

1. Project Information

Project Title: AURVEX – Smart Gold Management System

Project Type: Web Application with QR Code Integration + AI Features

Target Industry: Gold and Jewelry Retail Stores (Multi-branch support)

Primary Goal: Build an intelligent, secure, and automated platform for managing gold jewelry shops, including QR-based product tracking, real-time gold pricing (from market data or manual entry), inventory alerts, sales/purchases, staff management, and AI-powered insights & recommendations.

Team Members: (Names, IDs, Specialization, email)

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Date of Submission:

2. Project Overview

Abstract / Summary:

AURVEX is a comprehensive web-based platform designed specifically for gold and jewelry retailers.

Each gold piece receives a unique QR code containing: weight, type (ring, bracelet, chain, ingot, earrings, etc.), and karat (14, 18, 21, 22, 24).

During sales, scanning the QR auto-fills all fields. Gold prices are fetched automatically from live market data or entered manually. Craftsmanship (making) fee is added manually.

The system supports three clear permission levels:

- Super Admin (platform owner/manager)
- Admin (store owner)
- Seller (staff/employee)

Additional features include:

Low-stock alerts/notifications for specific item types/categories when inventory reaches critical levels

AI-powered personalized tips sent to each store owner based on their top-selling item types in their geographic region (e.g., "In your area, 21K chains are selling fastest — consider increasing stock")

AI Chatbot for internal support

AI-predicted next-day gold price

Special "Aboney" (wholesale supplier/reseller) page for managing bulk orders in grams, discounts, and payments (gold grams or cash)

A short description of the project idea, problem addressed, and proposed solution.

AURVEX is an innovative, cloud-based management platform designed to modernize and digitize the operations of traditional gold shops. By integrating real time market data, AI driven analytics,

and smart hardware solutions like QR scanning, the system transforms how jewelry businesses handle transactions, inventory, and financial reporting.

Problem addressed:

Calculation Errors & Losses Manual calculations are prone to human error, leading to financial discrepancies and significant losses for business. A single calculator malfunction can impact profitability. **Security Vulnerabilities** When staff are engrossed in complex manual calculations, they become vulnerable to theft or the substitution of genuine items with fakes, impacting inventory and revenue. **Time End Consuming Reconciliations** of day cash reconciliation often takes 2-3 hours, diverting valuable time that could be spent on strategic tasks or improving customer service.

Key Solutions & Innovations:

- **Automated Pricing Engine:** Links directly to live gold price APIs to ensure that every sale or purchase reflects current market values, preventing financial losses.
- **Smart QR Inventory:** Assigns a unique digital identity to every gold item, allowing staff to scan and retrieve full product details instantly, significantly speeding up the checkout process.
- **AI Powered Business Intelligence:** Features a predictive module that analyzes historical trends to forecast weekly gold prices and potential shop profits, empowering owners to make data selling decisions.
- **Comprehensive Reporting:** driven buying and generates detailed daily settlements and long-term financial reports, providing stakeholders with clear insights into expenses, sales performance, and customer history

Keywords:

Gold Shop Management, Jewelry Retail Automation, Web-based POS System, AI Price Prediction, QR Code Inventory, Real-time Gold Pricing, Financial Transaction Management, Progressive Web Application

3. Problem Statement & Market Need & Industry collaboration

Businesses that rely on manual financial calculations face multiple operational challenges that negatively affect accuracy, security, and efficiency. Manual calculations significantly increase the risk of human error, leading to potential revenue losses. Even a minor calculator malfunction can disrupt accuracy and impact overall profitability.

Additionally, when staff members are occupied with complex, time-consuming calculations, their attention is diverted from their surroundings. This creates security vulnerabilities, including increased theft.

End-of-day cash reconciliation further compounds the problem. The process often requires **2 to 3 hours**, consuming valuable staff time that could otherwise be dedicated to customer service, operational improvements, or strategic business activities. These delays reduce productivity and hinder overall business performance.

AURVEX supports one of Egypt's most important commercial sectors—the gold and jewelry industry—by digitalizing daily operations that traditionally rely on manual and error-prone processes. The system enhances accuracy in pricing, reduces financial losses, and improves security through QR-based item identification. Its AI features, including gold-price prediction and profit analysis, help shop owners make smarter, data-driven decisions in a highly volatile market.

On a societal level, AURVEX promotes transparency, reduces fraud risks, and improves customer trust by ensuring consistent and reliable transaction handling. By modernizing gold shops and improving their efficiency, the system contributes to stronger small and medium-sized businesses and supports Egypt's broader push toward technological advancement.

AURVEX provides strong value through AI-powered weekly gold-price predictions, giving shop owners better decision-making confidence. Its sales and profit analytics deliver quick insights into business performance, while smart notifications keep staff updated in real time. With secure

system controls and instant alerts, AURVEX ensures safer operations and prevents unauthorized or risky actions—all in one efficient, intelligent platform.

4. Objectives

- Develop an automated calculation system that eliminates human errors in weight, karat, and price determination to prevent financial losses.
- Reduce the time required for daily reconciliation and transaction handling through automated sales, purchase, and expense recording.
- Implement a secure QR-based identification system and real-time alerts to protect inventory, prevent item substitution, and reduce unauthorized system actions.
- Provide sales analytics, profit tracking, and detailed financial reports to support informed business planning.
- Integrate AI to forecast weekly gold prices, analyze profit trends, and assist staff through an intelligent chatbot for instant system-related inquiries.

5. Innovation & Expected Impact

What makes your project innovative or unique?

The project is highly innovative in its integration of an AI/Machine Learning engine for forecasting global gold prices and estimating profits based on market factors. Additionally, it leverages real-time WebSockets for live global market integration, Redis caching for 43-56x performance improvements, and Progressive Web App (PWA) capabilities enabling offline functionality for core operations.

What impact will it have? (e.g., cost saving, efficiency, sustainability, industry collaboration, community benefit)

Financial & Efficiency: Saves business money by eliminating calculation errors (targeting 99.99% accuracy) and reducing daily reconciliation time by 90%. Transaction processing times are cut down from 5-7 minutes to 2-3 minutes.

Security: Achieves 100% transaction traceability to prevent internal fraud and theft.

Strategic & Community: Provides the shop owner with deep business intelligence and AI insights to optimize inventory planning, while ultimately improving the customer's waiting time and service experience by 30%.

6. Methodology & Technical Approach

Architecture: The system utilizes standard Three-Tier Architecture (Presentation, Application, and Data layers).

Frontend Technologies: Built using React.js for a responsive, component-based user interface, styled with Tailwind CSS, and incorporating Swiper.js and Chart.js for data visualization. The UI is configured as a Progressive Web App (PWA) to ensure offline functionality.

Backend Technologies: Powered by PHP and the Laravel Framework, exposing a RESTful API. It uses Laravel Sanctum for API token security and Spatie Permissions for user roles.

Database: Deploys MySQL 8.0.36+ utilizing specific DECIMAL data types (e.g., DECIMAL(8,3) for weight, DECIMAL(12,2) for money) to ensure absolute financial precision without rounding errors.

Cloud & APIs: Integrates AWS S3 for cloud document/image storage, Redis for high-speed caching, and WebSockets for real-time live gold price streaming. It also integrates external Gold Price APIs (e.g., GoldAPI.io) and custom Machine Learning APIs for the AI prediction model.

7. Project Deliverables

1. Core Web System

Super Admin

- Add / manage stores
- Assign Admin & Seller
- View subscriptions

Admin

- Sell product (auto calculation)
- Buy product
- Generate QR
- Scan QR to auto-fill
- View reports
- View AI predicted price (next day)

Seller

- Sell / Buy
- Record expenses

2. AI Module (Simplified)

Only ONE AI feature:

✓ Gold price next-day prediction

- Use historical gold price dataset

- Show model accuracy
- Explain model simply (e.g., Linear Regression or LSTM)

Remove chatbot.

Remove regional intelligence.

Keep it focused.

3. Reports

- Daily settlement
- Monthly summary
- Per-employee sales
- Export to PDF

4. Security

- Role-based access control
- Secure authentication
- Basic backup explanation

8. Timeline (Gantt-style or simple milestones)

Week 1 – Requirements Finalization & System Design

Focus:

Freeze scope and design structure.

Tasks:

- Finalize reduced feature list
- Define user roles clearly (Super Admin / Admin / Seller)
- Design database schema (ER diagram)
- Define API endpoints
- Design wireframes (main dashboards + sell/buy screens)

Deliverables:

- ER Diagram
- System Architecture Diagram (3-tier)
- Wireframes (Figma)
- API structure document

Week 2 – Backend Setup & Authentication

Focus:

Build secure foundation.

Tasks:

- Setup Laravel project
- Configure MySQL database

- Implement:
 - User authentication (Sanctum)
 - Role-based permissions
- Create core tables:
 - Users
 - Stores
 - Products
 - Transactions
 - Expenses

Deliverables:

- Working login system
- Role-based access control
- Database connected

Week 3 – Core Gold Calculation Engine

Focus:

Build the financial brain of the system.

Tasks:

- Implement gold price input (manual + API optional)

- Build automatic total calculation:
 - $\text{Weight} \times \text{price} + \text{craftsmanship}$
- Implement buy logic (with discount %)
- Ensure correct DECIMAL handling

Deliverables:

- Fully working Sell module (calculation correct)
- Fully working Buy module
- Financial precision tested

Week 4 – QR Code Integration

Focus:

Inventory automation.

Tasks:

- Generate QR per product
- Store QR data in database
- Implement QR scanning
- Auto-fill sale form via QR

Deliverables:

- QR generation working

- QR scanning auto-fills data
- Printable QR labels

Week 5 – Admin Dashboard & Reports

Focus:

Business visibility.

Tasks:

- Build Admin dashboard:
 - Cash in safe
 - Daily settlement
- Generate:
 - Daily reports
 - Monthly reports
 - Per-employee reports
- Add PDF/Excel export

Deliverables:

- Dashboard functional
- Reports exportable
- Settlement auto-calculated

Week 6 – Super Admin Panel

Focus:

Multi-store control.

Tasks:

- Build Super Admin dashboard
- Add new store
- Assign Admin & Seller
- Subscription start/end logic

Deliverables:

- Super Admin fully functional
- Multi-store management working

Week 7 – AI Gold Price Prediction

Focus:

Add intelligent feature.

Tasks:

- Collect historical gold price dataset
- Train simple model:

- Linear Regression or LSTM
- Evaluate model (MAE / RMSE)
- Expose prediction via API
- Display predicted price in dashboard

Deliverables:

- AI model trained
- Accuracy report
- Prediction visible in system

Keep it simple and explainable.

Week 8 – Testing & Optimization

Focus:

Stability.

Tasks:

- Functional testing (all modules)
- Role restriction testing
- Financial accuracy testing
- Bug fixing
- Performance optimization

Deliverables:

- Test cases document
- Fixed major bugs
- Stable system

Week 9 – Documentation & Security Review

Focus:

Professional polish.

Tasks:

- Write:
 - System architecture section
 - Database explanation
 - AI explanation
- Document security measures
- Prepare user manual

Deliverables:

- Technical documentation
- User manual
- Finalized diagrams

Week 10 – Final Integration & Defense Preparation

Focus:

Submission readiness.

Tasks:

- Final full-system testing
- Prepare presentation slides
- Prepare live demo scenario:
 - Sell product
 - Scan QR
 - Show report
 - Show AI prediction
- Final code cleanup

Deliverables:

- Fully working web app
- Presentation slides
- Demo ready
- GitHub repository structured



9. Resources Required

- Software & Cloud Tools: Visual Studio Code, GitHub, Postman, Figma, Laravel Telescope/Debugger. Cloud infrastructure requires AWS S3, a hosting provider (DigitalOcean or AWS EC2), and Redis Cloud.
- APIs & Third-Party Services: Global Gold Price API (e.g., GoldAPI.io), AI Prediction API services, SMTP Email Provider (Gmail/Mailgun), Let's Encrypt SSL, and Cloudflare.
- Hardware: A dedicated QR Code Label Printer (e.g., Brother QL-800) and an optional physical QR code scanner.
- Funding: An estimated total budget of \$967 is required, to be funded via university allocations, team contributions, or sponsorship from Baba Wanis Jewelry.

10. Risk Assessment & Safety Considerations

Technical Risks: External API failures or downtime (mitigated by using redundant API providers and a 30-minute Redis cache fallback). Data Security Breaches (mitigated by deploying HTTPS/SSL, AES-256 encryption, reCAPTCHA v3, and strict Role-Based Access Control).

Financial / Project Risks: Budget overruns are mitigated by a dedicated 10% contingency buffer and maximum utilization of open-source/free tiers. Scope creep is managed via a strict feature freeze 4 weeks prior to submission.

Operational Risks: Resistance to technology adoption by shop staff (mitigated by early engagement, gradual rollout, and extensive hands-on training).

Safety / Disaster Recovery Considerations: To prevent catastrophic business data loss, the system relies on automated daily database backups stored off-site on AWS S3, utilizing point-in-time recovery, with a strict Recovery Time Objective (RTO) to restore the system within 4 hours.

11. References

List references (books, papers, websites, standards) used in proposal preparation.

Ultimate Solutions (Nawah Gold ERP) – Specialized solutions for buying, selling, and manufacturing gold, covering all financial and administrative operations.

Website: <https://www.ultimate-erp.com/gold>

NEBU App – A dedicated mobile application for managing jewelry stores in Egypt, considered one of the unique and distinctive local systems.

(Available through Facebook and local platforms)

Regional/international similar systems (for comparison):

Nebu (Logiology) – Comprehensive solution for jewelry retail traders.

E-Jewelry – Advanced system used in over 600 stores in Egypt and the Middle East.

WJewel – Full POS system for jewelry trade (sales, valuation, CRM).

12. Supervisor background, related projects and expertise

Eng. Aya Abdel Naby is an **Assistant Lecturer** in the **Computer Science Department, Faculty of Engineering**, has academic and research experience in Artificial Intelligence, with a specialization in fraud detection and anomaly detection systems. During her Master's research, she focused on intelligent fraud detection models using machine learning techniques to identify abnormal transaction patterns. Her ongoing PhD research further advances this expertise in anomaly detection, predictive modeling, and advanced AI-based classification systems.

Her research background includes:

- Machine learning for anomaly detection

- Deep learning model development and evaluation
- Pattern recognition and classification systems
- Predictive analytics and decision support systems
- Model performance evaluation and optimization