief, one must first dissect the epidemiological and economic backdrop of Romania. The demand for food scanning technologies is a direct derivative of the widening gap between the modern food supply chain and the biological realities of the population.

The market opportunity is driven by a "perfect storm" of public health crises in Romania, including high rates of obesity (over 38% of adults), a diabetes epidemic (1.3 million adults affected), and a rising prevalence of food allergies.

The relevant industry segment, Digital Fitness & Well-Being in Romania, is valued at approximately US\$228.60 million. The high-need Serviceable Available Market (SAM), consisting of adults with diabetes and obesity, is roughly 4.3 million individuals.

User Segments

- The "Vigilant Guardian" (Parents): Primarily focused on food safety and auditing nutritional value for children due to high anxiety regarding additives and allergies.
- The "Medical Manager" (Chronic Condition Management): Necessity-driven users, such as the 1.3 million diabetics, who rely on the app for survival metrics like sugar content and glycemic load to manage their condition.
- The "Holistic Optimizer" (Gen Z & Millennials): Urban, digitally literate users interested in "clean eating," gut health, and transparency, looking to avoid specific "bad" E-numbers and ultra-processed foods (UPFs).
- The "Dietary Restriction Navigator" (Vegans/Intolerant): Niche users who require 100% accuracy in rapidly identifying hidden animal products or allergens (like gluten/lactose) for ethical or health reasons.

Competitive Advantage

- AI-Based Recognition (OCR/Zero-Day Utility): Unlike competitors that rely primarily on barcodes and pre-existing databases, BioBrief uses Artificial Intelligence for Optical Character Recognition (OCR). Its Label Scanner can photograph and parse ingredient lists directly, correcting for glare and curvature. This grants "Zero-Day" utility, meaning it works instantly on any product with text, even newly launched or local brands not yet indexed in a global database.
- Database Accuracy and Independence: The app is explicitly marketed as an "Independent project," which fosters trust among a skeptical consumer base concerned about corporate food manufacturing influence. It employs a Hybrid Database Strategy, integrating global data from ecosystems like Open Food Facts with a proprietary localized Romanian layer for regional brands.
- Multilingual Support: The application supports multiple languages, including Romanian and English. This is a strategic advantage for regional adaptation, acting as

Mis Emilia Oana
Rusu Dinu Stefan
1272EA

a necessary translation layer for a diverse population and signaling readiness for expansion into neighboring markets like Moldova or Bulgaria.

Technical overview

BioBrief is a comprehensive mobile and web platform designed to help users make healthier food choices through product scanning, label analysis, and AI-driven recommendations. The system is built on a microservices-ready monolithic backend (Spring Boot) and a feature-rich cross-platform mobile app (Flutter).

Backend (Java/Spring Boot)

The backend is a robust Java application designed for high performance and scalability.

Core Technologies Framework:

Spring Boot 3.5.8-SNAPSHOT with Java 25

Primary Database: PostgreSQL (Product data, User data, Relationships)

Caching & Session: Redis (Spring Session, ShedLock for distributed locks)

Search Engine: Elasticsearch 8.15 (Product search, recipes)

Object Storage: Hetzner Storage (Images, icons, logos)

Database Migration: Liquibase

Frontend (Flutter)

The mobile application is built with Flutter, offering a premium native experience on iOS and Android.

Core Technologies Framework:

Flutter (Dart >=3.4.0)

Architecture: Feature-based architecture with Clean Architecture principles.

State Management: BLoC / Cubit (flutter_bloc). Over 26 Cubits/Blocs managing distinct features (Auth, Games, Scanning, Chat).

Navigation: go_router for declarative routing and deep linking.

Infrastructure & DevOps

The project uses modern DevOps practices for deployment and maintenance.

Containerization: Docker (Dockerfiles for web and backend).

Orchestration: Kubernetes (K8s) for production deployment.

Manifests for Deployment, Service, Ingress, HPA (Horizontal Pod Autoscaler).

CI/CD: GitHub Actions

Web Hosting: Nginx for serving the static landing page (scanneralimente-ro).

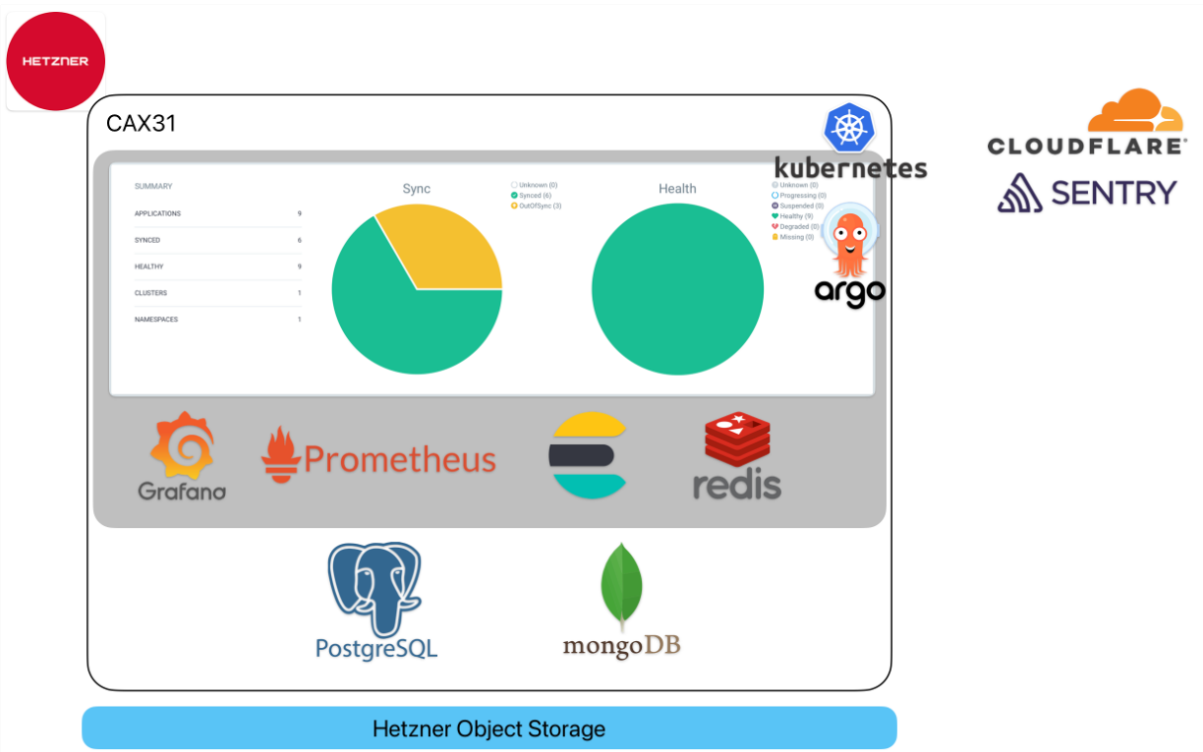


Figure 5 Food Scanner technologies

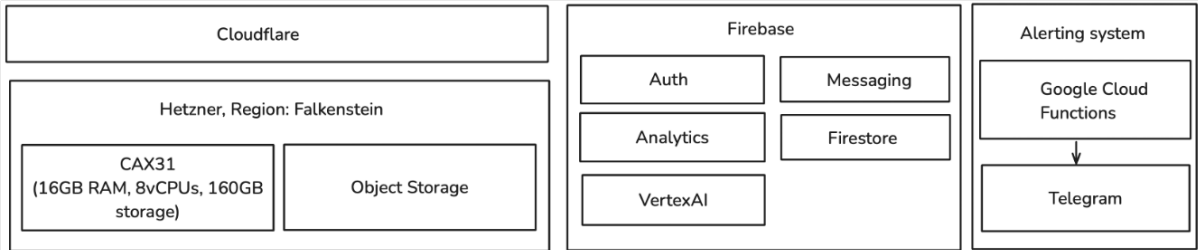


Figure 6 Food Scanner Architecture

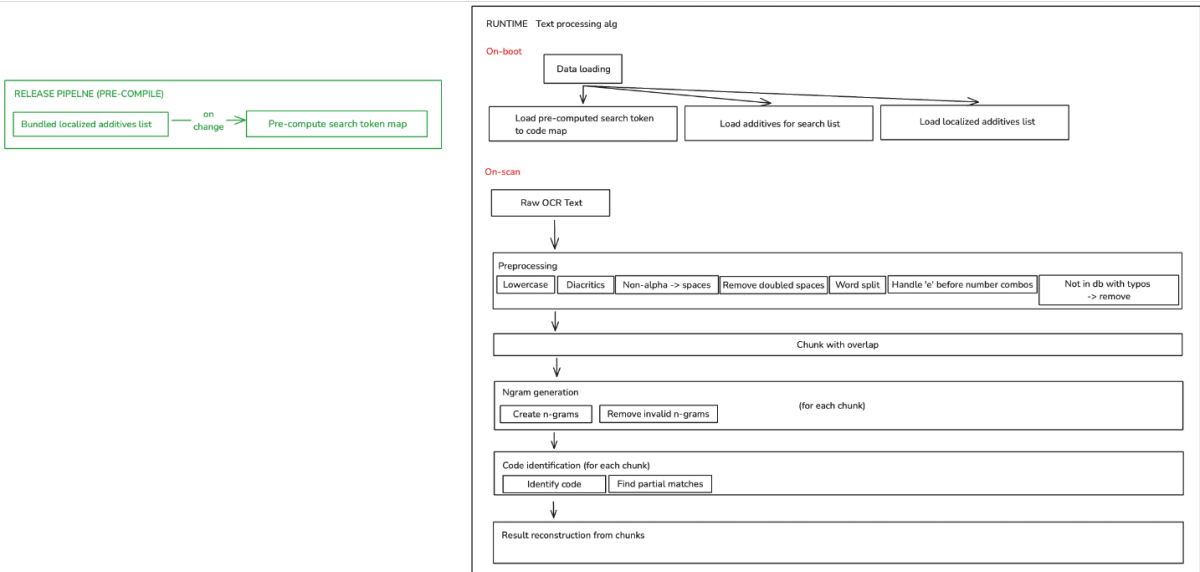


Figure 7 Food Scanner Algorithm



Figure 8 Food Scanner Image Processing

Project plan

We designed the Gantt chart presented below to provide a clear, structured view of the entire project timeline and to make it easy to understand how each phase connects to the next. The chart visually organizes all tasks, their durations, and their dependencies. The project spans from mid November until April, starting with the project planning and scope definition, finishing off with the application being published on App Stores.

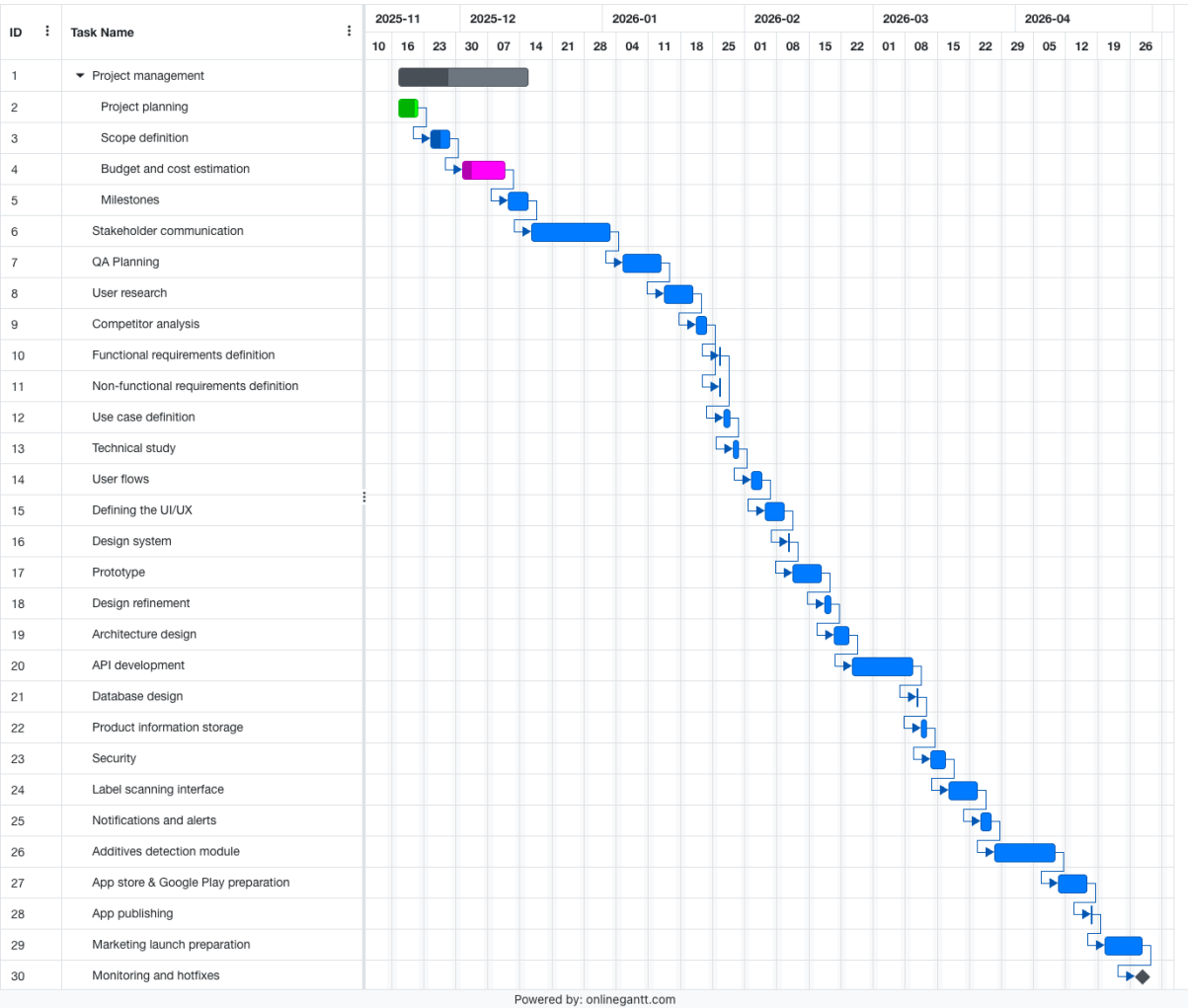


Figure 9 Food Scanner Gantt Chart

We created the WBS diagram shown below to complement the Gantt chart by breaking the project into clear, hierarchical work packages. This structure provides an organized overview of every major phase of the Food Scanner project and helps ensure that all tasks are accounted for before scheduling begins.

The diagram visually separates the project into five primary domains: **Project Management**, **Analysis**, **Design**, **Development**, and **Deployment & Release**. Each domain is broken down into smaller, actionable components that define the full scope of work.

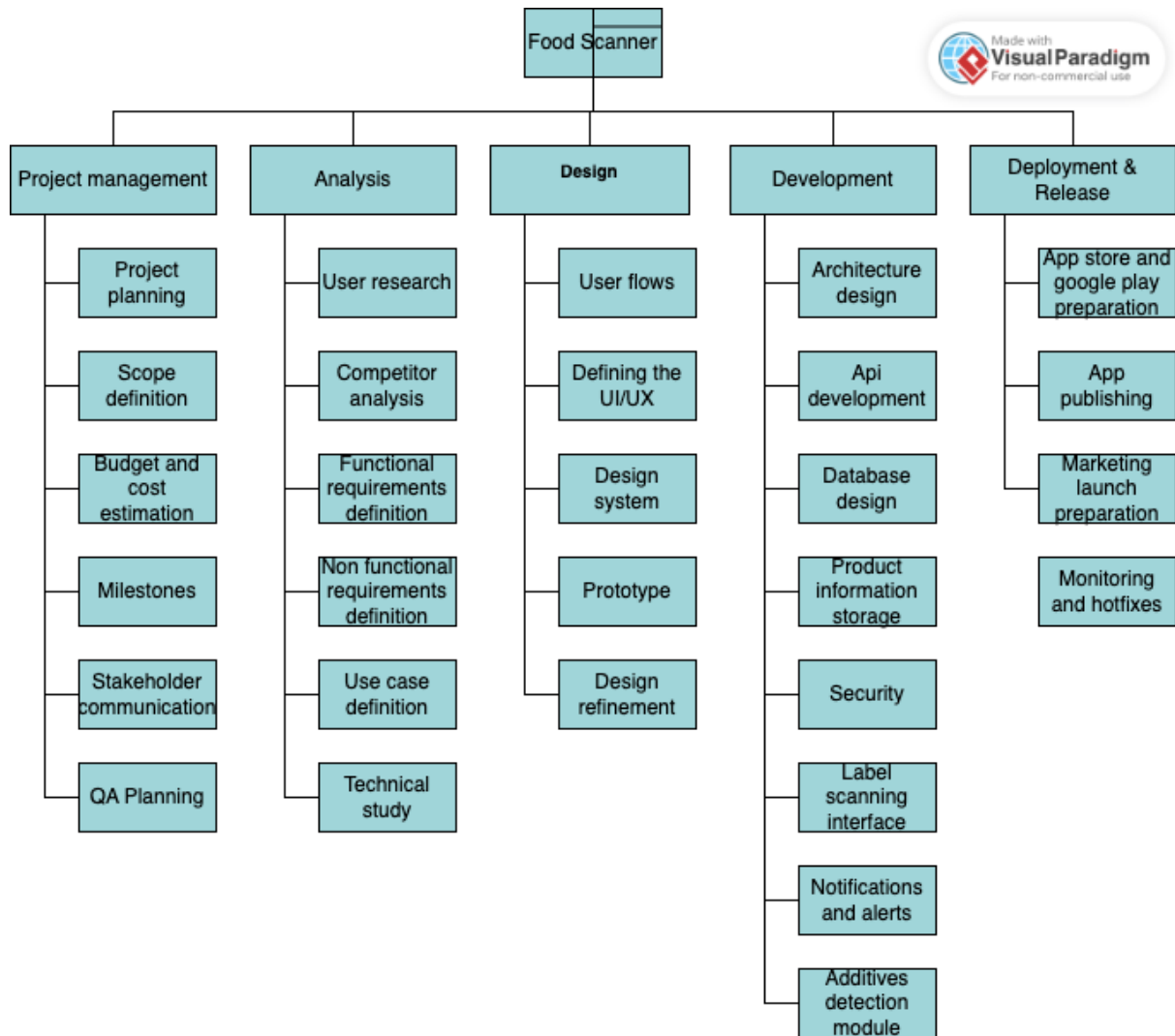


Figure 10 Food Scanner WBS Diagram

1. Core Architecture: Offline-First Strategy

Since the app requires full offline functionality, the database architecture is the most critical technical requirement.

- **Local Database Sync:** The app must ship with a pre-loaded, compressed SQLite (or Realm) database containing metadata for at least 50,000+ common Romanian SKUs (Stock Keeping Units).
- **Incremental Updates:** When the user is online, the app should silently fetch delta updates (only new products) to keep the local database small and current.
- **Offline Logic:** All scanning, parsing, and "BioBrief" scoring logic must reside on the device. No API calls should be required to scan a barcode or analyze ingredients.

2. Input & Scanning (Barcode + OCR)

- **High-Speed Barcode Scanner:**
 - Must support EAN-13 and EAN-8 (standard European formats).
 - **Latency:** Scan-to-result time must be under 200ms.

- **OCR (Optical Character Recognition) Module: ***
 - **Function:** Enable users to take a photo of an ingredient list for products *not* in the database.
 - **Keyword Detection:** The OCR must specifically highlight additives (E-numbers), allergens, and sugar content based on Romanian syntax (e.g., detecting "zahăr," "făină," "conservanți").
 - **Privacy:** Image processing must happen on-device (via ML Kit or Tesseract) to maintain the offline promise.

3. The "BioBrief" Engine (Product Analysis)

- **Scoring Algorithm:**
 - Generate a simple 1-10 or A-E health score for every product.
 - **Criteria:** Based on the Nutri-Score standard adapted for local health guidelines (sugar, salt, saturated fats vs. protein, fiber).
- **Romanian Localization:**
 - Database must prioritize Romanian brands (e.g., Borsec, Napolact, Arctic, local supermarket private labels like Pilos or K-Classic).
 - Ingredient analysis must account for local naming conventions (e.g., recognizing "E-uri" as additives).
- **Visualization:** Display a "Traffic Light" summary (Red/Yellow/Green) immediately after scanning.

4. Smart Kitchen: Fridge-to-Recipe Generation

- **Virtual Pantry:**
 - Users can "Save" scanned items to a "My Fridge" list.
- **Recipe Logic (Hybrid Offline/Online):**
 - **Offline Mode:** Match ingredients against a locally stored library of 500+ healthy "core" recipes.
 - **Algorithm:** "You have Milk, Eggs, and Spinach -> Make a Spinach Omelet."
 - **Constraint:** If "Generation" implies AI (LLM), this specific feature may require a brief online connection, OR the app must use a lightweight on-device small language model (SLM) if strict offline is mandatory.
- **Dietary Filters:** Filter recipes by "Vegan," "Fasting" (de Post - crucial for Romania), and "Gluten-Free."

5. User Experience: Frictionless & Lifestyle

- **No-Login Wall:**
 - Users land directly on the scan camera upon first launch.
 - User data (scanned history, fridge contents) is stored locally on the device via UserDefaults or SharedPreferences.
 - **Optional Sync:** Login is only prompted if the user wants to back up data or sync across devices.
- **"Cook & Eat Healthy" Dashboard:**

- Weekly summary of scanned items (e.g., "You scanned 40% high-sugar items this week").
- Daily tip regarding seasonal Romanian produce (e.g., "It's September; look for local plums").

6. Monetization: Freemium + Ad-Supported

- **Free Tier:**
 - Unlimited Barcode Scanning.
 - Basic "BioBrief" score (Good/Bad).
 - Banner ads displayed on the result screen (cached for offline display).
- **Premium Tier (BioBrief Pro):**
 - **Feature:** OCR Text Scan is a Premium feature.
 - **Feature:** Advanced Nutrient Breakdown (micronutrients).
 - **Feature:** Ad-free experience.
 - **Feature:** Unlimited "Fridge-to-Recipe" generations.

Deployment & Release

- 2 TikTok accounts, 1 post / day
- 1 Facebook account
- 1 Instagram account
- Short videos, under 30 seconds, scanning a product
- 'Real life' use-case, videos in which I did not say the app name => more views
- Let the users ask in the comments what is the app name
- After product market fit > Google Ads + Meta Ads

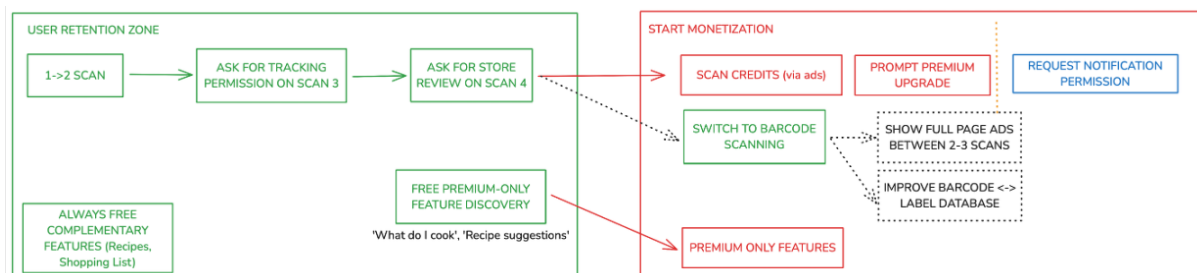


Figure 11 Food Scanner Retention Strategy

Metric	Value
Average Rating	5.0 / 5.0 (Based on recent feedback)

Top User Sentiment	"Best in class" vs. Competitors
Key User Persona	Parents & Health Enthusiasts
Core Value	Simplifying complex ingredient lists

Figure 12 Food Scanner User Feedback

- I tried several apps like this but yours is best in class
- Congratulations, an app that helps me especially to choose less harmful products for my child.
- The best app of this kind
- The app is very useful and intuitive. It helps me make better choices for my family.
- Perfect for those who want to know exactly what they eat. I highly recommend!
- Extremely useful and easy to use. It helped me choose the healthy option when 3 products look the same but the content from a health point of view is totally different.
- Finally a very useful app!

Budget & Resource Plan

1. Resource Estimation

To deliver the BioBrief MVP and achieve the market launch within the 6-month timeline (November – April), the project operates on a lean, high-efficiency resource model. The allocation focuses heavily on development and quality assurance to ensure the "Offline-First" architecture and AI components function flawlessly.

Human Resources

- **1 Full-Stack Developer (6 Months):** Responsible for the end-to-end technical implementation, including the Spring Boot backend, Flutter mobile application, and DevOps infrastructure (Docker/Kubernetes).
- **1 QA Engineer / Tester (6 Months):** Dedicated to validating the "Zero-Day" OCR utility, creating automated test scripts for the scanning engine, and performing regression testing across various Android and iOS devices.

Technical Resources & Tools

- **Development Environment:** 1 Commercial License for IntelliJ IDEA (Ultimate Edition) for full-stack Java and web framework support.
- **Cloud Infrastructure (Hetzner):** 1 Dedicated Server (CAX31 or equivalent) with 8 vCPUs and 16GB RAM to host the backend microservices, object storage for product

images, and the Redis cache.
+2

- **Artificial Intelligence Services:** Firebase Vertex AI integration for the "Recipe Magic" generation and advanced OCR processing.
+2

2. Cost Estimation (High-Level Budget)

The following budget outlines the projected costs for the 6-month development phase. This financial plan prioritizes low operational overhead by utilizing cost-effective, high-performance infrastructure (Hetzner) and scalable AI pricing (Firebase).

Category	Item	Monthly Cost	Total (6 Months)	Notes
Personnel	1 Dev + 1 Tester (@ €10/hr)	€3,200.00	€19,200.00	Based on ~160h/month per person.
Infrastructure	Hetzner Server (CAX31)	€25.00	€150.00	Backend hosting, DB & Storage.
AI Services	Firebase AI (Vertex AI)	~\$10.00	~€60.00	Generative recipe & OCR usage.
Software	IntelliJ IDEA License	~€60.00	€360.00	Commercial monthly license estimate.
Marketing	Social Media & Content	Organic	€0.00	Focus on TikTok/Influencer growth.

TOTAL			~€19,770.00	Total Estimated Budget
-------	--	--	-------------	------------------------

Figure 13 Food Scanner Budget

3. Strategic Funding & Partnerships

Given the public health focus and the rapid user growth (projected 100k+ MAU), BioBrief is uniquely positioned to attract non-dilutive funding and strategic partnerships rather than traditional VC capital alone.

- **Retail Partnerships:** We are seeking collaboration with major retail chains (e.g., Lidl, Kaufland) to integrate BioBrief's scanning technology directly into their loyalty apps. This offers retailers data on "health-conscious" shoppers while solving the "Cold Start" database problem for BioBrief.
- **Health & NGO Sponsorships:** The app's alignment with diabetes management and obesity prevention makes it a prime candidate for grants from health organizations or insurance companies seeking to lower long-term patient costs.
- **Government/EU Grants:** As a digital health initiative fighting the rise of non-communicable diseases in Romania, the project qualifies for EU digitalization and public health funding streams.

Success Metrics & KPIs

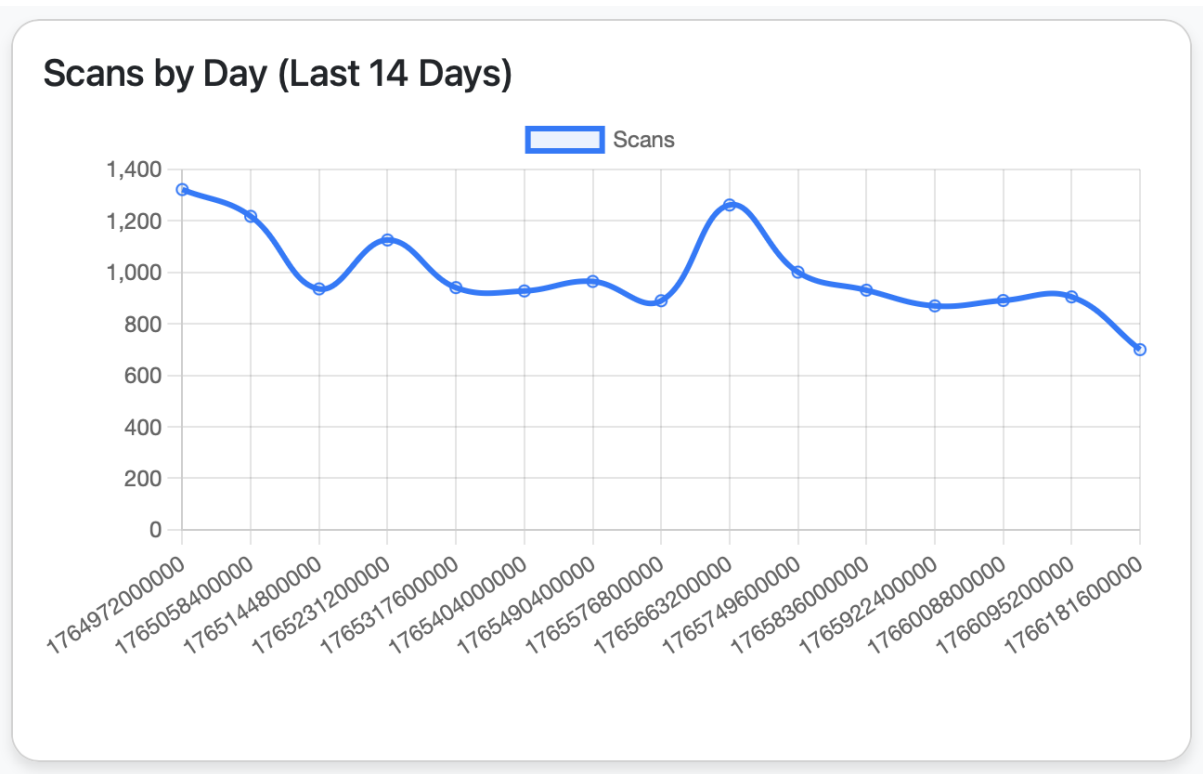


Figure 14 Food Scanner scans per day

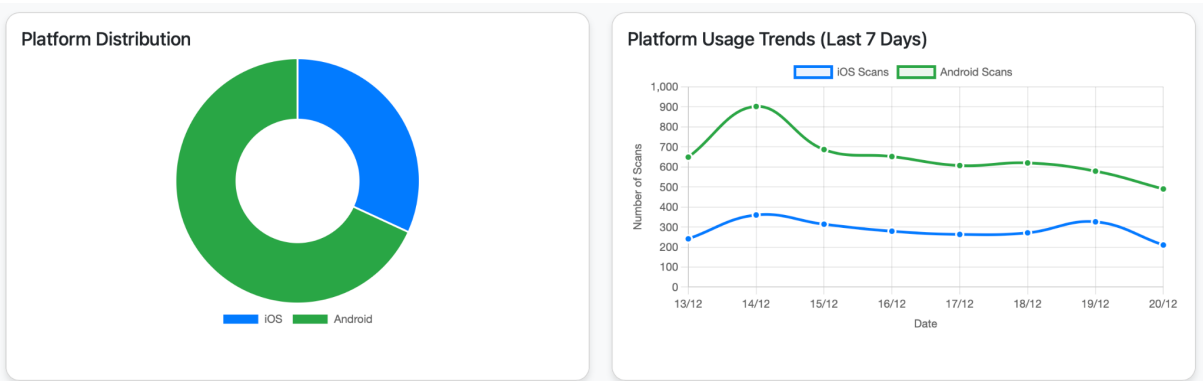


Figure 15 Food Scanner Platform Distribution

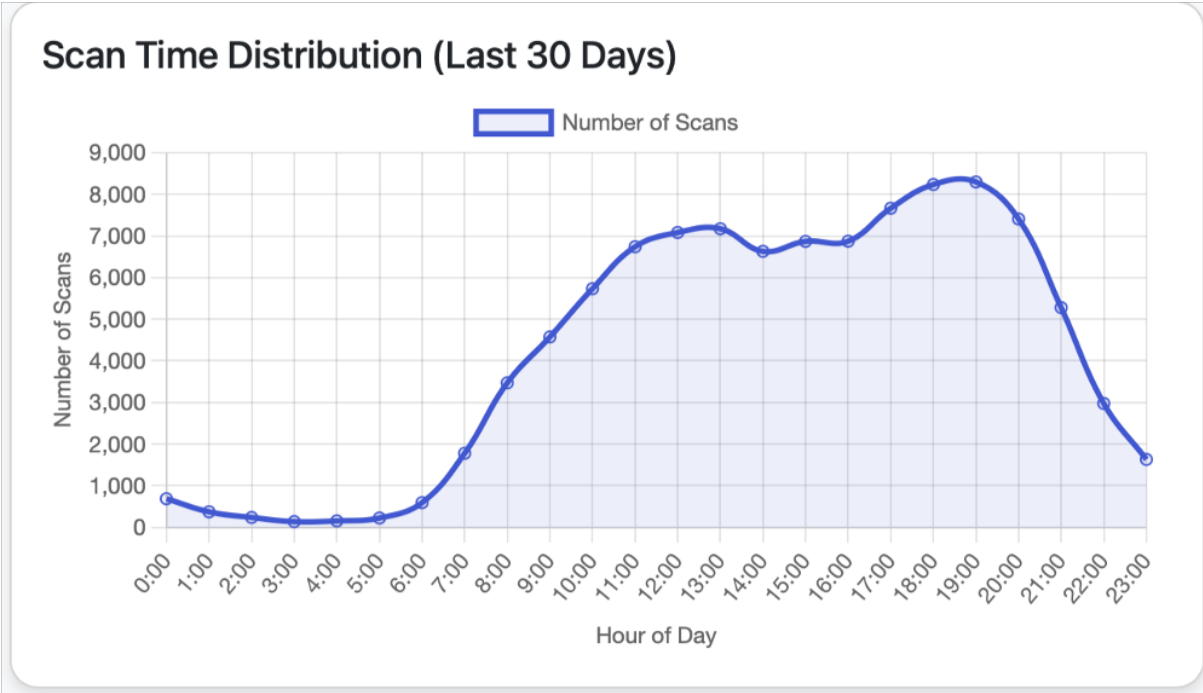


Figure 16 Food Scanner Scan Time

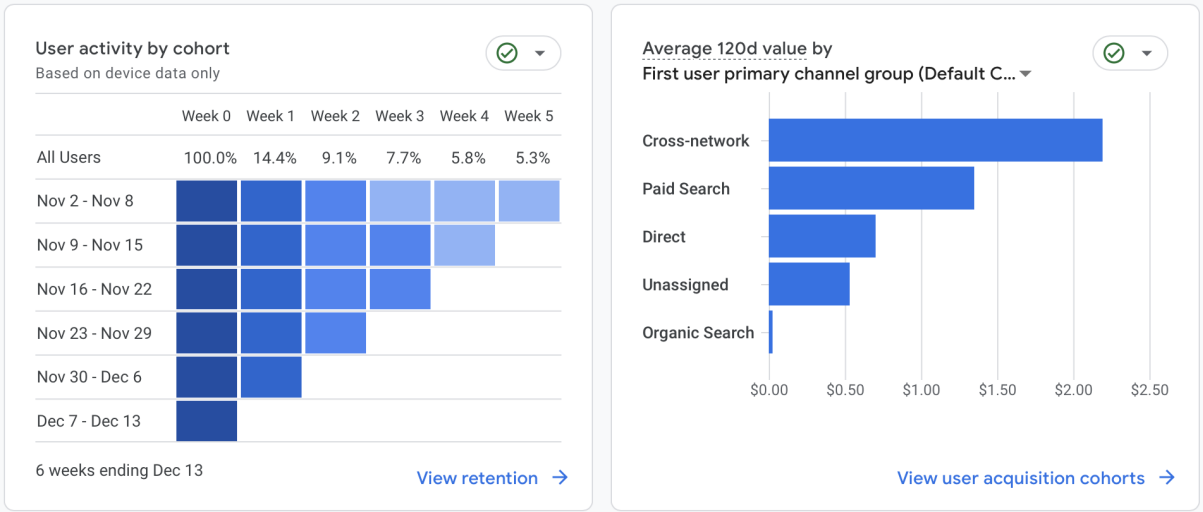


Figure 17 Food Scanner Retention and Traffic

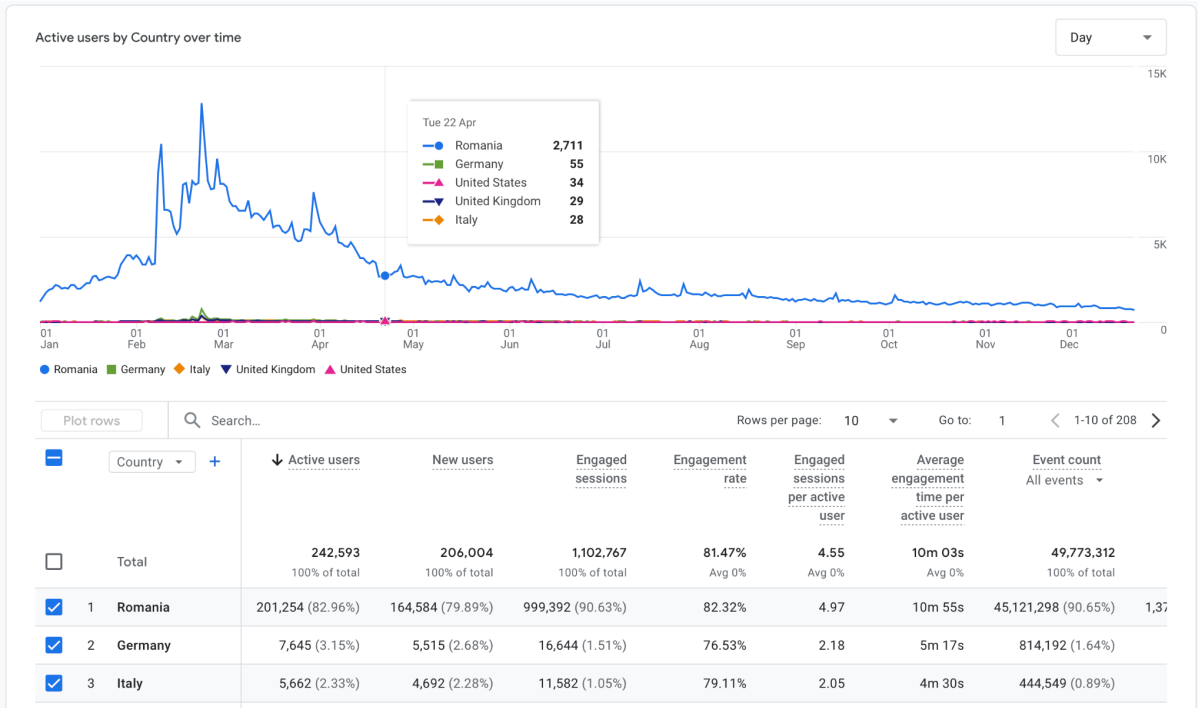


Figure 18 Food Scanner Active Users by Country over time

Conclusions

1. Impact on Public Health & Consumer Behavior

BioBrief represents a critical intervention in the modern Romanian food landscape, directly addressing the "Black Box" effect that alienates consumers from the nutritional reality of their diet. By transforming the complex, often deceptive industrial food label into immediate, actionable intelligence, the application does more than just scan barcodes—it fundamentally shifts consumer behavior.

- **Empowering the Consumer:** We reduce the cognitive load of label analysis from minutes of frustration to seconds of clarity. This "nudging" capability empowers our core personas—from the "Vigilant Guardian" parent to the "Medical Manager"—to make safer, data-driven choices, potentially reducing the burden of diet-related non-communicable diseases like obesity and diabetes.
- **Market Reformulation:** The collective power of over 100,000 monthly active users creates a feedback loop. As consumers consistently reject products with poor nutritional scores, manufacturers are pressured to reformulate, driving a market-wide shift toward transparency and healthier ingredients.

2. Call to Action: Partnership & Investment

Having demonstrated product-market fit with a solo-developer model and zero marketing spend, BioBrief is now poised for rapid scaling. The technical foundation—an offline-first, AI-

Mis Emilia Oana
Rusu Dinu Stefan
1272EA

driven architecture—is robust and proven. We invite strategic partners and investors to join us in the next phase of growth:

- **For Investors:** We offer a high-efficiency, low-overhead operational model with a proven retention strategy and a clear path to monetization through premium features and B2B data insights.
- **For Retailers & Health Organizations:** We seek collaboration to integrate our scanning technology into broader ecosystems. Whether through API licensing for retail loyalty apps or public health data initiatives, your sponsorship can help scale this tool from a niche utility to a national standard for food safety.

The technology is built. The user base is growing. Join us in defining the future of digital food transparency in Romania.