



Digital Eye

Production Monitoring, Production Forecasting & Behavioral Anomalies

Using AI, Language Models & Computer Vision to Quickly Scale Across Multiple Sectors

Case Study — Pakistan

Rapid proof-of-concept to national deployment

01

Cement

PROOF OF CONCEPT
POC in 1 month

SCALED DEPLOYMENT
27 factories within 45 days



02

Sugar

PROOF OF CONCEPT
POC in 1 week

SCALED DEPLOYMENT
Sector-wide in 1 month

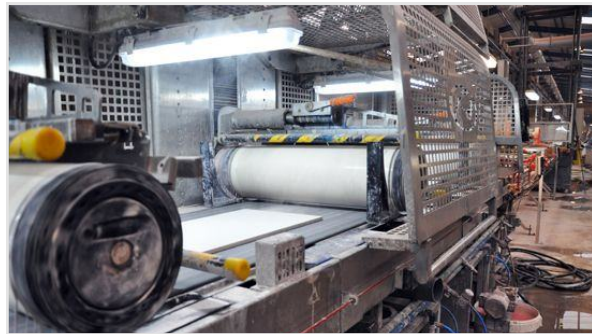


03

Tiles

PROOF OF CONCEPT
POC in 7 days

SCALED DEPLOYMENT
14 factories in 1 month



Upcoming Sectors

01 Beverages



02 Textile



03 Iron & Steel



04 Hatcheries



05 Tires



06 Packaged Milk



07 Juices



The system scales from POC to full sector deployment within weeks – no other platform matches this speed of expansion.

The Cost Problem Behind Traditional Monitoring

01 The traditional Track and Trace System (TTS), which uses a secure tax stamp to monitor production, guard against counterfeiting, and trace a product's Stock Keeping Unit (SKU) across the supply chain, is widely used wherever production and products require close monitoring.

However, traditional TTS depends on digital monitoring hardware, applicators, RFID and barcode readers, and dedicated scanning stations. It suits large operators with large budgets, stable temperatures, low humidity, and vibration-free production lines. Pakistan's factories and mills could justify neither the cost nor the operating conditions TTS demands: heat from kilns and furnaces, steam from processing, and constant dust and vibration accelerate corrosion in exposed circuitry and connectors past roughly 60% relative humidity, so the hardware fails exactly where it is needed most.

TRADITIONAL STAMPING HARDWARE

- Specialized readers & applicators
- Climate-controlled housing needed
- High capex + ongoing maintenance
- Slow, site-by-site rollout

02 To address this twin problem of cost and environmental resilience, **Mr. Abdul Wahid Uqaily**, then Director General (Digital Initiatives) at the Federal Board of Revenue, invited technology firms to propose a simpler, more practical alternative built on producers' existing hardware and internet connectivity. Among the participants, WorkCycle, the government and public sector arm of wAI Industries, took the lead, working closely with Mr. Uqaily to shape and deliver a viable solution. **What began as his challenge to Pakistan's technology firms became Digital Eye's national rollout.**

THE DIGITAL EYE APPROACH

- Uses cameras already installed
- Standard, off-the-shelf hardware
- Low capex, local GPU processing
- Deployed factory-wide in days



The Architect Behind the Workshop

Abdul Wahid Uqaily: Career in Tax Policy & Digital Transformation



Abdul Wahid Uqaily
KARACHI, SINDH, PAKISTAN

- PhD, State Capacity & Tax Compliance
- Ex-DG Digital Initiatives, FBR
- Ex-MD, STEVTA
- Ex-Chairman, Makli Society

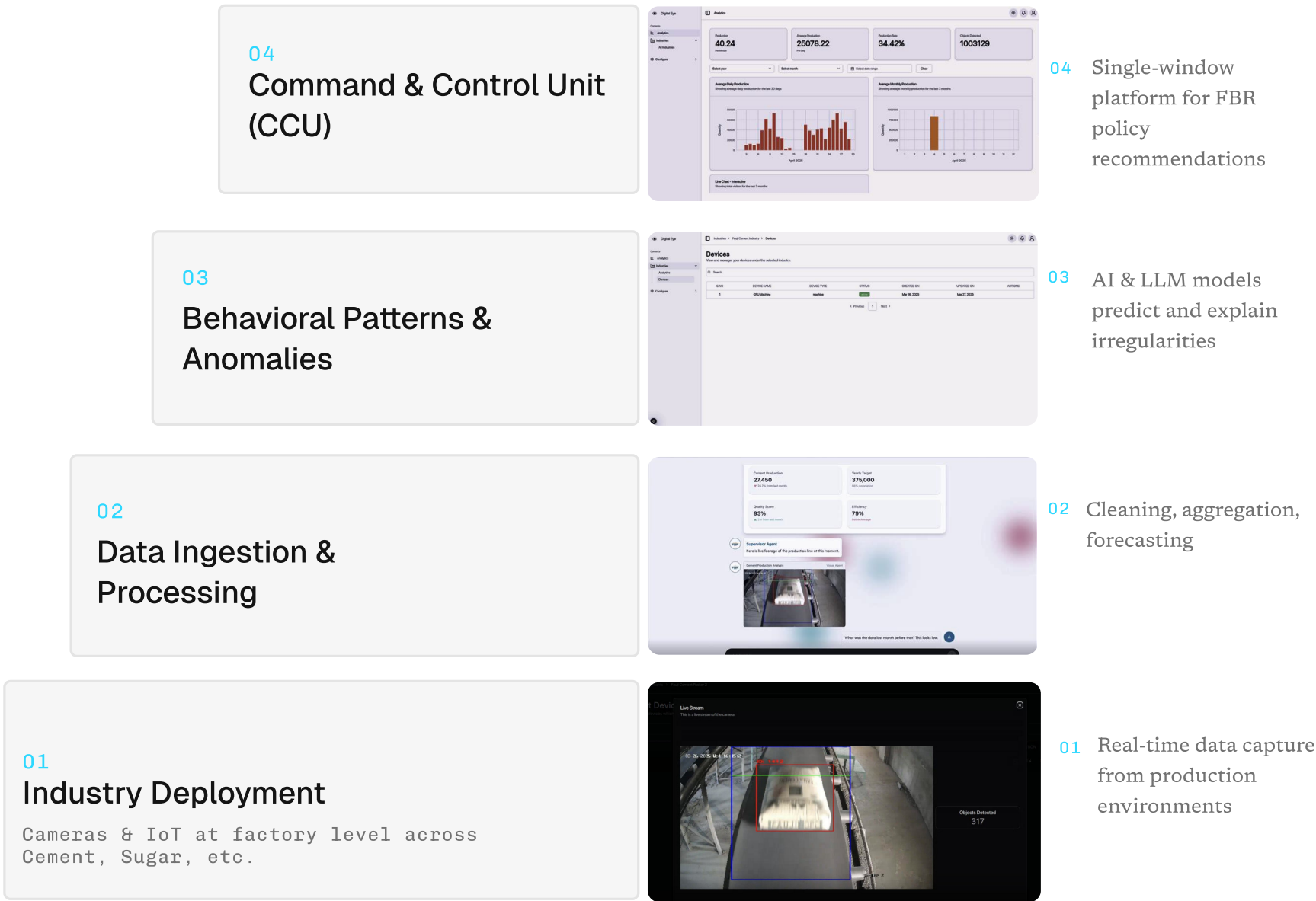
- 01 **Mr. Uqaily**, the original thinker behind Digital Eye, is an innovative digital technology leader, ideator, and practitioner in the public sector with several innovations attributed to him within Pakistan’s Federal Board of Revenue. Before FBR, he led the Employees' Old-Age Benefits Institution's (EOBI) pension digitalization project, which spared 400,00 plus elderly and infirm pensioners the burden of appearing in person to claim their pensions, while saving the institution significant sums lost to ghost pensioners and reconciliation errors.
- 02 His academic path spans Oklahoma State University, Stillwater, OK, Columbia University in the City of New York, and, most recently, West Virginia University, Morgantown, WV, where he was pursuing a PhD in Public Policy, focusing on state capacity and tax compliance. Along this path, his career sits at the intersection of digital transformation, tax compliance, technology innovation, and public administration.

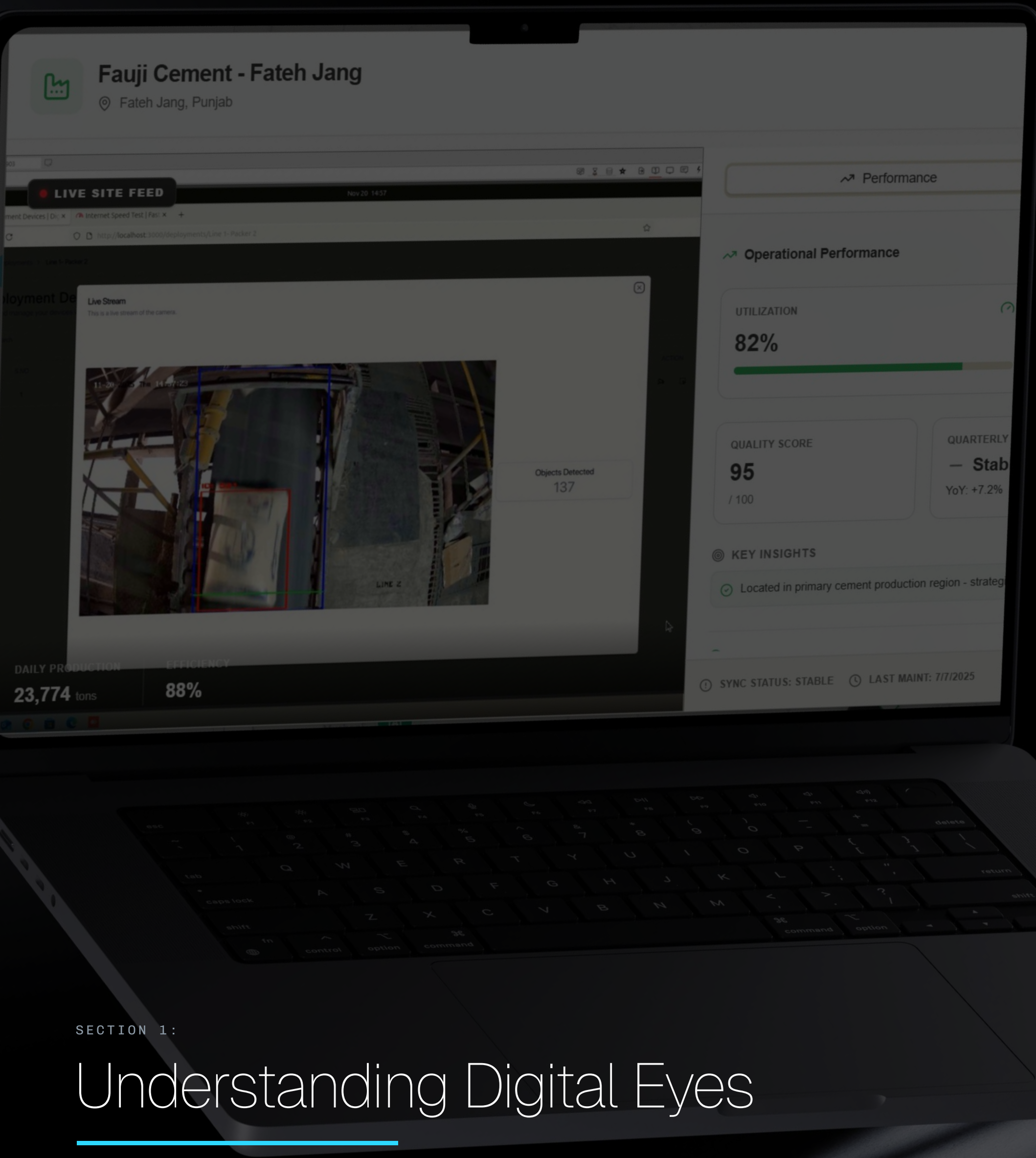


KEY INSIGHT

This is not a compliance story. It is an infrastructure one: Uqaily’s blend of tax-policy research and hands-on digital administration made him the natural partner for reframing factory monitoring as a national system, not a checkbox.

Four-Layer Architecture for National-Scale Production Intelligence



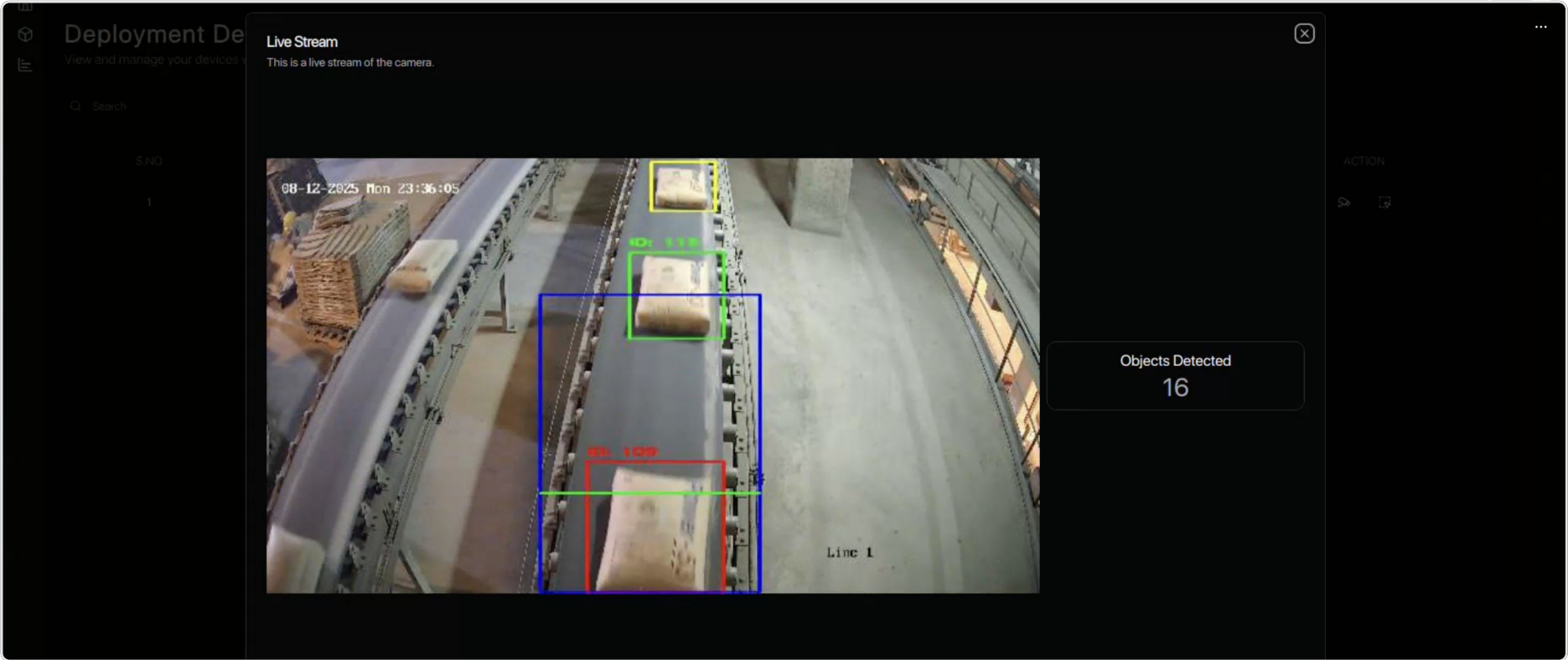
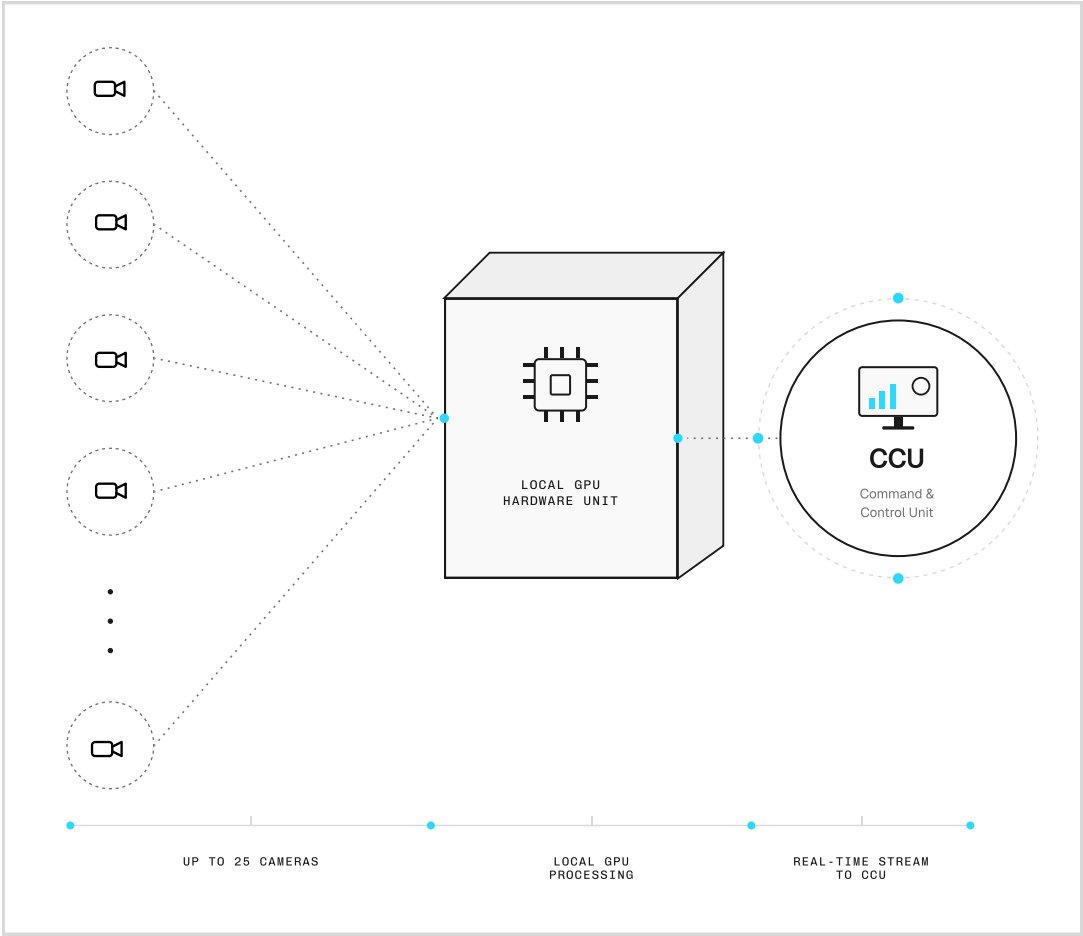


SECTION 1:

Understanding Digital Eyes

Flexible Multi-Camera Deployment with Local GPU Processing

- 01 Up to 25 cameras per GPU hardware unit
- 02 Application runs locally at each factory site
- 03 Cameras detect and count production items
- 04 Data streams in real-time to the CCU
- 05 Works across all manufacturing industries



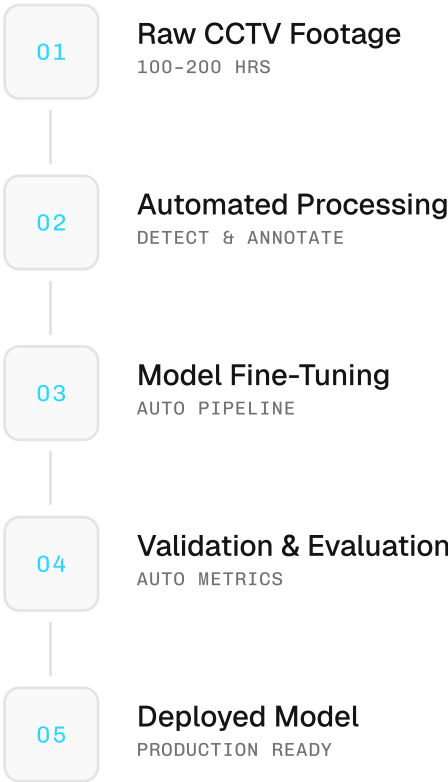
KEY INSIGHT

Any standard camera can be used – no specialized hardware needed. The system is flexible, scalable, and cost-effective.

Automated Model Fine-Tuning Enables Rapid Multi-Sector Expansion

- 01 Open-source CV models fine-tuned via fully automated pipeline
- 02 Only 100–200 hours of existing CCTV footage required
- 03 Automatically adapts to new product types and factory environments
- 04 Key enabler for 7-day POC and fast rollout

AUTOMATED FINE-TUNING PIPELINE



CONTINUOUS LEARNING & IMPROVEMENT

INTELLIGENCE LAB				
	Fine-tune Supervised training runs against the datasets attached to this model.	RUNS 12	LAST RUN 27 Jul	STATE Passed
	DCE Studio Policy, pipeline and context flow for one question, in a single window.	STAGES 5	OVERALL 0.58	POLICY v0.1
	Auto-Eval & Drift Score against the golden set and trigger a retrain when it crosses the threshold.	GOLDEN SET 240	THRESHOLD 0.85	STATE Awaiting eval
	Auto Reinforcement Learning Policy optimisation via PPO, GRPO, DPO or REINFORCE, from a reward signal.	STEPS 0	METHOD PPO	STATE Idle
	Auto Quantization Benchmark-guided precision reduction, measured before anything is adopted.	METHODS 6	AVAILABLE 0	STATE Not measured

KEY INSIGHT

The auto fine-tuning pipeline eliminates manual model training and allows expansion into new industries within days.

Fully Configurable Event Detection & Workflow Engine

- 01

Select Region of Interest (ROI) on camera feeds
- 02

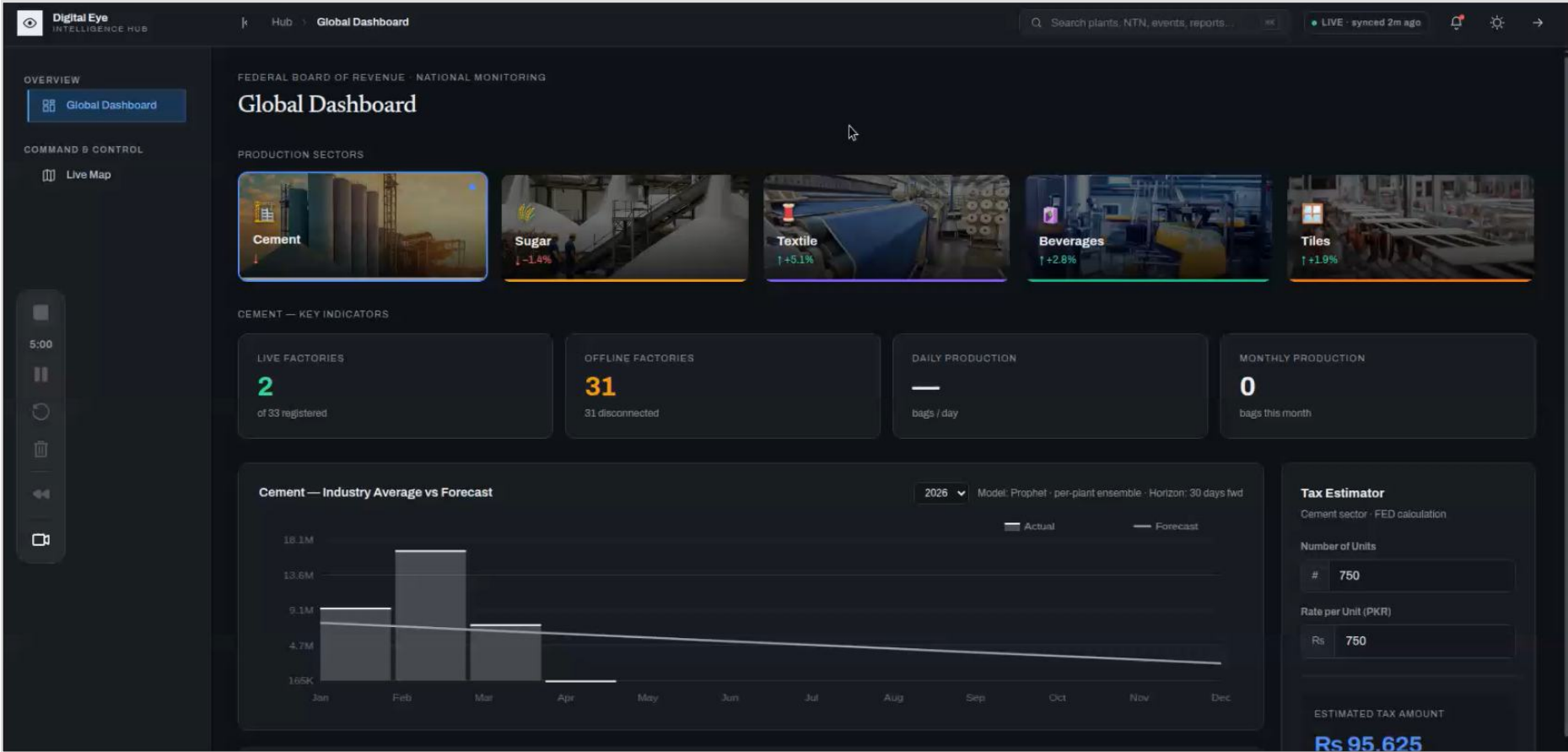
Define custom events and detection rules
- 03

Create notification workflows and alert systems
- 04

Structure database and reporting locally
- 05

Field teams configure without engineering support

DIGITAL EYE INTELLIGENCE HUB — LIVE MAP · GLOBAL DASHBOARD



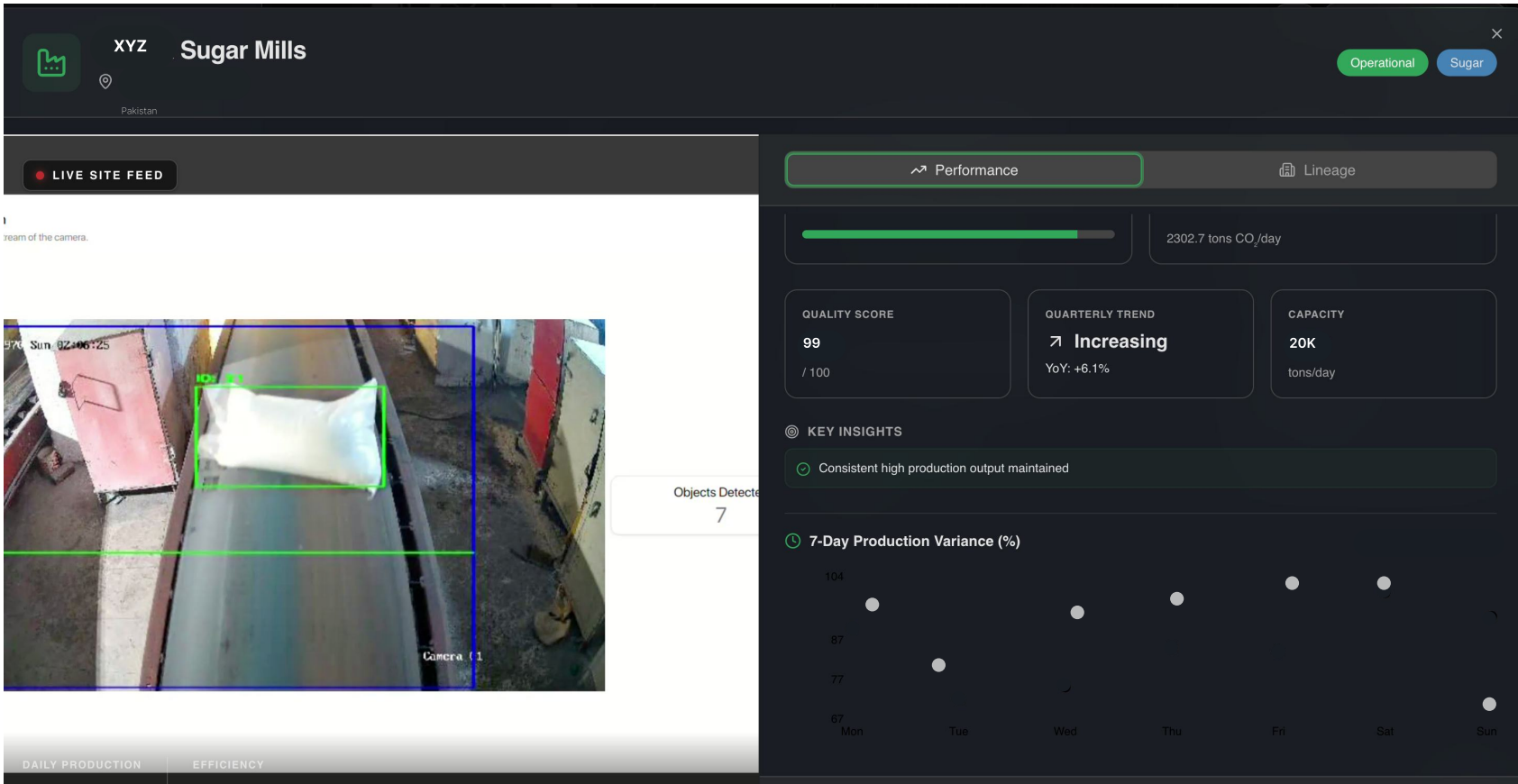
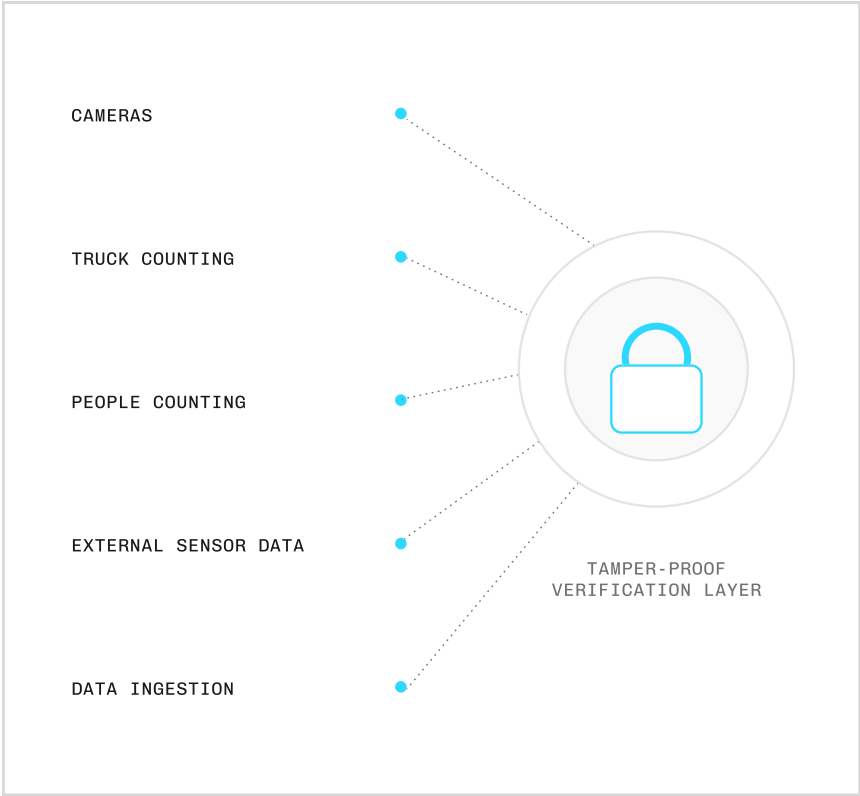
KEY INSIGHT

The platform empowers local operators to customize detection, events, and alerts without needing centralized technical support.

Two-Factor Authentication & Anti-Tampering

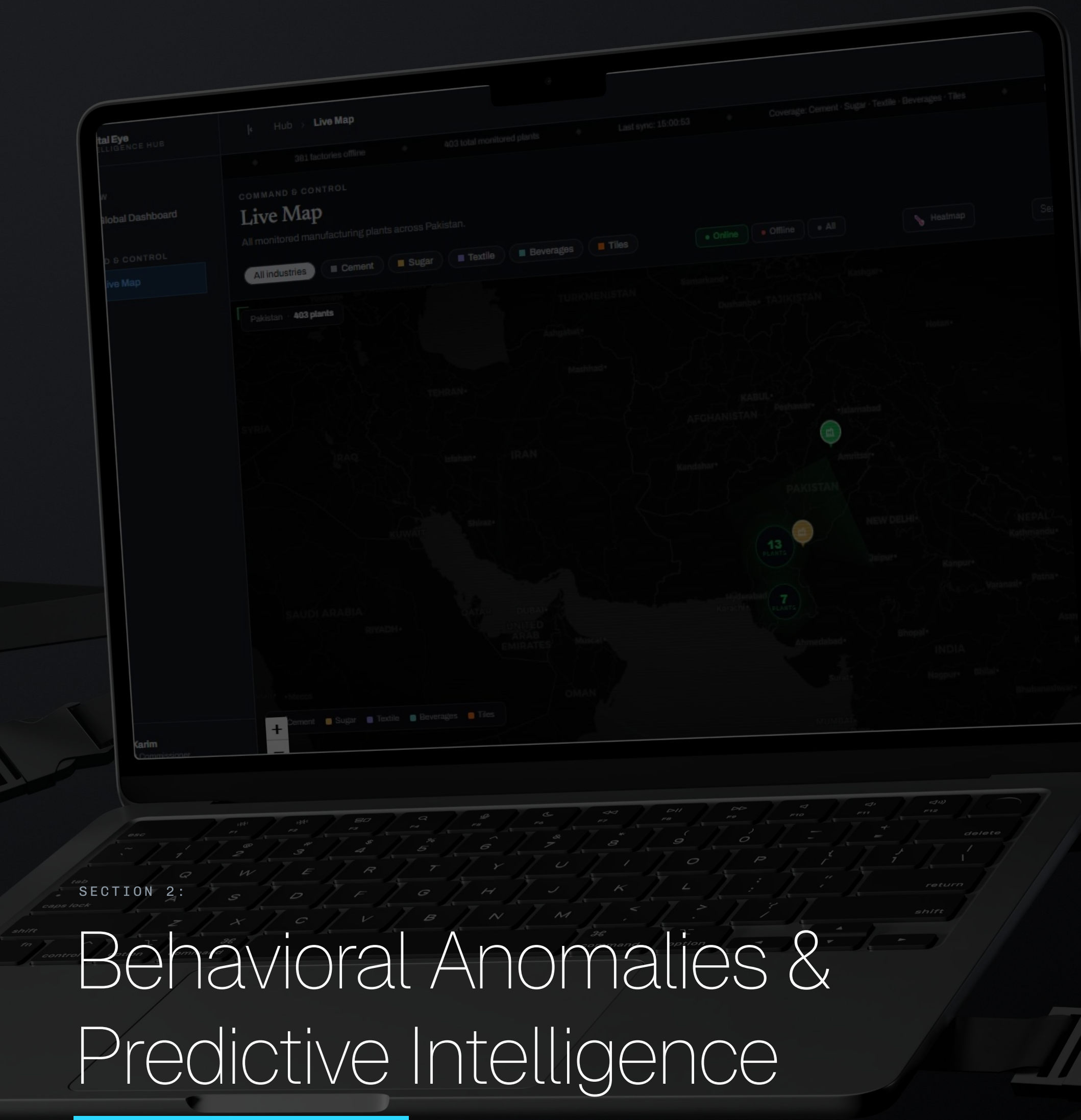
Multi-Layered Verification Prevents System Manipulation

- 01Cameras detect human intervention inside the data center/GPU room
- 02Truck counting provides secondary production verification
- 03People counting in restricted vs. unrestricted areas
- 04External sensor data (heat, electricity) cross-validates production data
- 05Internal and external data ingestion creates a tamper-proof verification layer



KEY INSIGHT

Multiple independent data sources ensure that any attempt to manipulate the core monitoring system is immediately detected and flagged.



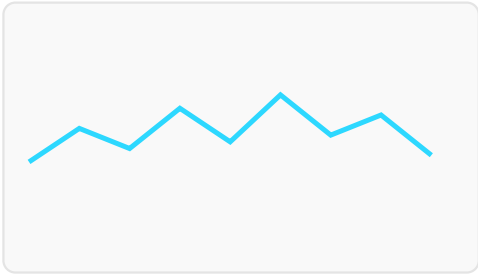
SECTION 2:

Behavioral Anomalies & Predictive Intelligence

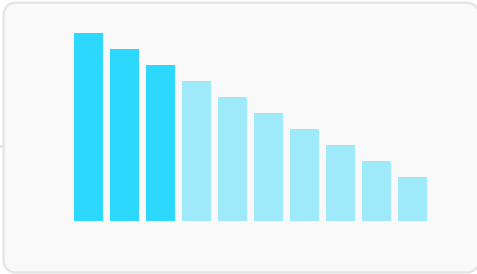
Fourier Transformation + LLM Analysis Identifies Intentional Fraud

- 01 Predictive model uses Fourier transformation to detect anomalies in time-series data
- 02 Identifies unprobabilistic recurring patterns (e.g., cameras going down at 3:00 PM daily)
- 03 Anomaly data is sent to LLM for contextual analysis and investigation
- 04 LLM generates comprehensive reports explaining the nature and intent of detected patterns
- 05 AI and LLM together conclude whether patterns indicate intentional fraud

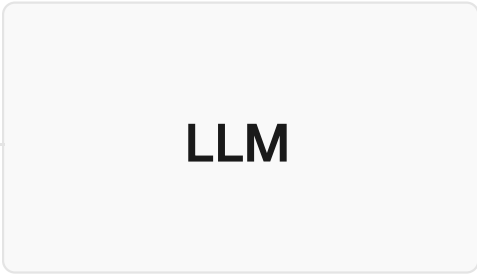
TIME-SERIES DATA



FOURIER TRANSFORMATION



LLM ANALYSIS



INVESTIGATION REPORT



KEY INSIGHT

The combination of mathematical anomaly detection and LLM reasoning creates an intelligent system that not only detects irregularities but explains them with actionable evidence.

Actual vs. Forecast Analysis

Industry-Normalized Forecasting Triggers Automated AI Investigations

- 1

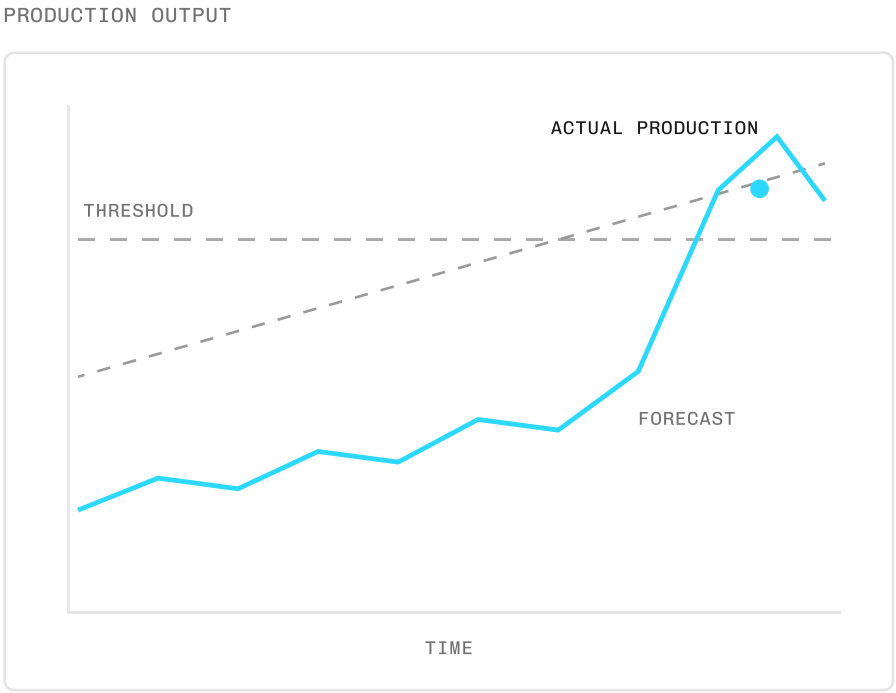
System calculates industry averages and factory-specific historical averages
- 2

Averages are normalized based on manufacturing unit size
- 3

A production forecast is generated for each factory
- 4

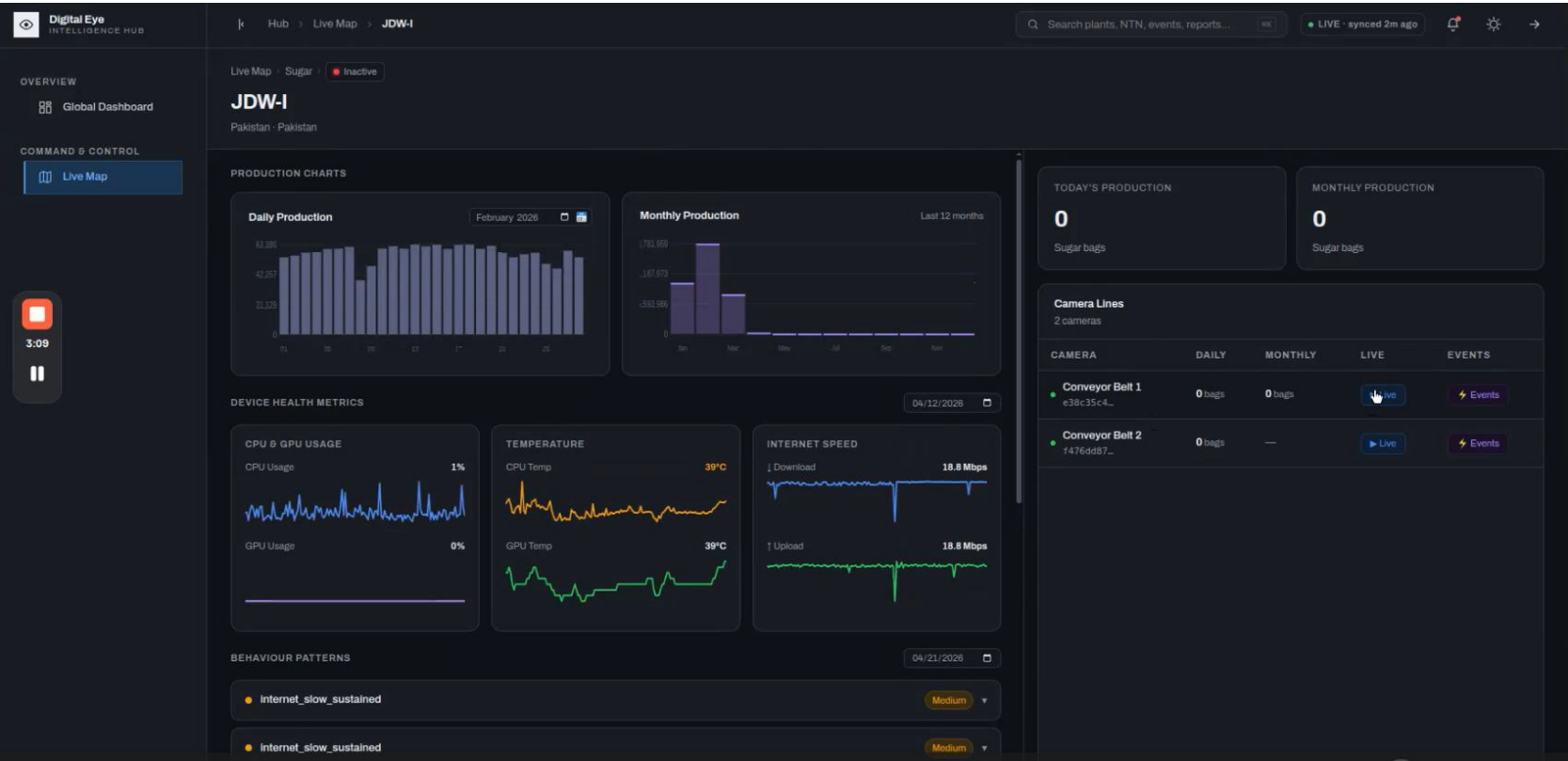
When actual production exceeds threshold, AI agents automatically investigate
- 5

Investigations are autonomous – no human trigger required



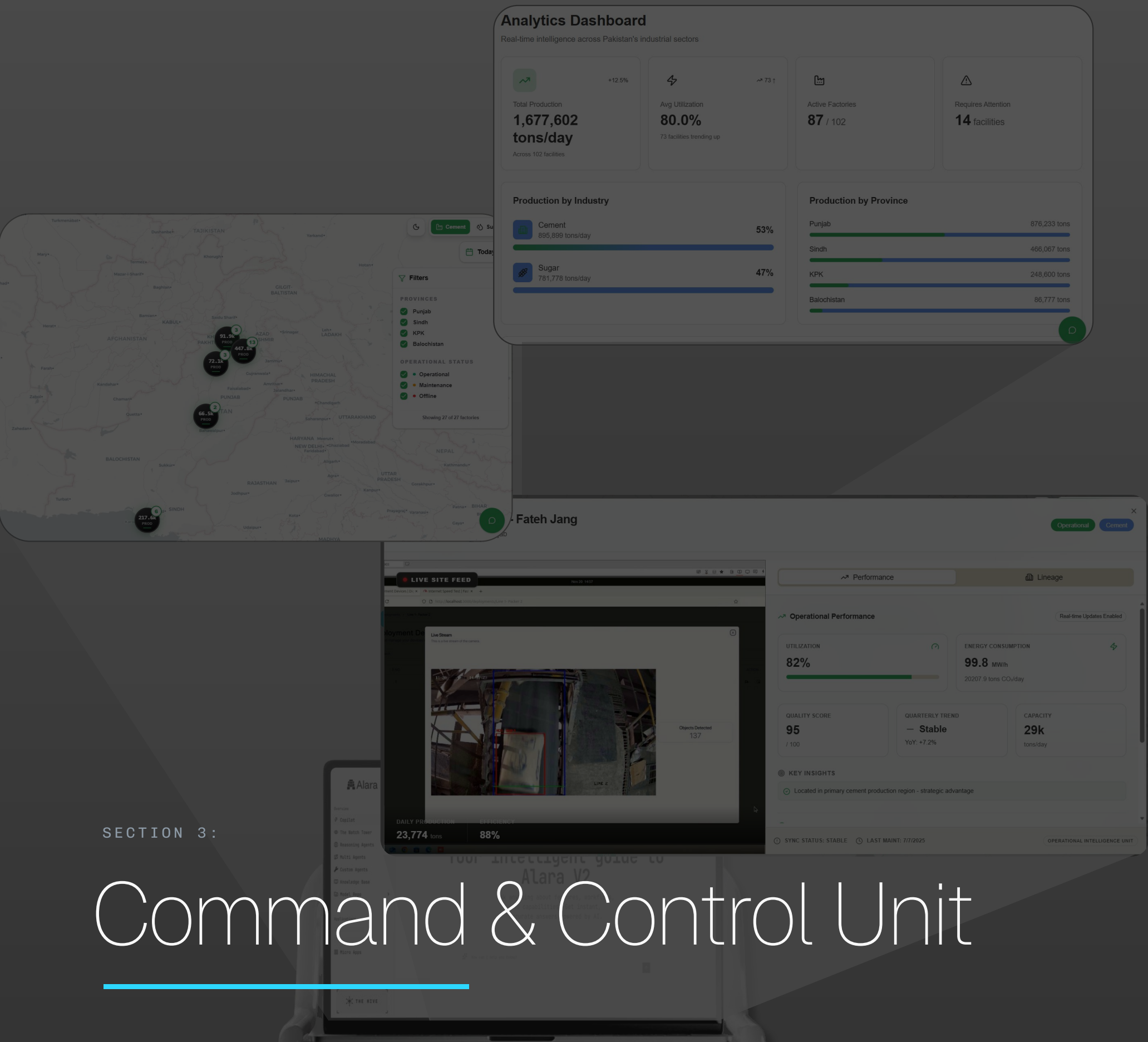
Threshold exceeded → AI agents automatically investigate

LIVE STREAM – PRODUCTION COUNTING & DETECTION



KEY INSIGHT

The forecasting engine creates a baseline of expected behavior, and any deviation beyond acceptable thresholds triggers an autonomous AI investigation cycle.



SECTION 3 :

Command & Control Unit

Command & Control Unit (CCU)

Single-Window National Platform for Policy Recommendations

- 01

Aggregates all production monitoring, anomaly detection, and forecasting data into one platform
- 02

Utilized by the Government of Pakistan for evidence-based policy decisions
- 03

Generates research papers based on the most authentic production data available
- 04

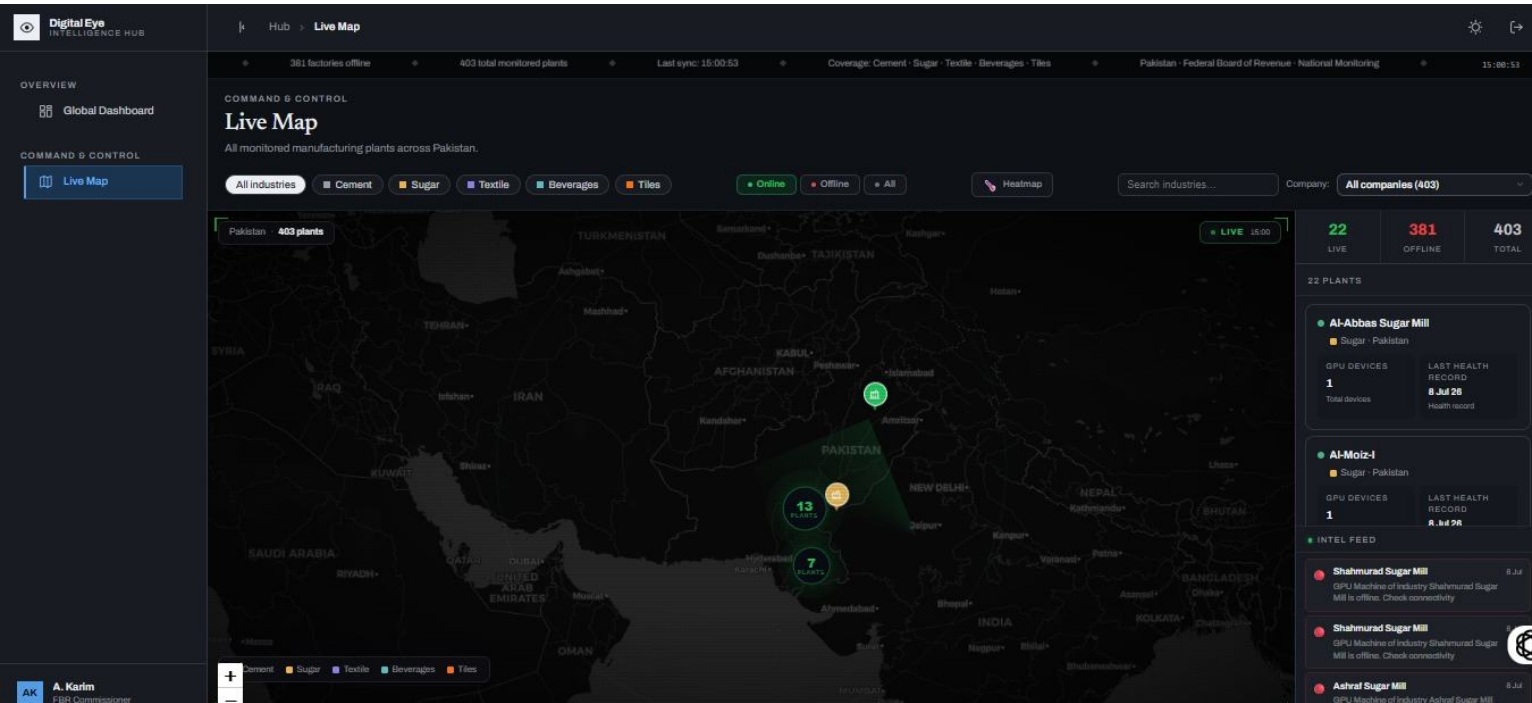
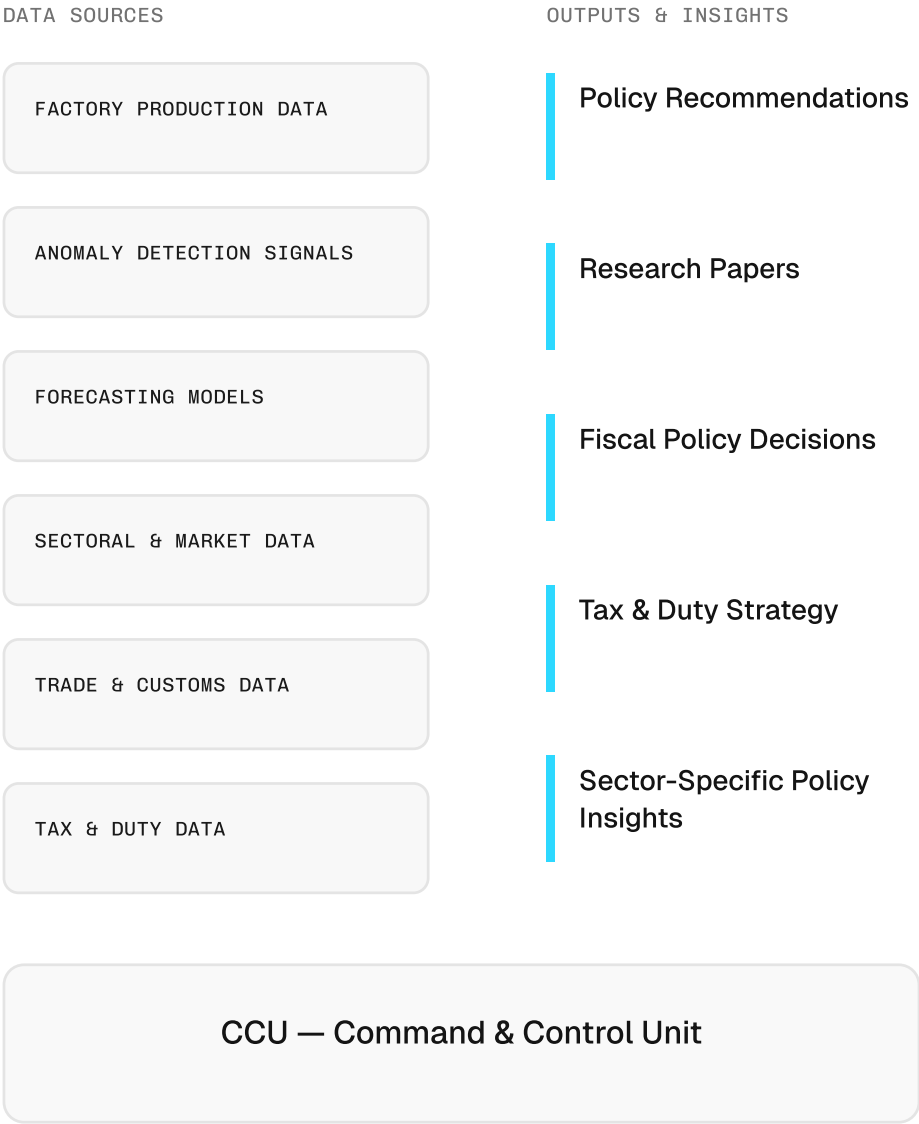
Informs decisions on: duty application, tax reduction, tax incentives, and sector-specific fiscal policy
- 05

Federal government uses CCU insights to determine tax and duty implementation strategy
- 06

APIs available for external system integrations including Customs, WeBOC, Digital Invoicing, POS and more
- 07

Production forecasting across AI sectors.
- 08

Policy making and annual budget estimation using reasoning AI agents



KEY INSIGHT

The CCU transforms raw factory-level data into national-level intelligence that directly informs fiscal policy and revenue mobilization strategy.

Three Pillars of the AI-Powered Production Intelligence Pipeline

01

AI & Computer Vision is Flexible and Cheap

Better than specialized hardware – just add more cameras to create more events. Achieves the same purpose with greater flexibility at much lower cost.

02

AI & LLM Deliver Actionable Intelligence

Not just raw alerts, but cleaned, contextualized reports with specific actionable insights for field formation officers. Reports have far greater value than simple event notifications.

03

National-Scale Data Enables Better Policy

Aggregating production intelligence at a national level enables the government to determine larger fiscal and industrial policy for the country.



Localised Custom Solution Design, Development & Deployment

Built in Pakistan, for Pakistan – by Workcycle Technologies

01

Custom-Built Local Solution

Workcycle Technologies, a Pakistani IT company, custom-designed the entire solution and all ML models – purpose-built for FBR production monitoring.

02

Won Every POC Against Global Competition

Competed directly with international tech companies across all POCs. Workcycle’s solution ranked #1 in reliability, flexibility, and cost-effectiveness every time.

03

25 Field Engineers Deployed Nationwide

Workcycle deployed approximately 25 field engineers across Pakistan for on-site installation, commissioning, and configuration at factory sites across all sectors.

04

Full SLA Coverage Across All Factories

Workcycle manages Service Level Agreements across every factory and every industry – ensuring uptime, rapid field response, and compliance for FBR inspectors.

WORKCYCLE TECHNOLOGIES



#1

Ranked in every POC against global tech companies



25

Field engineers deployed nationwide across Pakistan



SLA

Full coverage across every factory and every industry

KEY INSIGHT

A Pakistani company – not a foreign vendor – custom-built, outcompeted global rivals, deployed 25 engineers nationwide, and now maintains this entire national production intelligence infrastructure.

Thank You

PRODUCTION MONITORING, PRODUCTION FORECASTING &
BEHAVIORAL ANOMALIES

Adam Smith International

REMIT — Revenue Mobilisation, Investment & Trade