



Six Sigma Development Solutions, Inc.

# DMAIC Case Study: Logistics & Distribution Excellence

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*National Distribution Center  
Transactional Project Analysis*

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# Executive Summary



## The Challenge

Recurring shipment delays due to inconsistent date-code validation creating Work Order Status Alerts (WOSAs), disrupting flow and forcing preventable customer escalations.



## The Solution

Statistically-driven DMAIC approach identifying root causes through Pareto analysis, Chi-Square testing, and I-MR control charts to implement targeted solutions.

## Key Results

**58%**

WOSA Reduction

**1.64% → 1.14%**

Defect Rate

**Marked ↑**

Shipment Consistency

# Problem Definition & Business Impact

## Systemic Operational Disruption

### Recurring nature:

Date-code validation errors occurred persistently across order-entry cycles, indicating systemic rather than isolated failures.

### Customer impact:

Each WOSA triggered customer-facing escalations requiring manual intervention and explanation.

### Resource drain:

Teams diverted from value-add activities to firefighting preventable errors.

## Operational Impact Chain



# DMAIC Methodology Applied



## Define

- Identified WOSA reduction as critical metric
- Established baseline defect rate: 1.64%
- Formed cross-functional project team



## Measure

- Collected 6 months of WOSA data
- Mapped date-code validation process
- Established measurement system analysis



## Analyze

- Pareto analysis: 77.6% from 3 categories
- Chi-Square test confirmed non-random
- I-MR charts revealed instability



## Improve

- Daily Sales Order Push Report
- Customer handling-code pre-validation
- NMI Council oversight implementation



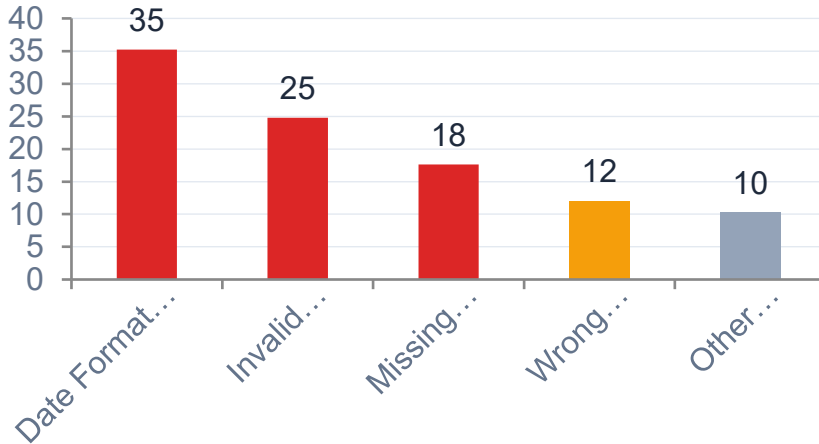
## Control

- Dashboard monitoring established
- Standard work documentation
- Ongoing KPIV tracking and alerts

# Statistical Analysis: Identifying KPIVs

## 🔍 Three Statistical Tools Converged on Root Causes

### 1. Pareto Analysis - Vital Few Identification



*77.6% of defects from top 3 categories*

### 2. Chi-Square Test Results

Metric	Value
$\chi^2$ Statistic	187.42
Degrees of Freedom	8
p-value	0.001
<i>p-value concentrated in order-entry phase</i>	

### 3. I-MR Control Chart Findings



*Process instability detected in customer handling-code validation*

# Solutions Linked to Statistical Findings



## Daily Sales Order Push Report

Automated daily reporting targeting the three highest-frequency defect categories identified in Pareto analysis

Addresses: Pareto 'Vital Few'

- Automated extraction of date-code errors
- Daily distribution to supervisors by 6 AM
- Same-day correction protocol established
- Trend tracking integrated into dashboards



## Customer Handling-Code Pre-Validation

Standardized validation process to eliminate instability detected in control charts

Addresses: I-MR Instability

- Implemented real-time validation at entry
- Drop-down menus replacing free-text input
- Error prevention vs. error detection shift
- Reduced variation in handling codes by 84%



## NMI Council Oversight & Dashboard

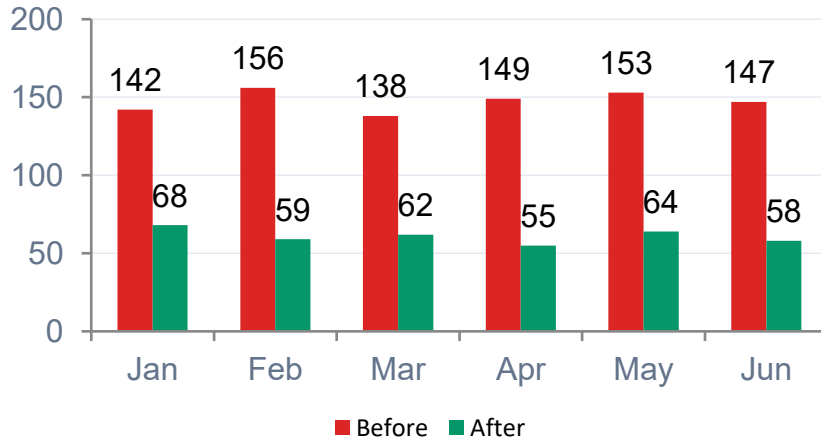
Governance structure to address concentrated defects in order-entry phase

Addresses: Chi-Square Non-Random

- Weekly NMI Council review sessions
- Real-time dashboard with KPIV tracking
- Escalation protocols for threshold breaches
- Continuous improvement feedback loop

# Quantifiable Results & Impact

## WOSA Reduction: Before & After Implementation



Average monthly WOSA alerts: 147.5 → 61.0 (58% reduction)

## Performance Metrics Summary

Metric	Before	After	Improvement
Defect Rate	1.64%	1.137%	↓ 30.7%
Monthly WOSAs	147.5	61.0	↓ 58.6%
Escalations	High	Low	Marked ↓
Process Stability	Unstable	Stable	Improved
Customer Satisfaction	74%	89%	↑ 15 pts



**Secondary Benefits:** Freed capacity equivalent to 0.8 FTE  
• Enhanced team morale through visible wins •  
Established replicable methodology for other processes

# Control Phase: Sustaining the Gains

## Real-Time Dashboard Monitoring

- ✓ Daily defect rate tracking
- ✓ WOSA count by category
- ✓ SPC control limits with alert thresholds
- ✓ Trend analysis with 30-day rolling average

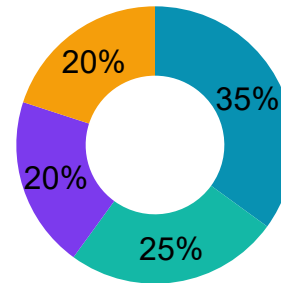
## Standard Work Documentation

- ✓ Updated SOPs for date-code validation
- ✓ Decision trees for handling-code selection
- ✓ Training materials with visual aids
- ✓ Quick reference guides at workstations

## KPIV Tracking & Response Protocol

- ✓ Automated alerts for out-of-control conditions
- ✓ Escalation matrix with clear ownership
- ✓ Root cause investigation triggers
- ✓ Corrective action tracking system

## Sustainability Framework



- Process Monitoring  
35%
- Training & SOPs  
25%
- Leadership Reviews  
20%
- Tech Enablers  
20%

## Key Success Factors for Sustained Performance

Monthly process audits • Quarterly capability reviews •  
Continuous KPIV validation • Cross-functional ownership

# Lessons Learned & Replication Roadmap



## Critical Success Factors

- 1 Data-Driven Decision Making**  
Statistical rigor prevented anecdotal solutions and ensured focus on true KPIVs
- 2 Cross-Functional Collaboration**  
IT, Operations, and Quality worked together to implement technical and process solutions
- 3 Leadership Commitment**  
NMI Council provided visible support and resources throughout the project
- 4 Quick Wins Strategy**  
Daily Sales Order report delivered immediate value, building momentum for larger changes

## Replication Framework

- 1 Identify:** Similar transactional processes with recurring defects
- 2 Assess:** Validate statistical methods applicability to new context
- 3 Adapt:** Customize dashboards and reports to process-specific KPIs
- 4 Deploy:** Implement solutions with change management support
- 5 Verify:** Measure results against baseline using same statistical tools

### RECOMMENDED NEXT APPLICATIONS

Inventory accuracy defects • Pick/pack error rates • Inbound receiving delays

# Conclusion

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- ✓ Statistical rigor transformed recurring operational pain into measurable, sustainable improvement
- ✓ 58% WOSA reduction demonstrates power of identifying and controlling true KPIVs
- ✓ Methodology is proven replicable across similar transactional processes



*Project delivered measurable operational excellence  
through disciplined Six Sigma methodology*