KOLA™

WHITE PAPER

From Counting to Knowing

Continuous Inventory Intelligence and the End of the Cycle Count

How the Kola Full-Field AI-daptive Array maintains a live, verified Digital Twin of warehouse and fulfilment operations - and what that is worth.

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Executive Summary

Most warehouses and fulfilment operations still know their inventory the way they did decades ago: by counting it. Between counts, the record in the ERP or WMS drifts away from what is actually on the shelves, and the cost of that drift is spread so widely across the business that it rarely appears as a single line on the P&L. It shows up as cycle count labour, as pick errors and reshipments, as shrinkage nobody can trace, and as orders committed against stock that is not where the system says it is.

This paper describes a different model. **Kola**, the Full-Field AI-daptive Array developed by Chestnut Compute Corp, observes the entire floor continuously and maintains a live Digital Twin of the operation - a reconciled, time-stamped model of every tracked item, location and transition. Instead of discovering discrepancies at the next audit, the operation sees them the moment they occur, with evidence attached.

18-26 mo	-75%	≈0	0
Typical payback period (facility-dependent)	Inventory audit cost reduction	Shrinkage from loss or misrouting	Cycle counts or ad-hoc checks needed

> *Headline figures are outcomes achievable in best-fit facilities. Section 8 sets out the conservative modeled case, built on published industry benchmarks, from which individual facility estimates are calculated.*

The system installs alongside existing infrastructure. It does not replace the ERP, the WMS or warehouse processes; it feeds them better information. Kola is offered through a structured pilot program for operations managing 50,000 sq ft or more of active inventory, and the underlying technology is patent pending.

1. The Problem: Inventory Accuracy Is a Snapshot

Every inventory record is only as accurate as the last time someone confirmed it. A cycle count produces a moment of confidence, and from that moment forward accuracy begins to decay. Items are put away in the wrong slot, picked from the wrong location, damaged and set aside, or removed without a transaction. None of these events announce themselves. They accumulate quietly until the next count reveals them, often weeks later, when the cause can no longer be traced.

The cost of this is real but fragmented. Industry benchmarks used in the Kola financial model put the major components at:

- **Cycle counting:** on average about 10% of total warehouse labour hours each year are spent counting inventory that the system is supposed to already know.

- **Pick errors:** roughly 1.5% of all picks go wrong - wrong item, wrong quantity or wrong location - at an average cost of about $40 per incident once corrective handling, customer service, returns and reshipment are included.
- **Shrinkage:** theft, administrative error, supplier fraud and damage average about 1.25% of inventory value across North American distribution and warehouse operations.
- **Fill-rate uncertainty:** every order committed against an unverified record carries residual risk, which operations absorb as safety stock, expediting and lost customer confidence.

Because each of these costs sits in a different budget line, they are rarely added together, and inventory inaccuracy comes to be treated as a condition of the industry rather than a problem with a solution.

2. Why Periodic Methods Fall Short

The conventional response to inaccuracy is to count more often or to scan more thoroughly. Hand-held scanning, fixed scanning portals and scheduled scanning rounds by mobile units all improve the picture, but they share one structural limitation: they observe inventory at intervals. Between scan windows, the operation is blind.

Periodic methods also tend to confirm presence rather than explain change. A count can tell an operator that an item is missing; it cannot say when it left, where it went or who moved it. Without that context, discrepancies are corrected in the record but their causes persist, and the same losses recur.

Finally, periodic methods consume the very labour they are meant to protect. Every count, every audit preparation sprint and every investigative recount takes staff away from the work that requires their judgment.

3. A Different Model: The Environment Reports Itself

Kola replaces the periodic snapshot with continuous observation. Fixed Array modules installed throughout the facility watch every zone - aisles, pick faces, staging areas and docks - without scan windows, without scan wands and without moving parts. When something changes, the Array sees it, confirms it and records it, and the Digital Twin updates accordingly.

The Digital Twin is the centre of the model. It is a continuously updated virtual record of the physical operation, reconciled against ERP and WMS data in real time. What operators and executives see on the Signature Dashboard is not the result of last week's count; it is the state of the facility now.

This changes the nature of inventory management from reactive to proactive. Instead of asking "what went wrong since the last audit?", the operation is told, at the moment a deviation occurs, that reality and the record no longer agree - and is given the evidence to act on it.

4. How Kola Works: Three Layers

Kola is a three-layer system. Each layer has a distinct role, and together they run continuously so that nothing on the floor goes unaccounted for.

Layer 1 - Site Layer: Array modules capture the full field

Fixed Array modules provide continuous, contactless coverage of the facility. The Array pairs constant, wide awareness of every monitored zone with close, on-demand confirmation at the precise location where activity occurs, so that full-field coverage and item-level detail are delivered together rather than traded off against each other. Edge nodes process the signal on-site, which means moment-to-moment event detection does not depend on a cloud connection.

- Fixed installation - no mobile units, charging cycles or scheduled rounds
- Edge processing for real-time local event detection
- Contactless operation, independent of staff workflows
- Continuous coverage with no scan windows

Layer 2 - Cloud Analytics Core: events reconciled, Digital Twin updated

Structured event data flows from the Site Layer to the Cloud Analytics Core, where every observed change is checked against existing inventory and ERP/WMS records. When something does not match, the system flags it immediately rather than waiting for the next manual count. The Core also tracks flow patterns across zones and time periods, building a reliable baseline for process improvement and capacity planning.

Layer 3 - Signature Dashboard: truth at a glance

The Signature Dashboard presents the verified state of inventory, flow integrity and active exceptions to operators on the floor and executives on any connected device. Every alert is traceable to a time-stamped event with a short evidence clip, and audit logs can be exported for compliance and review.

5. What Happens When an Item Moves

The value of continuous observation depends on trust in each individual event. Kola treats every change on the floor with the same verification discipline:

1. **Detection.** Activity inside a monitored zone is flagged by the Array.
2. **Directed confirmation.** A close, unobstructed observation of the specific location is captured at the moment it is needed.
3. **Identification.** The observation is matched against the registered reference catalog for the items stored there, confirming identity and count.

4. **Two-look verification.** The change is confirmed with a second look to rule out a momentary obstruction such as a passing worker or lift truck.
5. **Record and display.** The Digital Twin, the audit ledger and the Signature Dashboard update together, and the event is classified as removed, added, moved or unresolved.

From first detection to confirmed display update, the sequence completes in about one second. Every step is kept as a time-stamped entry, so the record is not only a current snapshot but a reviewable history. Partial changes inside a bin are held to the same confirmation and audit standard as any other event; finer detail never means a lower verification bar.

6. Design Principles

Kola is built around a small set of commitments that guide every engineering decision:

- **Zero blind spots.** Every zone, every transition and every exception is monitored continuously. The Digital Twin reflects the operation in real time, not by approximation.
- **Zero drift.** The system self-reconciles against source data every cycle, so accuracy holds over time instead of decaying between counts.
- **Zero rip and replace.** Kola integrates with the ERP and WMS already in place. Teams keep working in the same systems, with better information.
- **Explainable outcomes.** Every flagged event is time-stamped, logged and traceable, building trust with operations teams, auditors and customers.
- **People win with better information.** Staff are freed from manual rounds and audit preparation to focus on exception response and improvement.
- **Designed for scale.** The architecture is engineered for complex, high-throughput environments where inventory accuracy is a competitive requirement.

7. Integration: ERP, WMS and Automation

Kola enriches existing systems rather than replacing them. The ERP and WMS remain the system of record; Kola feeds them a continuously verified view of physical reality. Integration with ERP and WMS platforms is handled during deployment, an API is available, and no changes to established workflows are required.

Kola is equally complementary to warehouse automation. Robots and collaborative robots already have capable vision for their own tasks, and Kola does not replace it. Instead, Kola acts as the conduit between automated handling and the inventory count: it takes the events reported by robots and fleet systems and reconciles them against the Array's own independent observation before the count is updated. The result is a single verified record across both human and automated activity.

8. The Financial Case

The Kola financial model applies published industry benchmarks to four savings categories, then deducts the ongoing subscription before calculating payback, so that results reflect net return rather than gross savings. Individual estimates use a facility's size, operation type, location (average warehouse wage) and shift pattern, and may vary by about plus or minus 30% depending on existing processes, SKU complexity and current accuracy baseline.

Savings categories and model assumptions

Category	Industry benchmark	Kola model assumption	Benchmark source
Cycle counting	About 10% of total warehouse labour hours	60% reduction in cycle count labour cost	MHI Annual Industry Report; Aberdeen Group
Labour efficiency	Total labour cost including a 30% burden rate	15% recovery of labour time not already spent on cycle counting	WERC; industry operations benchmarks
Pick errors	About 1.5% of picks; about $40 per incident	40% reduction in pick error rate	Tompkins Associates; Supply Chain Dive
Shrinkage	About 1.25% of inventory value	40% reduction in shrinkage	NRF National Retail Security Survey; CSCMP

Inventory value is estimated from facility footprint using density profiles by operation type, ranging from about $68 per sq ft for e-commerce to about $211 per sq ft for cold storage (WERC DC Measures and MHI operation profiles).

Published pricing

Component	Pricing basis	Notes
Hardware	$5.11 per sq ft; modules from $3,500 each	Array modules, mounting and installation
Professional services	$30,000 flat estimate	System integration, ERP/WMS connection and initial configuration
Subscription (SaaS)	$0.48 per sq ft per year; from $1,000 per site per month	Capped at $120,000 per year for large facilities

Worked example: 100,000 sq ft retail distribution facility

Item	Estimate
Hardware (100,000 sq ft at $5.11)	$511,000
Professional services	$30,000
Total installed cost	$541,000
Annual subscription	$48,000
Estimated net annual saving (after subscription)	$265,000
Simple payback	About 24 months
Year 1 tax relief under immediate expensing (26.5% combined rate, Ontario)	About $143,000
Effective installed cost after tax relief	About $398,000
Tax-adjusted payback	About 18 months

The example sits within the headline payback range of 18 to 26 months. Facilities with higher labour costs, multiple shifts, higher inventory value or a weaker current accuracy baseline generally see larger savings, and the best-fit facilities approach the headline outcomes described in the Executive Summary.

9. Canadian Tax Treatment

For Canadian operations, current federal tax measures materially improve the economics of deployment. Bill C-15, the Budget Implementation Act, 2025, No. 1, received Royal Assent on March 26, 2026, enacting the Productivity Super-Deduction. Among its measures is immediate expensing - a 100% deduction in the year the asset becomes available for use - for computers, data network infrastructure and other productivity-enhancing assets.

Kola's sensor hardware and edge compute nodes are expected to fall within these categories. Rather than spreading the deduction across several years under standard capital cost allowance, a qualifying installation can be written off in Year 1, which is what drives the tax-adjusted payback in the worked example above. The SaaS subscription is an operating expense and is deductible each year under ordinary rules.

In September 2026 the federal government also proposed a Productivity Mega Deduction that would make immediate expensing permanent for a broader range of capital assets; it remains draft legislation.

> *Tax figures are estimates based on a combined federal/Ontario corporate rate of 26.5%. Rates, asset classification and eligibility vary by province and corporate structure. This is not tax advice; consult a qualified tax advisor.*

10. Where Kola Fits

Kola is designed for operations managing 50,000 sq ft or more of active inventory, where accuracy is a competitive requirement. The largest savings category differs by operation type:

Operation type	Typical profile
E-commerce / Fulfilment	High-velocity operations with dense pick activity and moderate inventory value; pick error and labour savings are typically largest
3PL / Contract Logistics	Highest inventory density and transaction volume; accountability to multiple clients makes evidence-backed records especially valuable
Retail Distribution	High inventory value with predictable cycle patterns; shrinkage and audit savings are significant
Manufacturing / Industrial	Lower pick frequency but high inventory value and strict compliance requirements; traceability is a primary driver
Cold Storage / Food	Highest inventory density with lower pick rates and added regulatory pressure around traceability

11. The Pilot Program

Kola is deployed through a structured pilot program for qualifying operations. A pilot follows a phased rollout over several weeks: site assessment and Array installation, connection to the facility's ERP and WMS, calibration, and a live operating period in which the Digital Twin, anomaly detection and Signature Dashboard run against real activity. The pilot is designed to demonstrate the outcomes described in this paper in the facility's own environment before broader deployment.

Chestnut Compute can also prepare a detailed financial briefing for a specific facility, including a tax-adjusted deployment scenario and a phased rollout cost model. No commitment is required at this stage.

Request a conversation

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About Chestnut Compute

Chestnut Compute Corp is an Ontario, Canada company developing Kola, the Full-Field AI-daptive Array, to give warehouse, fulfilment and manufacturing operations continuous, verified visibility of their inventory. The company was founded by Marc Etherington, an inventor and designer with more than 15 years as a corporate president across augmented reality, broadband communications, AI-driven business automation and autonomous mobility. The Kola technology is patent pending.

About the figures in this paper

Headline outcomes represent results achievable in best-fit facilities. Modeled savings are calculated estimates that apply published industry benchmarks to facility parameters; they are not guarantees, and actual results depend on each facility's processes, SKU mix and accuracy baseline. Pricing reflects Chestnut Compute's published pricing as of November 2026 and is subject to change.