Reducing “Faltantes Facturados No Enviados” (FFNE) from 1.10%–4.01% to ⩽1% in a Beauty Distribution Operation

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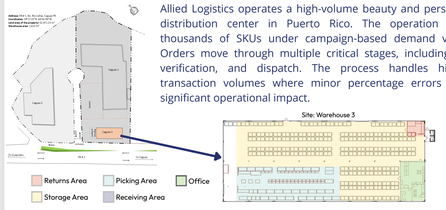
Summary: This project reduced systemic FFNE risk in a high-volume fulfillment operation by applying DMAIC to a process operating up to 4.01%, well above the ≤1% target. Baseline data confirmed statistical instability and structural capability gaps. Root causes were identified within manual control points and addressed through targeted error-proofing and process redesign. The initiative delivers measurable financial protection and sustainable operational stability.

DEFINE

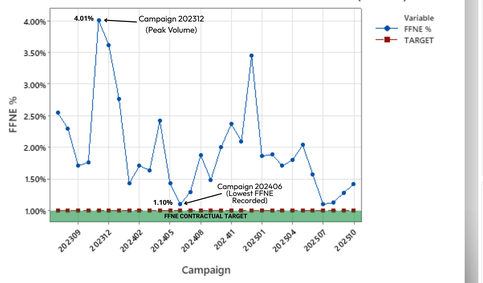
Business Context



Allied Logistics operates a high-volume beauty and personal care distribution center in Puerto Rico. The operation manages thousands of SKUs under campaign-based demand variability. Orders move through multiple critical stages, including picking, verification, and dispatch. The process handles high daily transaction volumes where minor percentage errors generate significant operational impact.

“Faltantes Facturados No Enviados” (FFNE) represent billed products that were not delivered to customers. These defects directly impact customer satisfaction, generate claim costs, increase rework, and expose the company to financial loss. Due to the scale of operations, even small deviations above 1% translate into thousands of defective orders annually.
Reducing FFNE is therefore a strategic operational priority aligned with cost control, service reliability, and contractual performance.

Problem Statement



FALTANTES FACTURADOS NO ENVIADOS - FFNE
Items billed to the customer that were not shipped, shipped incorrectly, or found defective

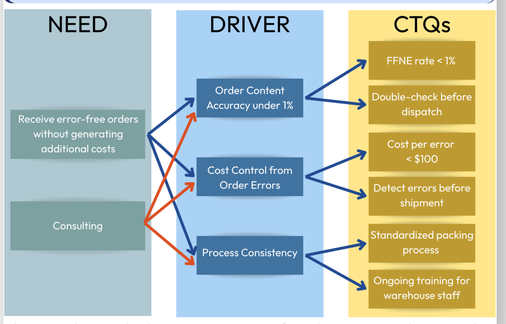
CAMPAING
Sale period in which catalogs with products, promotions, and new launches are offered by consultants to their customers.

Between 2023 and 2025, FFNE levels surged as high as 4.01%—more than four times the ≤1% target—triggering 2,253 claims and exposing the operation to sustained financial loss and service credibility risk. What appeared to be a small percentage deviation translated into thousands of defective orders, revealing a systemic breakdown in fulfillment reliability.

SIPOC

The SIPOC reveals a high-volume, multi-handoff fulfillment process where 57% of critical steps are manual, concentrating FFNE risk in picking and verification operations.

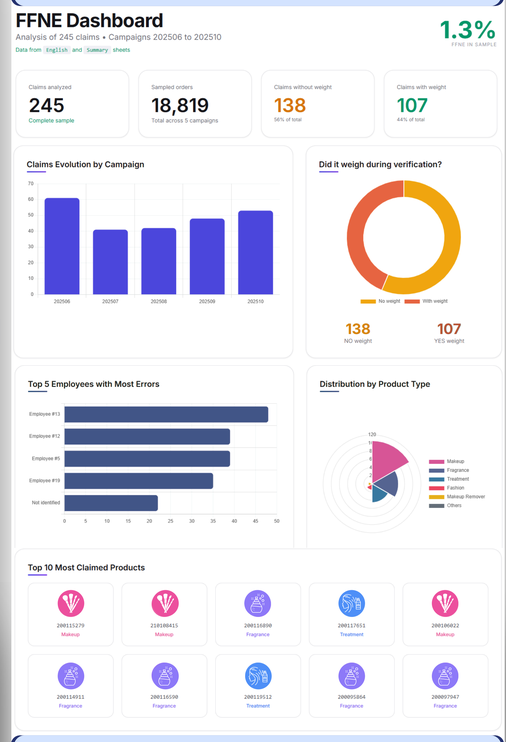
CTQ Analysis



The CTQ analysis translated customer expectations of complete, accurate, and on-time orders into measurable operational requirements. Order accuracy and fulfillment reliability were identified as critical drivers, with FFNE rate established as the primary performance metric. To meet customer expectations, the process must operate at ≤1% FFNE, ensuring physical quantity matches billed quantity and eliminating claim-related discrepancies.

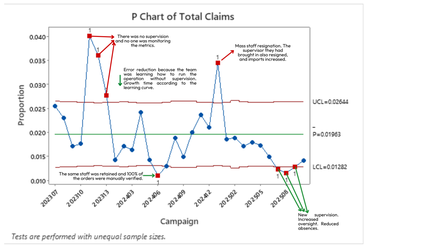
MEASURE

Baseline Data Overview



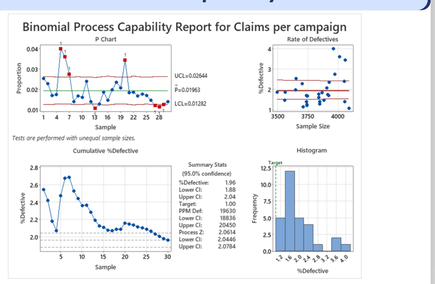
Baseline

FFNE HAS ALWAYS BEEN ABOVE THE 1% TARGET



The P-Chart confirms that FFNE performance consistently exceeded the ≤1% target, with a process average of 1.96% and peaks reaching 4.01%. Multiple points exceeded the upper control limit (UCL = 2.64%), indicating special cause variation and statistical instability. The process was not operating in statistical control, demonstrating high variability and elevated defect exposure during the baseline period.

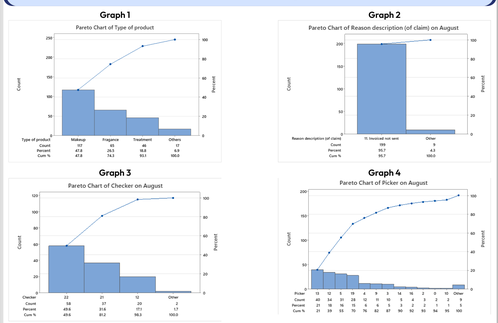
Process Capability



Process capability analysis confirmed that the fulfillment process was not capable of meeting the ≤1% FFNE requirement. With a process mean of 1.96%, performance operated nearly twice the target specification, resulting in a high defect probability per campaign. The calculated defect rate translated into thousands of defective orders annually, demonstrating structural inability to consistently meet customer expectations under current conditions.

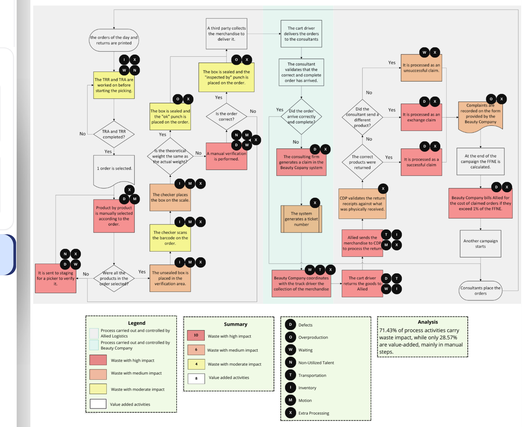
ANALYZE

Pareto Analysis



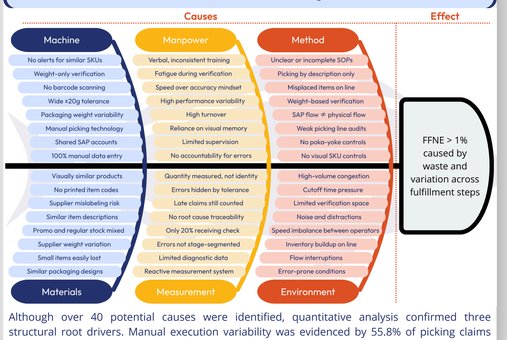
Pareto analysis revealed that 47.8% of claims were concentrated in Makeup products, and 74.3% in the top two product categories, confirming strong defect concentration rather than uniform distribution. Additionally, 95.7% of cases were classified as “Invoiced not sent,” validating that FFNE is primarily an execution failure within fulfillment operations. Performance variability was further concentrated at the individual level, where 81.2% of verification-related claims were linked to two checkers and 55.8% of picking-related claims were generated by three pickers. These findings confirm that FFNE was structurally concentrated within specific product groups and manual execution points, not randomly distributed across the process.

Flowchart and Waste Analysis



The AS-IS process map identified 28 total activities, of which only 8 (28.57%) were value-added, while 20 activities (71.43%) carried measurable waste impact. Within these, 10 were classified as high-impact waste, 6 as medium-impact, and 4 as moderate-impact. Waste concentration was primarily linked to manual picking, verification, and claim processing steps, where defects, extra processing, waiting, and motion were repeatedly observed. Error detection occurs after product selection rather than at the source, structurally increasing defect escape probability. This waste-heavy architecture directly sustains baseline FFNE performance averaging 1.96% and peaking at 4.01%, confirming that process design—not isolated execution—drives variability and claim exposure.

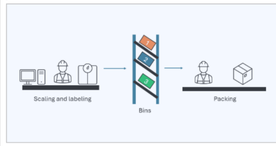
Root Cause Analysis



Although over 40 potential causes were identified, quantitative analysis confirmed three structural root drivers. Manual execution variability was evidenced by 55.8% of picking claims concentrated in three operators and 81.2% of verification claims in two checkers. Limited real-time validation—specifically ±20g weight-only verification and absence of barcode poka-yoke—aligned with 95.7% of claims classified as “Invoiced not sent.” Additionally, 71.43% of mapped activities carried waste impact, sustaining FFNE at 1.96% on average and peaks of 4.01%.

IMPROVE

Upstream Validation



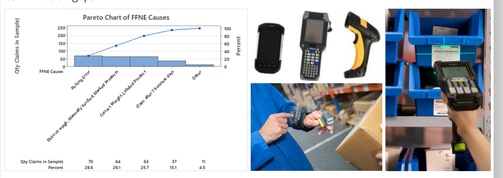
Projected FFNE reduction: 30%–40%.
Projected performance range: 1.18%–1.37%.

Proposal 1 introduces upstream SKU validation through barcode scanning, weight confirmation, automated labeling, and controlled bin staging before packing. This structured intervention directly addresses validated Analyze findings related to manual picking variability, SKU similarity risk, and late defect detection.

Directed Picking Model

Directed Picking Model – Scenario 1 (SAP / RF Integration)

Scenario 1 leverages existing SAP/APESAT infrastructure to enforce SKU validation at the source. RF scanning confirms item identity during picking, and integrated weight validation confirms completeness before verification. This approach strengthens system enforcement using current enterprise platforms, minimizing development risk while significantly reducing manual confirmation gaps.



Projected FFNE reduction: 52%–60%.
Projected performance range: 0.78%–0.94%, archieving the ≤1% CTQ target.

Digital Enforcement Platform – Scenario 2 (Custom WMS)

Scenario 2 introduces a custom-built digital enforcement layer integrating scan + weigh validation with real-time exception control and automated poka-yoke logic. Unlike Scenario 1, this model operates as an independent validation engine designed specifically to eliminate reliance on manual confirmation and maximize structural error prevention.

Projected FFNE reduction: 56%–68%.
Projected performance range: 0.63%–0.86%, archieving the ≤1% CTQ target.

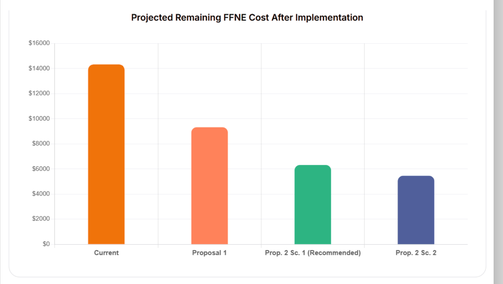
While both scenarios structurally reduce FFNE below the ≤1% requirement, Scenario 1 offers the most balanced risk-to-investment profile, whereas Scenario 2 maximizes long-term scalability and digital enforcement strength.

Financial Impact and ROI

Financial Impact of FFNE Reduction Proposals

Historical FFNE claim costs (202307–202510): **$14,317**

CURRENT SITUATION	Proposal 1	Proposal 2 • Scenario 1 (RECOMMENDED)	Proposal 2 • Scenario 2
$14,317	$3,600	$35,060	$42,500
Total FFNE claim costs (202307 – 202510)	Investment	SAP/APESAT RF Scan	Custom Scan + Weigh MVP
	~35% reduction	Investment (pilot)	Avg. Investment
	$5,011 saved	~56% reduction	~62% reduction
	Payback ~0.7 years	$8,017 saved	$8,877 saved
		Most balanced solution	Payback ~4.8 years
		Payback ~4.4 years (direct)	



Proposal 2 – Scenario 1 is recommended as the most balanced solution to achieve FFNE ≤1% while addressing the vital few root causes.

The financial analysis compares the baseline FFNE cost exposure of $14,317 against three structured improvement scenarios. While Proposal 1 offers a low-investment option with moderate defect reduction, the directed picking model (Proposal 2 – Scenario 1) delivers the strongest balance between investment and savings potential. Projected reductions between 52% and 62% significantly decrease residual claim exposure, positioning the operation to achieve sustainable compliance with the ≤1% performance target.
The comparative analysis demonstrates that structured system enforcement generates materially greater long-term financial protection than incremental manual controls.

CONTROL

System Change that Prevent Backsliding

Four interconnected control measures create barriers that make the improved process the default and protect against regression to old habits.

Standard Work Becomes Default
Update SOPs and work instructions so the improved method becomes official. Applies to order build (picking, packing), product verification, dispatch, and line feed where impacted.

Mandatory CTQ Checkpoints
Critical verifications become required sign-offs before release or dispatch. Clear role handoffs with defined responsibilities: who verifies, who seals, who authorizes release.

Visual + Physical Controls
Critical sequence posted at packing and verification stations. Hold tagging and physical segregation prevent silent release of incomplete orders.

Governance & Ownership
Single process owner accountable for FFNE sustainment and escalation. Clear escalation path when thresholds are exceeded.

Sustainment Enablement: Training + Change Management

Training Approach
Role-based training with floor demonstration and skill validation. Area leads use standard checklists to certify competency through hands-on assessment.

Training Metrics
Qualification completion rate: % of impacted staff certified
Time-to-qualification: Days from training to validation
Requalification compliance: % requalified after 30+ days away, FFNE involvement, or process changes
Repeat-error rate: Same operator repeats same error post-training

Change Management Actions
Document control gates go-live until SOP update and training communication complete. Short shift huddles plus simple status boards (orders, holds, exceptions). Layered process audits with frequent, brief checks per shift.

Key Performance Indicator (KPI)

A. Measurement System

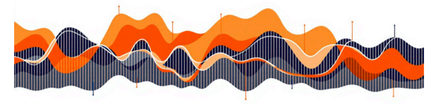
Lagging KPI: FFNE rate = defective orders / total orders (weekly, summarized by campaign)

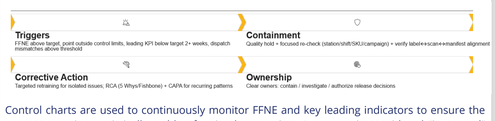
Leading KPIs (escape prevention drivers):
- Verification compliance rate
- Scan-to-manifest match rate (first pass)
- Seal/label integrity compliance
- Hold & resolution cycle time
- First-pass yield at verification (if applicable)

The control system monitors FFNE through a defined measurement structure that includes both lagging and leading indicators. The primary lagging KPI is the FFNE rate per campaign (defective orders divided by total orders). Leading KPIs focus on error prevention performance, including verification compliance, scan-to-manifest match rate, seal integrity, and first-pass yield. These indicators ensure early detection of process drift before claims occur.

B. Stat Control & Stability

Control charts track FFNE and critical leading indicators. **"In control" evidence:** Stable performance with no special-cause signals, sustained across one full campaign cycle. Pre/post comparison with hypothesis testing if data volume allows.





Control charts are used to continuously monitor FFNE and key leading indicators to ensure the process remains statistically stable after implementation. A process is considered “in control” when performance stays within control limits and no special-cause variation signals are detected across a full campaign cycle.
Sustained stability confirms that improvements are embedded structurally rather than temporarily suppressing defects. If performance exceeds the 1% threshold or shows statistical instability, predefined triggers activate containment, investigation, and corrective action protocols.
Process ownership is formally assigned to Operations leadership, with weekly KPI review and campaign-close reporting. Escalation triggers include FFNE exceeding 1%, leading KPI deterioration for two consecutive weeks, or scan-to-manifest misalignment.
Corrective actions include targeted retraining, RCA (5 Whys / Fishbone), and control limit reassessment once stability is reestablished.

Acknowledgments

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