

Costco Unified Intelligence & Operations Hub (CUIOH)

Project Requirements Document (PRD)
Version: 1.1.3
Date: June 26, 2025
Author: David Parrott - IT Project Manager at Costco Wholesale

1. Project Overview

CUIOH is a centralized, AI-enhanced, blockchain-enabled enterprise platform for internal use at **Costco Wholesale**, designed to streamline internal operations, optimize supply chain and inventory management, improve employee workflows, enhance data-driven decision-making, and enable secure smart contract-based vendor relations.

2. Technology Stack

Frontend:

- ReactJS / VueJS
- Tailwind CSS
- Headless UI

Backend:

- Node.js (Express)
- Django (REST Framework)

Database:

- PostgreSQL (relational)
- MongoDB (document/logs)

AI/ML:

- Python
 - scikit-learn
 - TensorFlow
 - PyTorch
 - spaCy

Blockchain:

- Ethereum / Polygon
- Web3.js
- Solidity

DevOps:

- Docker
- Kubernetes
- GitHub Actions
- AWS/GCP

Authentication:

- OAuth2
- JWT
- SSO (Okta/SAML)

Others:

- Redis (cache)
- Elasticsearch (search)
- RabbitMQ

3. Key Application Modules

3.1. AI-Powered Inventory & Supply Chain Manager

Features:

- Demand forecasting by product, warehouse, season
- AI alerts for under/overstock
- Supplier delivery analytics
- Dashboard with charts (Recharts)
- Integration with vendor systems/API

AI Models:

- Time Series: Prophet, LSTM
 - Anomaly Detection: Isolation Forest
 - Clustering: K-Means for product grouping
-

3.2. Employee Workflow and Productivity Hub

Features:

- Role-based access
 - Shift scheduling & attendance
 - Task assignments with deadlines
 - Performance dashboard
 - Vacation/leave management
 - AI-based shift optimization
-

3.3. Smart Vendor & Procurement Portal

Features:

- Vendor registration and KYC
- Smart contract creation for deals
- Token-based escrow payments
- Auto-payment upon delivery confirmation
- Vendor rating system
- Blockchain transaction history

Blockchain Tech:

- Web3.js interface
 - Solidity contracts
 - On-chain dispute resolution triggers
-

3.4. Internal AI Chatbot Assistant

Features:

- NLP-based question answering
 - Access internal SOPs, HR docs, product info
 - Language support (English, Spanish, French, etc.)
 - Task automation (e.g., "Generate return report for Warehouse 32")
-

3.5. Smart Returns & Exchange Management System

Features:

- Return validation with fraud detection
 - Customer history integration
 - Real-time inventory update
 - Return reason analytics
 - RFID/QR code scanning support
-

3.6. Executive Intelligence Dashboard

Features:

- Sales, inventory, HR, vendor KPIs
 - Predictive analytics
 - Customizable charts and widgets
 - Export to PDF/Excel/CSV
 - AI summaries for reports
-

3.7. Internal Token Reward System

Features:

- Issue tokens for goals, performance, training
- Redeem tokens for internal perks (e.g., extra time off)
- On-chain transparency
- Monthly leaderboard

3.8. Compliance & Audit Tracker

Features:

- Upload & version policies
 - Audit logs
 - AI-based summarization of changes
 - Automated alerts for mandatory training
 - Audit trail for regulatory inspection
-

4. UX/UI Requirements

- Mobile responsive (warehouse tablets, phones)
 - Clean, minimal UI using Tailwind CSS
 - Dark/light mode support
 - Accessibility compliant (WCAG 2.1)
 - Multi-language support (i18n)
-

5. Security & Authentication

- End-to-end encryption (TLS 1.3)
 - Role-based permissions (admin, manager, clerk, vendor, executive)
 - JWT for session management
 - SSO for employee login (Okta/SAML)
 - Crypto wallet integration (MetaMask/WalletConnect)
-

6. Integrations

System Integrations:

- SAP / ERP: Inventory & Finance sync
 - Employee Directory (LDAP): User roles & authentication
 - Blockchain Node (Infura): Smart contract deployment
 - Email (SendGrid): Notifications
 - SMS (Twilio): Alerts
 - OCR/Computer Vision API: Document scanning
-

7. Database Schema (Example)

Table: `inventory`

- `id`: UUID
- `product_id`: VARCHAR
- `warehouse_id`: VARCHAR
- `quantity`: INTEGER
- `stock_date`: TIMESTAMP

Table: `employees`

- `id`: UUID
- `name`: VARCHAR
- `role`: VARCHAR
- `department`: VARCHAR
- `performance_score`: FLOAT

Table: `smart_contracts`

- `id`: UUID
 - `vendor_id`: UUID
 - `contract_hash`: TEXT
 - `status`: VARCHAR
-

8. Testing & QA

- Unit, Integration, and End-to-End (Cypress) testing

- Load testing using JMeter
 - AI model accuracy validation
 - Smart contract testnets: Ropsten, Polygon Mumbai
-

9. Deployment Strategy

- Staging & Production environments
 - CI/CD pipeline with GitHub Actions
 - Containerized via Docker
 - Deployed on AWS/GCP (EC2 + RDS + EKS)
 - Backup & disaster recovery plan
-

10. Timeline (Suggested)

Project Phases:

- Requirements Gathering: 2 weeks
 - UI/UX Design: 3 weeks
 - MVP Development: 3 months
 - AI/Blockchain Integration: 2 months
 - Internal Testing: 1 month
 - Pilot Launch: 1 month
 - Full Rollout: 1–2 months
-

11. Success Metrics

- 30% improvement in inventory turnover
 - 40% reduction in employee scheduling conflicts
 - 25% faster return processing
 - Increased vendor transparency and reduced disputes
 - Positive feedback on AI assistant usage
-

12. Risks & Mitigations

Identified Risks & Mitigations:

- AI model bias or inaccuracy → Continuous training & human review
 - Smart contract bugs → Formal audits, testnet deployments
 - Internal adoption resistance → Training, gamification, incentives
 - Data privacy concerns → Strong encryption, access control
-

Summary

CUIOH is more than just a tool—it's a **scalable internal ecosystem** to power Costco's future with **AI, blockchain, and automation**. It integrates data across departments, empowers employees, improves vendor accountability, and provides top executives with predictive insights—all from a single unified platform.