

MINI PROJECT

LEAN SIX SIGMA YELLOW BELT

REDUCING INSURANCE CLAIM PROCESSING ERRORS

USING LEAN SIX SIGMA DMAIC

*Improving Process Accuracy,
Reducing Errors, and Delivering
Value to Customers*



BACKGROUND

Insurance claim processing is a critical service activity that directly affects customer satisfaction, operational efficiency, and financial performance. The process involves receiving claim documents, verifying customer information, validating benefit coverage, and making payment decisions.

However, variations in the claim verification process may generate errors such as incorrect claim approval, payment mistakes, and rework activities. These defects increase operational costs and may reduce customer trust.

Based on historical data, the claim processing operation handled approximately **312,000** claims annually with **4,898** claim errors, resulting in an error rate of **1.5%**. Therefore, a Lean Six Sigma DMAIC project was initiated to identify root causes and improve process accuracy.



CLAIM PROCESS OVERVIEW



BUSINESS PROBLEM / PROBLEM STATEMENT

The insurance claim processing process is experiencing a high error rate of **1.5%**, causing incorrect claim decisions, additional rework, increased operational costs, and potential customer dissatisfaction.

CURRENT CONDITION (BASELINE)



BUSINESS IMPACT

-  Additional verification and correction activities (rework)
-  Potential financial losses due to incorrect payments
-  Reduced customer satisfaction and trust
-  Increased operational workload and cost



PROJECT OBJECTIVE

To reduce insurance claim processing errors from **1.5%** to below **0.8%** using Lean Six Sigma DMAIC methodology.

1.5%
Error Rate



DMAIC
Approach



≤ 0.8%
Error Rate
(Target)

LEAN SIX SIGMA PROJECT CHARTER

Mini Project – Yellow Belt

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REDUCING INSURANCE CLAIM PROCESSING ERRORS



BUSINESS CASE

High claim processing errors create rework, additional operational costs, and customer dissatisfaction. Improving claim accuracy will increase service quality and process efficiency.



PROBLEM STATEMENT

The insurance claim process has an error rate of **1.5%**, causing incorrect claim decisions and additional correction activities.



PROJECT GOAL

Reduce claim processing errors from **1.5%** to below **0.8%** using Lean Six Sigma DMAIC methodology.



EXPECTED BENEFITS

- Reduce defects and rework
- Minimize operational cost
- Improve customer satisfaction
- Increase process efficiency and accuracy

CURRENT CONDITION (BASELINE)



1.5%
Error Rate

- 312,000 claims / year
- 4,898 errors / year
- Sigma Level: **3.66 σ**

IMPROVEMENT JOURNEY

Lean Six Sigma DMAIC



DEFINE



MEASURE



ANALYZE



IMPROVE



CONTROL

PROJECT INFORMATION



SCOPE (IN)

Claim document verification, data entry, claim validation, payment decision process.



SCOPE (OUT)

Customer medical treatment process and insurance policy design.



BASELINE PERFORMANCE

- Total claims processed : **312,000** / year
- Claim processing errors : **4,898** / year
- Error rate : **1.5%**



KEY METRICS (CTQ)

- Claim error rate (%)
- Rework cases
- Number of defects
- Customer complaints



METHODOLOGY

Lean Six Sigma DMAIC
(Define – Measure – Analyze – Improve – Control)



PROJECT DURATION

3 Months



PROJECT TEAM

Project Champion, Process Owner, Quality Team, Claim Processor, Data Analyst



PROJECT SPONSOR

Operations Manager

TARGET CONDITION



≤ 0.8%
Error Rate

Error rate reduced to below **0.8%** within 3 months.



This project aims to deliver better quality, lower cost, and higher customer satisfaction through effective process improvement.

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MEASURE PHASE

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REDUCING INSURANCE CLAIM PROCESSING ERRORS

PARETO ANALYSIS OF CLAIM PROCESSING ERRORS

Pareto analysis is used to identify and prioritize the most significant types of claim processing errors that contribute to the overall defects.

No.	Type of Error	Number of Errors	Percent (%)	Cumulative Percent (%)
1	Incomplete / Missing Documents	1,710	34.9%	34.9%
2	Incorrect Data Entry	1,260	25.7%	60.6%
3	Benefit / Coverage Miscalculation	870	17.8%	78.4%
4	Incorrect Patient Information	540	11.0%	89.4%
5	Duplicate Claim Submission	270	5.5%	94.9%
6	Incorrect Coding / Procedure Code	150	3.1%	98.0%
7	Others	98	2.0%	100.0%
TOTAL		4,898	100.0%	



KEY FINDINGS

- The top 3 error types (Incomplete/Missing Documents, Incorrect Data Entry, and Benefit/Coverage Miscalculation) contribute to **78.4%** of total claim processing errors.
- Improvement efforts should focus on these critical few causes to achieve the greatest impact.

ERROR RATE (DEFECT RATE)

$$\text{Error Rate} = \frac{\text{Total Defects}}{\text{Total Opportunities}} \times 100\%$$

$$= \frac{4,898}{312,000} \times 100\% = 1.5\%$$

DPMO CALCULATION

$$\begin{aligned}\text{DPMO} &= \text{Error Rate} \times 1,000,000 \\ &= 1.5\% \times 1,000,000 \\ &= 15,000 \text{ DPMO}\end{aligned}$$

SIGMA LEVEL (LONG TERM)

$$\text{DPMO} = 15,000$$

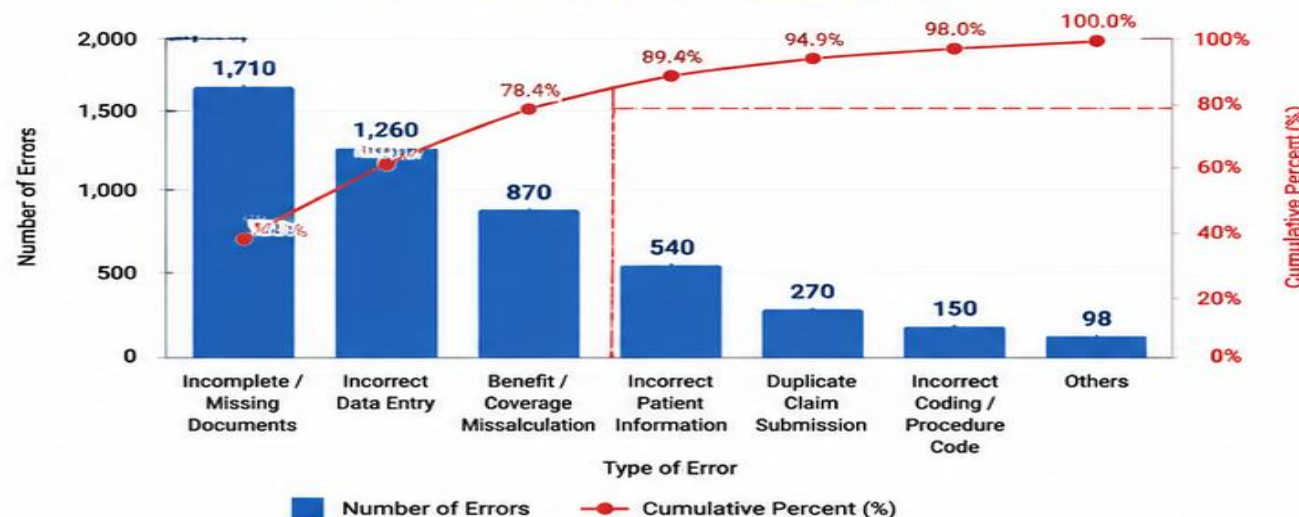


$$\text{Sigma Level} = 3.66 \sigma$$

DATA SUMMARY

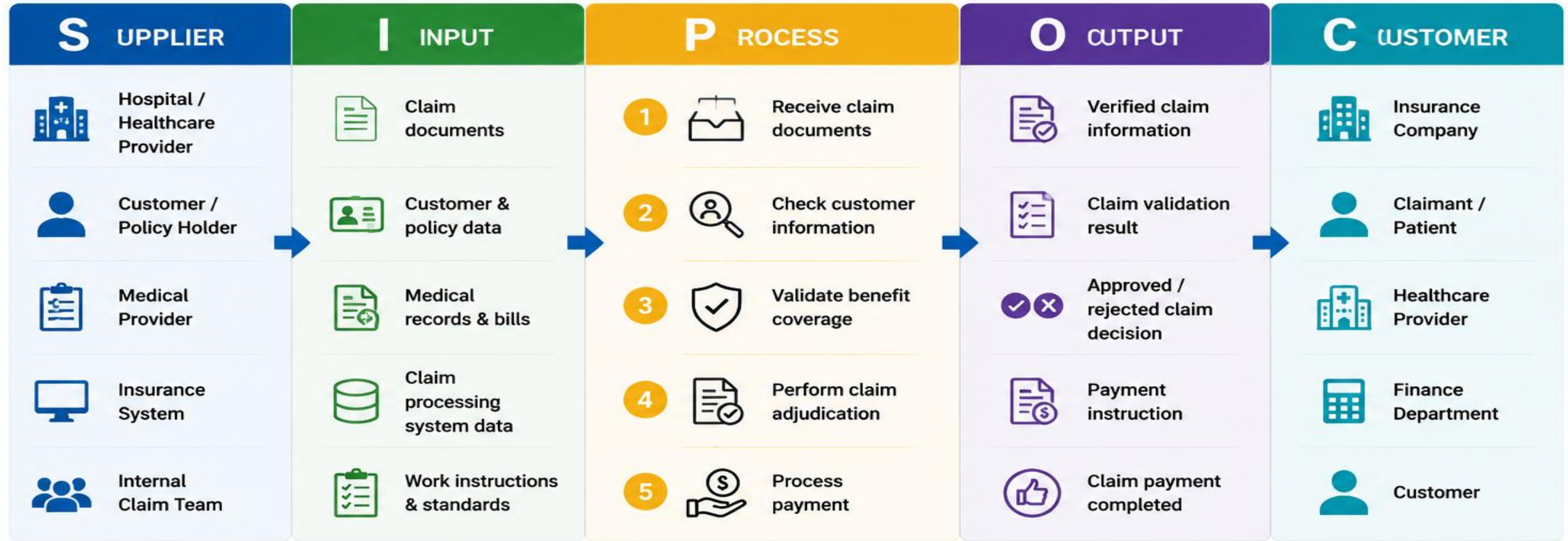
	Total Claims Processed (Opportunities)	312,000 claims / year
	Total Claim Processing Errors (Defects)	4,898 errors / year
	Error Rate (Defect Rate)	1.5%
	Observation Period	January – December 2024 (12 Months)

PARETO CHART OF CLAIM PROCESSING ERRORS



SIPOC – INSURANCE CLAIM PROCESSING

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PROCESS SCOPE

Start: Receive claim documents

End: Claim payment completed

CRITICAL REQUIREMENTS (CTQ)



Claim accuracy



Correct payment decision



Fast processing time



Minimum claim errors

PROJECT FOCUS

Reduce claim processing errors from **1.5%** to **≤0.8%** using Lean Six Sigma DMAIC.



MEASURE PHASE

Lean Six Sigma Yellow Belt Mini Project

REDUCING INSURANCE CLAIM PROCESSING ERRORS

1. DATA SUMMARY

	Total Claims Processed (Opportunities)	312,000 claims / year
	Claim Processing Errors (Defects)	4,898 errors / year
	Error Rate (Defect Rate)	1.5%
	Observation Period	January – December 2024 (12 Months)
	Process	Insurance Claim Processing

2. CALCULATION: DPMO

$$\text{DPMO} = \frac{\text{Total Defects}}{\text{Total Opportunities} \times \text{Opportunities per Unit}} \times 1,000,000$$

Assumption:
Opportunities per Claim (Unit) = 1
(Satu klaim hanya dinilai 1 peluang untuk error)

Total Defects	= 4,898
Total Opportunities	= 312,000
Opportunities per Unit	= 1

$$\text{DPMO} = \frac{4,898}{312,000 \times 1} \times 1,000,000 = 15,698 \text{ DPMO}$$

3. CALCULATION: ERROR RATE

$$\text{Error Rate (Defect Rate)} = \frac{\text{Total Defects}}{\text{Total Opportunities}} \times 100\%$$

Total Defects	= 4,898
Total Opportunities	= 312,000

$$\text{Error Rate} = \frac{4,898}{312,000} \times 100\% = 1.5\%$$

4. CALCULATION: SIGMA LEVEL (LONG TERM)

Step 1: Convert DPMO to Defect Rate

$$\begin{aligned} \text{Defect Rate} &= \frac{\text{DPMO}}{1,000,000} \\ &= \frac{15,698}{1,000,000} \\ &= 0.015698 \end{aligned}$$

Step 2: Convert Defect Rate to Z (Short Term)

$$\begin{aligned} Z (\text{Short Term}) &= \text{NORMSINV}(1 - 0.015698) \\ &= 2.19 \end{aligned}$$

Step 3: Adjust for 1.5 Sigma Shift (Long Term)

$$\begin{aligned} Z (\text{Long Term}) &= Z (\text{Short Term}) + 1.5 \\ &= 2.19 + 1.5 \\ &= 3.69 \sigma \end{aligned}$$

$$\text{SIGMA LEVEL (LONG TERM)} = 3.66 \sigma$$

5. MEASURE PHASE SUMMARY



The current claim processing error rate is **1.5%**, which equals **15,698 DPMO** and a sigma level of **3.66 σ** (long term). This performance is below the target and requires improvement.

CURRENT CONDITION

1.5%
Error Rate

15,698
DPMO

3.66 σ
Sigma Level



TARGET CONDITION

≤ 0.8%
Error Rate

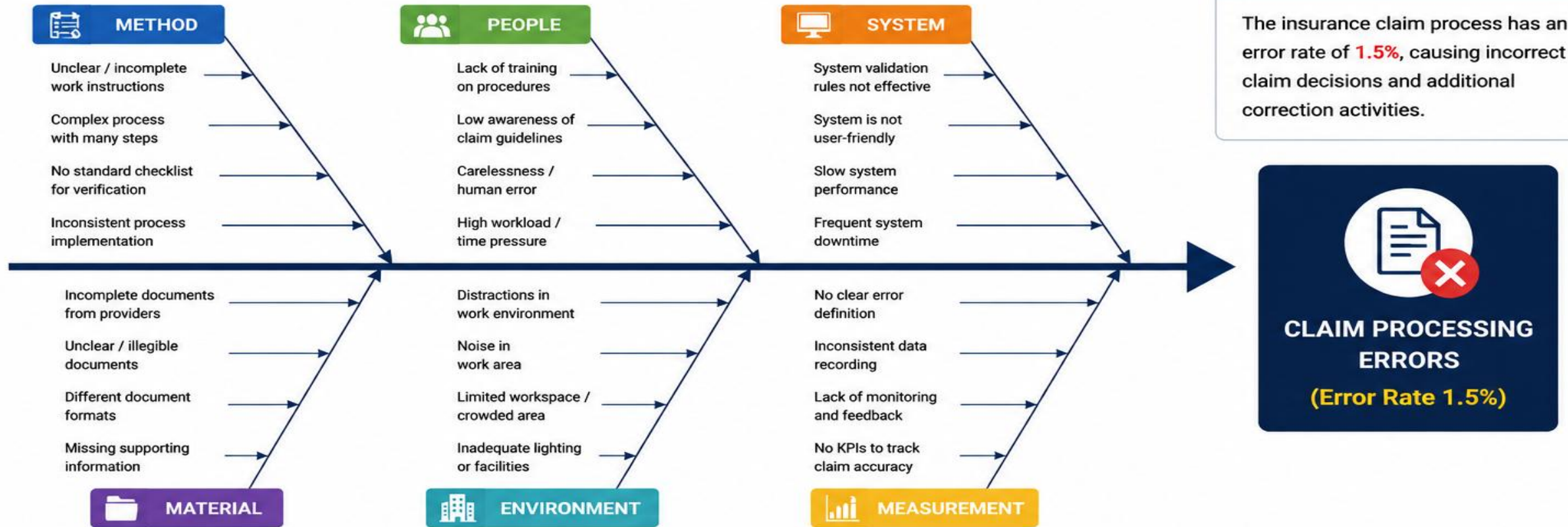
≤ 8,000
DPMO

≥ 4.0 σ
Sigma Level



REDUCING INSURANCE CLAIM PROCESSING ERRORS

CAUSE AND EFFECT DIAGRAM (FISHBONE)



KEY INSIGHTS

- The main causes of claim processing errors come from Methods, People, and Materials.
- Incomplete or unclear documents, human error, and complex procedures are the most influential factors.



NEXT STEP

Prioritize root causes using a Pareto chart and select vital few causes for improvement.



REDUCING INSURANCE CLAIM PROCESSING ERRORS



IMPROVEMENT PLAN

This plan outlines the key actions, responsible owners, supporting visuals, and schedule for implementing solutions to eliminate root causes and reduce claim processing errors.

No.	Root Cause Addressed	Improvement Action	Improvement Action (Detail)	PIC (Owner)	Supporting PIC	SCHEDULE				Status
						May 2024	Jun 2024	Jul 2024	Aug 2024	
1	 Incomplete / unclear documents	Standardize Document Checklist	Create and implement a standard claim document checklist for all claim types to ensure completeness before processing.	 Claims Team						 Done
2	 Lack of training / human error	Training & Competency Program	Conduct training on claim guidelines, system usage, and common errors. Assess competency after training.	 HR & Claims Team						 Done
3	 System validation rules not effective	Enhance System Validation Rules	Add mandatory fields, logic checks, and alerts to prevent incorrect or incomplete data entry.	 IT Team						 Done
4	 Complex process / many steps	Simplify Process Workflow	Remove non-value-added steps, combine approvals, and reduce handoffs to streamline the process.	 Process Excellence						 Done
5	 No standard checklist for verification	Implement Verification Checklist	Introduce a verification checklist before claim approval to ensure consistency and accuracy.	 QC Team						 Done

 Plan / In Progress  Completed



Note: All planned improvement actions will be monitored and reviewed regularly to ensure successful implementation and achievement of the expected results.



REDUCING INSURANCE CLAIM PROCESSING ERRORS

Metric	Definition / Formula	Before Improvement (Baseline)	After Improvement (Post Implementation)	Improvement	% Improvement
Total Claims Processed (Opportunities)	Number of claims processed per year	312,000 claims / year	315,000 claims / year	+3,000 claims / year	+0.96% ↑
Total Errors (Defects)	Number of claim processing errors per year	4,898 errors / year	2,160 errors / year	-2,738 errors / year	-55.9% ↓
Error Rate (Defect Rate)	$\frac{\text{Total Errors}}{\text{Total Claims Processed}} \times 100\%$	1.50%	0.69%	-0.81 percentage points	-54.0% ↓
DPMO (Defects Per Million Opportunities)	$\frac{\text{Total Errors}}{\text{Total Opportunities}} \times 1,000,000$	15,698	6,857	-8,841 DPMO	-56.4% ↓
Sigma Level (Long Term)	Calculated using DPMO (with 1.5σ shift)	3.66 σ	4.34 σ	+0.68 σ	+18.6% ↑



SUMMARY

After implementation of improvement actions, the error rate decreased by 55.9%, DPMO improved by 56.4%, and the Sigma level increased from 3.66 σ to 4.34 σ.

REDUCING INSURANCE CLAIM PROCESSING ERRORS

The Control phase ensures the sustainability of improvements by standardizing processes, monitoring performance, and taking appropriate actions when deviations occur.

1. STANDARDIZATION



All effective improvement actions are standardized to ensure consistent execution and to prevent the return of errors.

Standardized Item	Description	Reference / Document	Owner	Date Issued
Claim Document Checklist	Standard checklist for all claim types	STD-CLM-001 (Checklist)	Claims Team	May 10, 2024
Training & Competency Program	Guidelines for training, evaluation, and competency assessment	STD-TRN-001 (Training SOP)	HR & Claims Team	May 15, 2024
System Validation Rules	Mandatory fields, logic checks, and validation rules	STD-SYS-001 (System Rules)	IT Team	May 20, 2024
Process Workflow	Standard process flow with roles & handoffs	STD-PRO-001 (Process Map)	Process Excellence	May 25, 2024
Verification Checklist	Checklist for verification before claim approval	STD-VER-001 (Verification)	QC Team	May 25, 2024

RESPONSE PLAN (WHEN DEVIATION OCCURS)

Condition	Detection Method	Reaction Plan	Responsible	Escalation
Error Rate > UCL (2.20%)	P Chart weekly monitoring	- Investigate root cause immediately - Implement containment action - Update risk assessment if needed	QC Team Process Owner	Escalate to Process Excellence Manager if not resolved within 3 days
Mandatory field validation failure	System alert / Error log	- Review and fix system rule - Retest and confirm - Communicate update to users	IT Team	Escalate to IT Manager if issue persists
Checklist non-compliance > 2 occurrences	Audit / Verification check	- Reinforce training - Coach the team - Re-audit	Claims Team Lead HR	Escalate to Department Manager

5. SUSTAINABILITY CHECK



Process is documented and standardized

Yes



KPIs are monitored regularly

Yes



Team is trained and competent

Yes



Issues are detected and addressed quickly

Yes



CONTROLLED & SUSTAINED

The process is under control, performance is stable, and improvements are sustained.



ERROR RATE

0.69%

(vs 1.50% Before)



DPMO

6,857

(vs 15,698 Before)



SIGMA LEVEL (LT)

4.34 σ

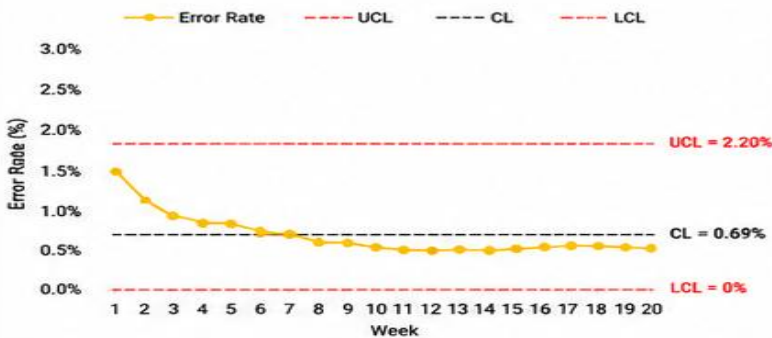
(vs 3.66 σ Before)

2. ONGOING MONITORING



Key process metrics are monitored regularly to ensure sustained performance.

P Chart – Error Rate Over Time



Monitoring Plan

Metric	Error Rate, DPMO, Sigma Level
Frequency	Weekly
Data Source	Claims System
Chart Type	P Chart
Owner	QC Team
Review Meeting	Weekly Operational Review

4. CONTROL ACTIVITIES



Ongoing activities to maintain and sustain the improvements.



Standard Work Compliance: Ensure all team members follow standardized processes and checklists.



Training & Competency: Conduct refresher training every 6 months or as needed.



Internal Audit: Perform monthly process audits to ensure compliance.



Performance Review: Review KPI trends in weekly operational meetings.



Document Control: Maintain and update all standard documents as needed.



Continuous Improvement: Identify new opportunities for further improvement.