

Costco Unified Intelligence & Operations Hub (CUIOH)

Project Requirements Document (PRD)

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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
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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
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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
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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")
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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
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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
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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
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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
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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
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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
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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
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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.