

Reduction in % of Accounts Receivable > 90 Days in Health Care Revenue Cycle Management

Mohana Parvathy

ROADMAP



OVERVIEW

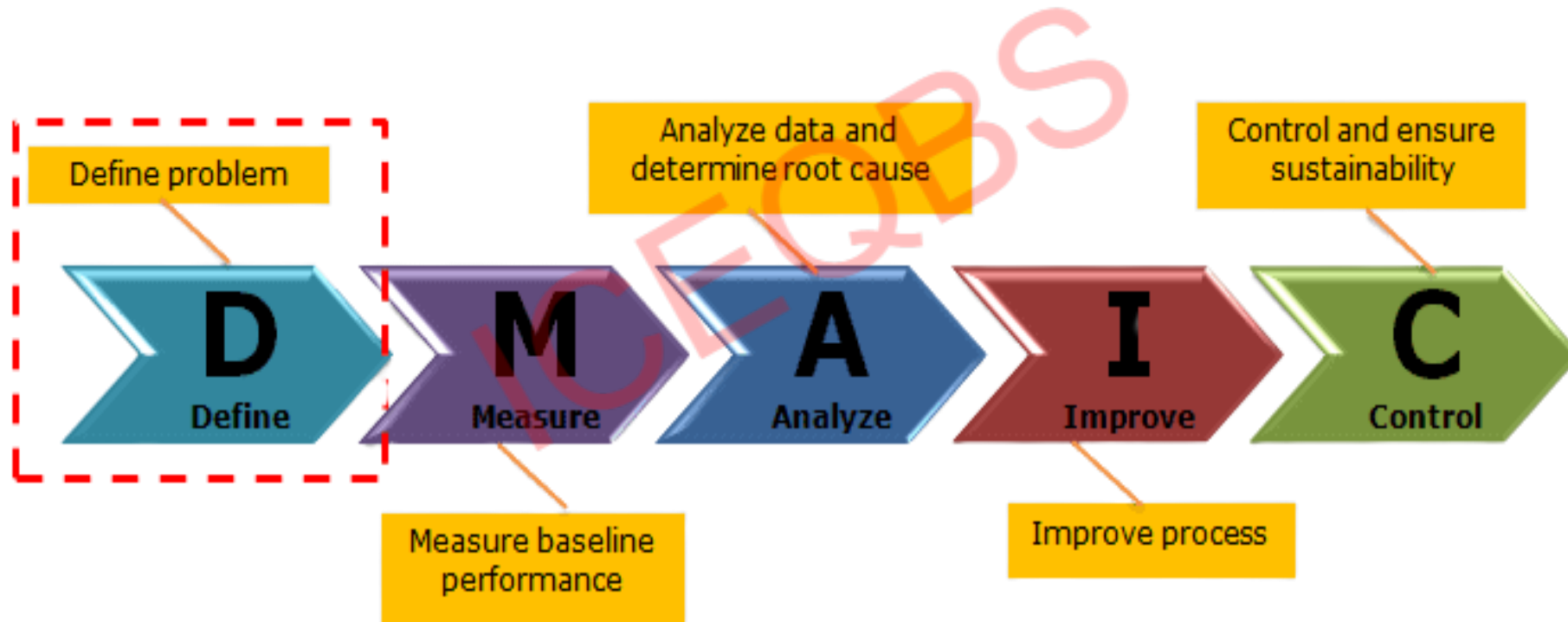


Background

Over the past nine months, the Accounts Receivable (A/R) aging above 90 days has averaged 5%, delaying cash flow, increasing bad debt risk, and indicating inconsistency in the follow-up process. Reducing the aged receivables to 3% or lower within 12 weeks will enhance liquidity, improve working capital, and strengthen financial stability.

Streamlining and standardizing the A/R follow-up through Lean Six Sigma will help identify root causes, eliminate inefficiencies, and ensure timely collections. This improvement will not only accelerate cash inflows and reduce rework but also enhance payer relationships, boost team productivity, and contribute to long-term operational and financial excellence.

DEFINE PHASE



CTQ Tree :

Voice of customer	Critical to X	Primary Metric for improvement
"Our Accounts Receivable (A/R) aging reports show too many accounts in 90+ day buckets"	CTC – Timely and accurate follow-up on claims not happening will result in bad debts not collected	Primary Metric - Y = % of A/R Over 90 Days Secondary Metric - Productivity

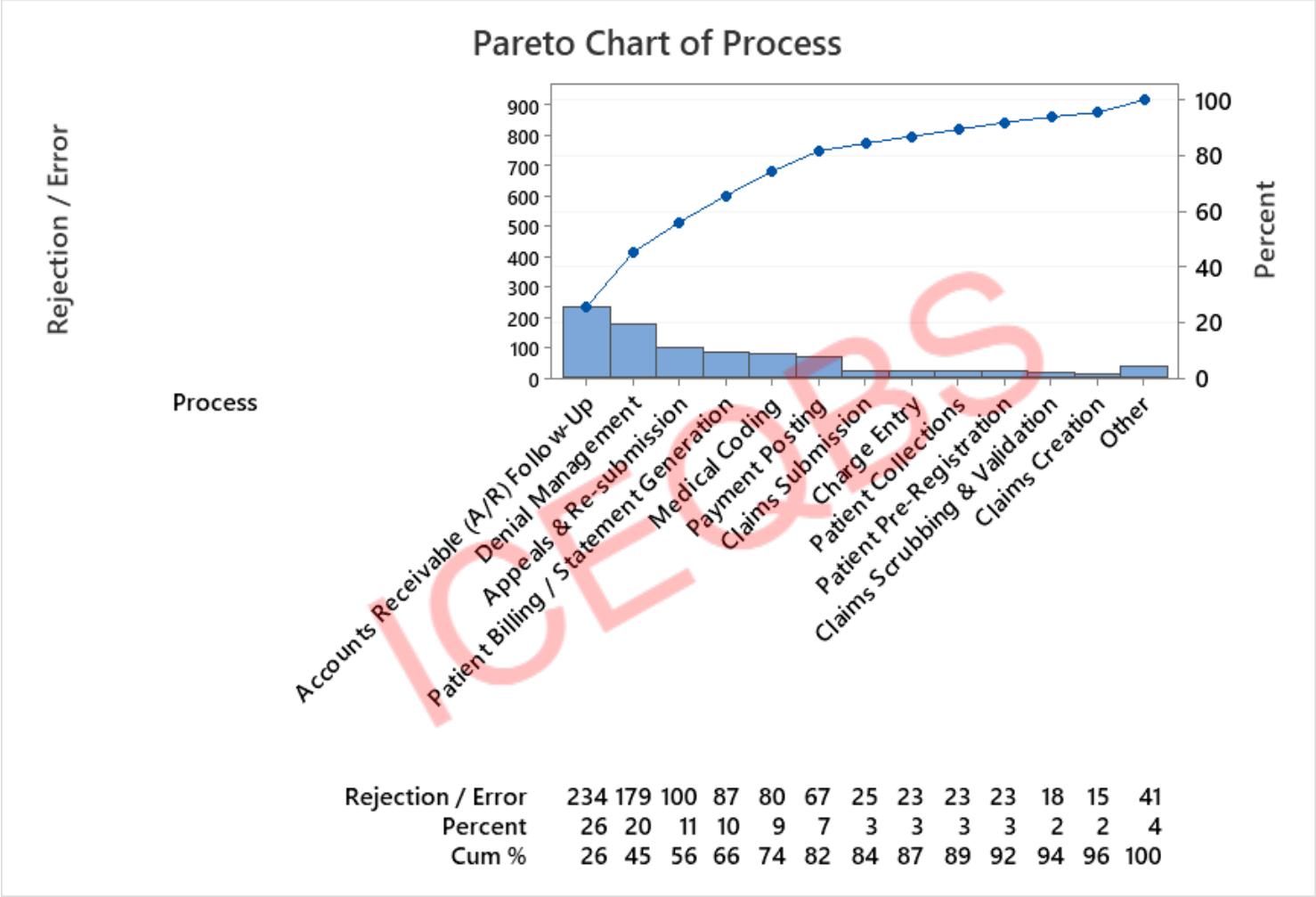
Baseline Performance of Primary Metric (9 months data as Bar chart)



Inference :

- Last 9 months percentage data shows a significant variation and hence ideal problem to be taken up as a Six Sigma Project.

Pareto chart



Inference :

- Accounts Receivable follow ups contributes substantially for the scrap and included in the scope of the project

SIPOC

S (Suppliers)	I (Inputs)	P (Process Steps)	O (Outputs)	C (Customers)
- Patient Registration Team	- Patient Demographics	1. Retrieve aged accounts (A/R > 90 days)	- Updated aged A/R report	- Finance / Management
- Insurance Payers	- Insurance Eligibility Information	2. Analyze outstanding claims and reasons for delays	- Prioritized follow-up list	- Billing/RCM Team
- Billing Department	- Billing and Claims Data	3. Contact payers and resolve claim issues	- Resolved claims and updated payment status	- Healthcare Providers (clients)
- IT / Data Team	- Payment Posting Data	4. Document follow-up actions and outcomes	- Reduced % of A/R > 90 days	- Patients / Guarantors
- Denial Management Team	- Denial and Appeal Records	5. Escalate unresolved claims for appeals	- Clean and updated accounts receivable	- Insurance Companies

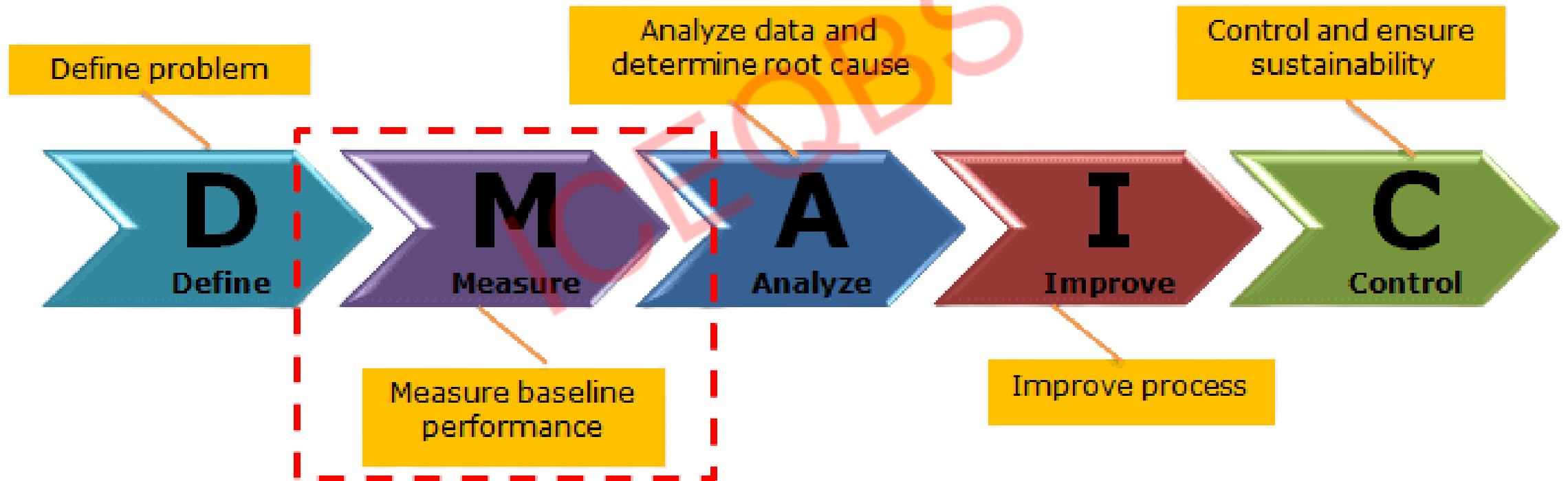
Project Charter

Project Title:		Reduction in % of Accounts Receivable > 90 Days in Health Care Revenue Cycle Management		
Project Leader			Project Team Members:	
Mohana Parvathy			A/R Analysts, Billing Staff, IT Rep Compliance / Quality Analyst Automation / Reporting Specialist	
Champion/Sponsors:			Key Stake Holders	
RCM Director / Operations Head			RCM Director / Operations HeadA/R Department Supervisor	
Problem Statement:			Goal Statement:	
Over the past 9 months, the percentage of Accounts Receivable (A/R) aging over 90 days has averaged 5%, with fluctuations ranging from 3.6% to 6.7%. This level of aged receivables delays cash flow, increases the risk of bad debt, and indicates inconsistency in the A/R follow-up process.			To reduce the % of A/R over 90 days from the current average of 5% to 3% or lower within the next 12 weeks, by identifying root causes and implementing process improvements in the A/R follow-up function.	
Secondary Metric			Assumptions Made:	

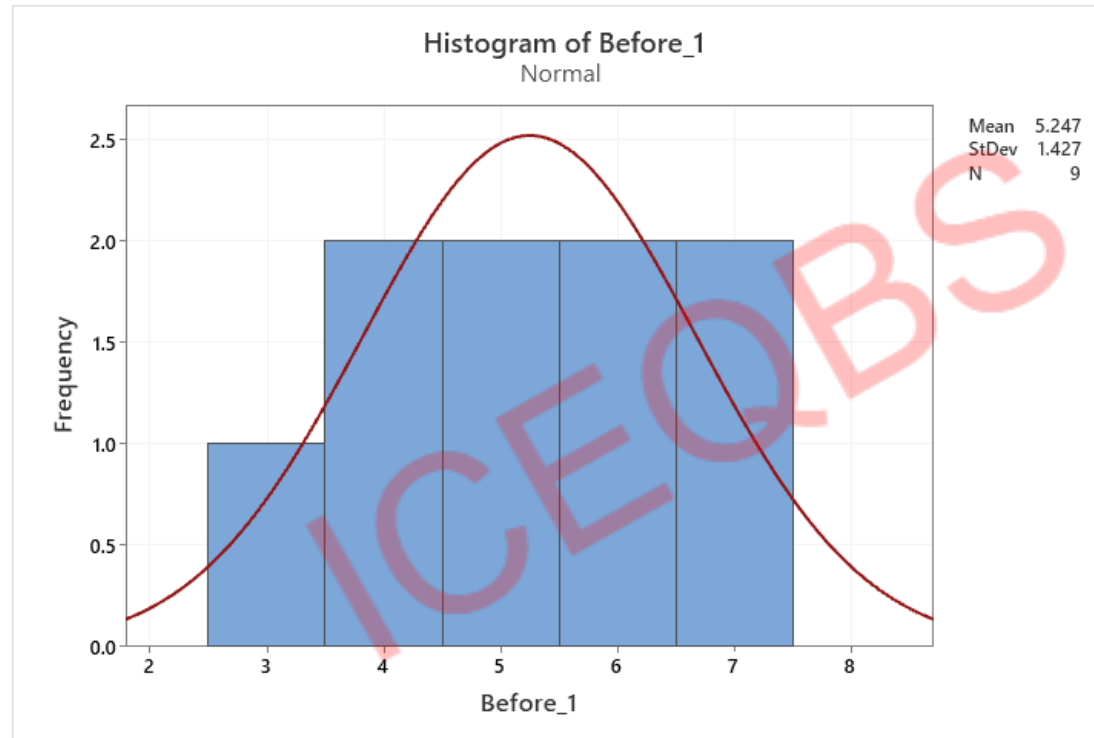
Project Charter

Tangible and Intangible Benefits:		Risk to Success:		
Improved collections and cash flow Lower write-off rates Higher net collection rate (NCR) Reduced burden on A/R staff				
In Scope:		Out of Scope:		
A/R follow-up on claims aged 60–90 days Claims across all payer types (commercial, govt) Follow-up strategies, automation, and workflow		Front-end processes like registration & eligibility Coding and charge capture processes Patient balance collections		
Signatories:		Project Timeline:		
RCM Director / Operations Head				
		Phase	Timeline	Activities
		Define	Week 1	Charter creation, stakeholder alignment
		Measure	Weeks 2–3	Baseline data collection, control charts
		Analyze	Weeks 4–5	Root cause analysis (Fishbone, 5 Whys, etc.)
		Phase	Timeline	
		Define	Week 1	
		Measure	Weeks 2–3	
		Analyze	Weeks 4–5	

MEASURE PHASE



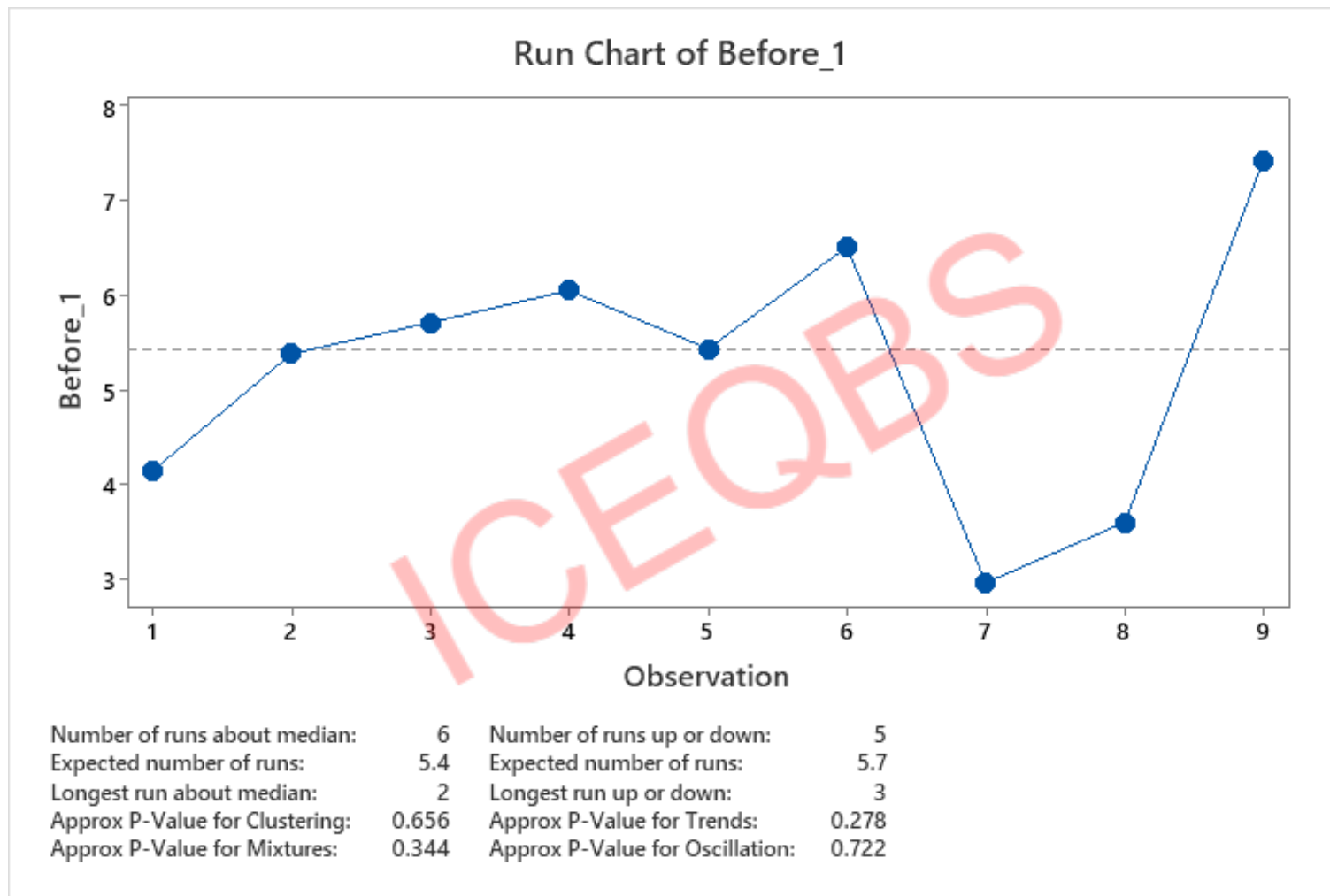
Data collection – Histogram (Before improvement)



Inference :

- Data is normally distributed over the mean

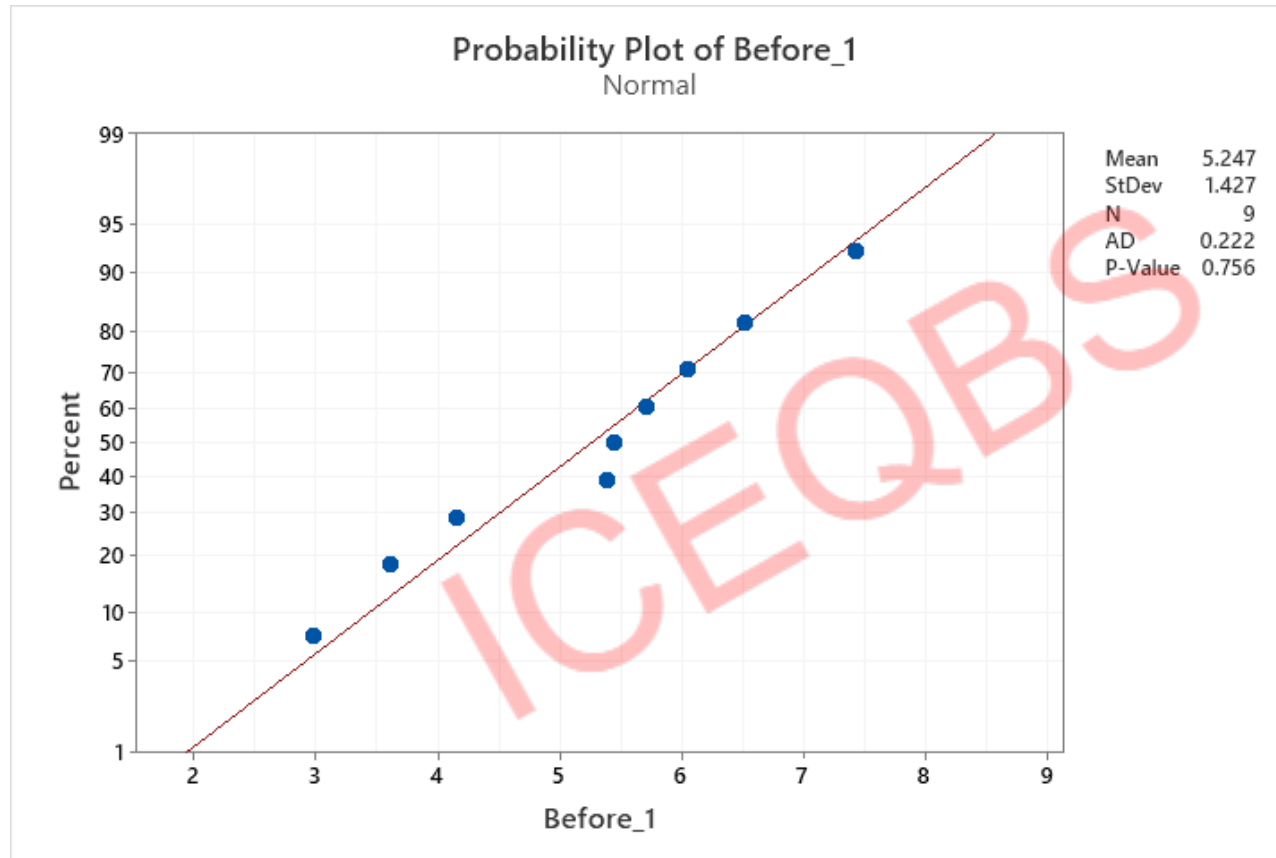
Data collection – Run Chart (Before improvement)



Inference :

$P > 0.05$ – No special causes in the process. Data can be used for further analysis

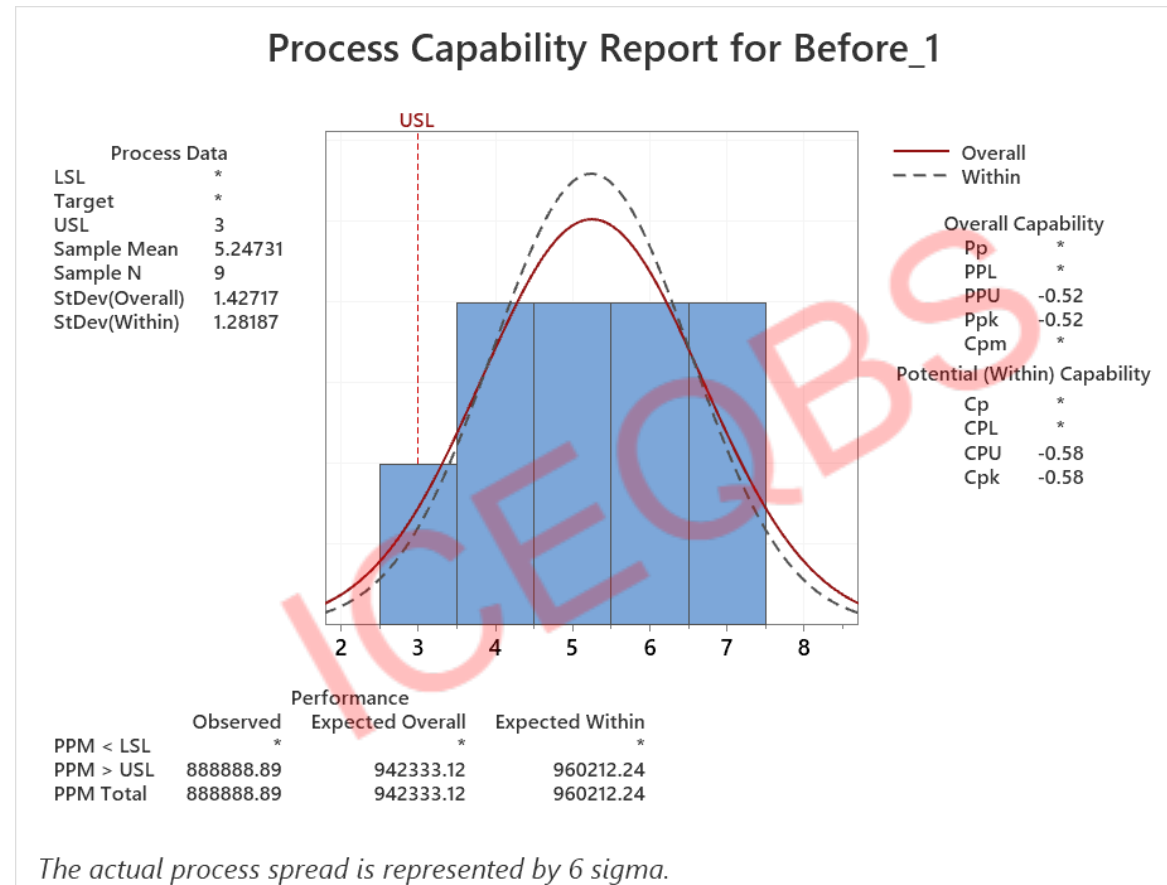
Data collection – Normality plot (Before improvement)



Inference :

- $P > 0.05$ in all scenarios, thus all the data is normally distributed

Data collection – Process capability (Before improvement)



Inference :

- CpK is negative. Process is highly incapable

3M Analysis for Waste

MUDA

- Repeated follow-ups on already paid claims due to delayed system updates.
- Manual data entry of claim details already available in another system.
- Waiting for payer responses due to poor follow-up scheduling or missed windows.

Mura

- Some claims are followed up within 7 days, others after 30+ days — no standard cycle.
- A/R staff performance varies significantly due to lack of SOPs or training.
- Claim volumes fluctuate across days without balancing workload, leading to backlogs.

Muri

- A single A/R analyst handling 200+ accounts daily due to understaffing.
- No automation, leading to manual tracking of aging claims in spreadsheets.
- Follow-up staff spending excessive time navigating multiple disconnected systems.

8 Wastes Analysis

Defects

- Incorrect insurance info leading to claim rejections
- Duplicate claims due to improper status update

Overproduction

- Following up on low-priority claims too frequently
- Generating weekly reports that no one uses

Waiting

- Waiting for denial reasons from payer
- Delay in receiving remittance advice for posted payments

Non-Utilized Talent

- A/R staff doing repetitive manual data entry
- No involvement of A/R team in process improvement discussions

Transportation

- Downloading reports from one system and uploading into another
- Manually moving patient files between departments

Inventory

- Large number of unworked aging claims
- Stacked unresolved denials waiting for follow-up

Motion

- A/R staff switching between multiple systems/screens
- Searching manually through emails for payer responses

Overprocessing

- Rechecking already verified claims manually
- Logging follow-up notes in multiple systems unnecessarily

Action Plan for Low Hanging Fruits

Special Causes (sudden failures / abnormalities)

Issue Observed	Lean Tool	Action Plan	Benefit
System downtime affecting A/R updates	Root Cause Analysis / 5 Whys	Coordinate with IT to fix recurring system issues and schedule downtimes off-peak	Improve claim tracking; reduce rework
Payer policy changes causing unexpected denials	Poka-Yoke (Error Proofing)	Create a payer policy tracker updated monthly; notify A/R team proactively	Fewer claim rejections; faster resolution
Time zone delays with offshore team	Standard Work	Define follow-up windows that overlap across time zones	Reduced turnaround time
System downtime affecting A/R updates	Root Cause Analysis / 5 Whys	Coordinate with IT to fix recurring system issues and schedule downtimes off-peak	Improve claim tracking; reduce rework
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Action Plan for Low Hanging Fruits

Muda (Waste)

Issue	Lean Tool	Action Plan	Benefit
Manual re-entry of data between systems	RPA (Robotic Process Automation)	Automate claim data transfer using a bot	Eliminate rework; increase speed
Rechecking already verified claims	Standard Work	Define clear SOP for verification and handoff checkpoints	Avoid overprocessing

Mura (Unevenness)

Issue	Lean Tool	Action Plan	Benefit
Irregular follow-up cycles between team members	Load Balancing / Heijunka	Distribute aged claims evenly using workload dashboards	Consistent process execution

Muri (Overburden)

A/R staff overburdened by 200+ accounts/day	Workload Rationalization	Reallocate accounts or implement AI-driven prioritization	Reduce burnout; increase quality
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Action Plan for Low Hanging Fruits

Waste	Lean Tool	Action Plan	Benefit
Waste – Motion	Switching between systems for follow-up	5S / Workspace Optimization	Integrate key tools into one dashboard or reduce system-switching steps
Waste – Waiting	Delay in payer responses without tracking	Visual Management (Kanban)	Use Kanban board to track pending claims by status
Waste – Skills	Trained staff doing repetitive entry work	Job Enrichment / Kaizen	Free up skilled staff by automating low-skill tasks

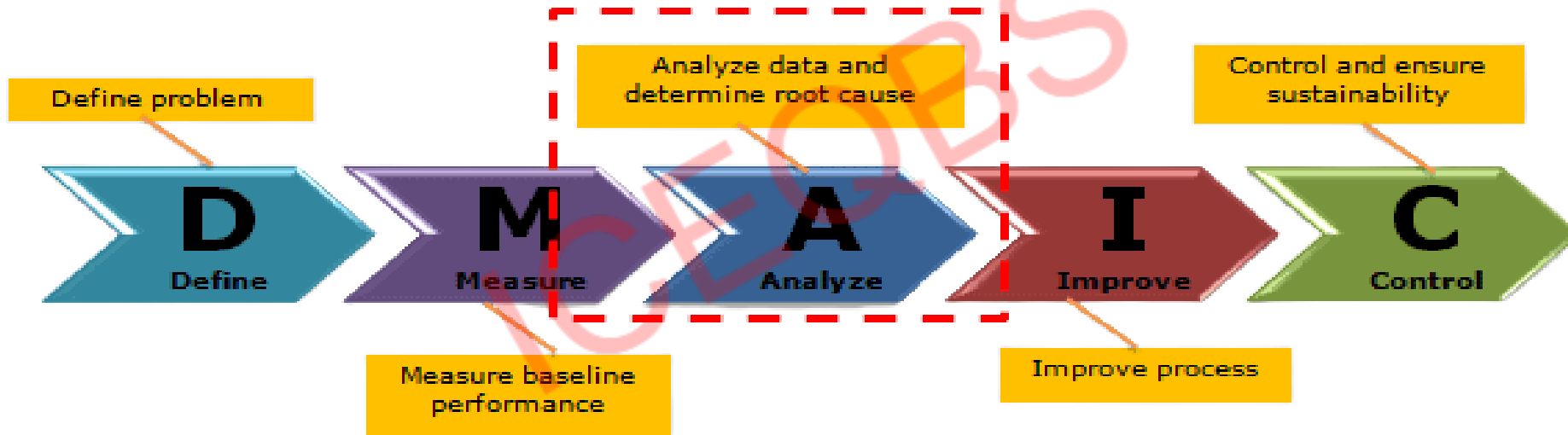
Top 12 Prioritized Root Causes (Based on Net Score)

Root Cause	Score
Delay in denial codes from payers	765
System downtime or slow software performance	245
Lack of automation in claim tracking and follow-up	234
Disparate systems not integrated	165
Manual data entry errors	123
No SOP (Standard Operating Procedure) for follow-up	100
Unclear claim ownership or responsibility	98
High staff workload with unbalanced claim distribution	91
Poor inter-team communication	90
Outdated software tools	77
No follow-up reminders or alerts in system	75
Untracked or poorly tracked denials	43

Data Collection Plan

Data Element	Definition	Data Source	Collection Method	Frequency	Responsible Person	Purpose
Total A/R Amount	Total outstanding receivables across all aging buckets	Billing System (e.g., Epic, Kareo)	Auto-export from system	Weekly	A/R Analyst	To calculate % over 90 days
A/R > 90 Days	Total dollar value of A/R aged more than 90 days	A/R Aging Report	Auto-export	Weekly	A/R Analyst	Key metric for project (denominator)
% A/R > 90 Days	(A/R > 90 days / Total A/R) * 100	Derived Metric	Calculated in Excel/Power BI	Weekly	A/R Manager	Primary metric for improvement
Claim Status	Current status (Pending, Denied, Paid, etc.)	Billing Software	Auto-extract + manual review	Daily	A/R Team	Understand delay patterns
Claim Follow-Up Date	Last action/follow-up performed on claim	A/R Notes / Logs	Manual entry / System log	Daily	A/R Executive	Check timeliness of action
Denial Reason Code	Code/description for denied claims	EOBs / Denial Reports	Automated + Manual Review	Weekly	Denial Analyst	Identify denial root causes
Follow-Up TAT	Time taken between denial and action taken	System timestamps	Derived metric (Excel)	Weekly	Quality Analyst	Find process delays
Payer Name	Insurance company or government payer	Billing system	Auto-extract	Weekly	A/R Analyst	Segment data by payer
Claim Owner	Staff assigned to the claim	Task assignment log / A/R queue	Manual / System-based	Weekly	Team Lead	Track workload and ownership
Number of Touchpoints	Number of times claim was worked	Activity logs	Manual / System-based	Weekly	QA Analyst	Measure process efficiency

ANALYSE PHASE



Analyse – Hypothesis testing

Binary Logistic Regression: AR90_5 versus Denial_Delay_5, Followup_Time_5

Regression Equation

$$P(1) = \frac{\exp(Y')}{1 + \exp(Y')}$$

$$Y' = -30.36 + 0.703 \text{ Denial_Delay_5} + 0.733 \text{ Followup_Time_5}$$

Coefficients

Term	Coef	SE Coef	Z-Value	P-Value	VIF
Constant	-30.36	5.84	-5.20	0.000	
Denial_Delay_5	0.703	0.146	4.82	0.000	1.99
Followup_Time_5	0.733	0.156	4.70	0.000	1.99

Odds Ratios for Continuous Predictors

	Odds Ratio	95% CI
Denial_Delay_5	2.0208	(1.5183, 2.6896)
Followup_Time_5	2.0809	(1.5332, 2.8241)

Model Summary

Deviance R-Sq	Deviance R-Sq(adj)	AIC	AICc	BIC	Area Under ROC Curve
71.66%	70.77%	70.15	70.25	80.72	0.9819

Goodness-of-Fit Tests

Test	DF	Chi-Square	P-Value
Deviance	247	64.15	1.000
Pearson	247	75.48	1.000
Hosmer-Lemeshow	8	3.30	0.914

Analysis of Variance

Wald Test			
Source	DF	Chi-Square	P-Value
Regression	2	26.63	0.000
Denial_Delay_5	1	23.26	0.000
Followup_Time_5	1	22.12	0.000

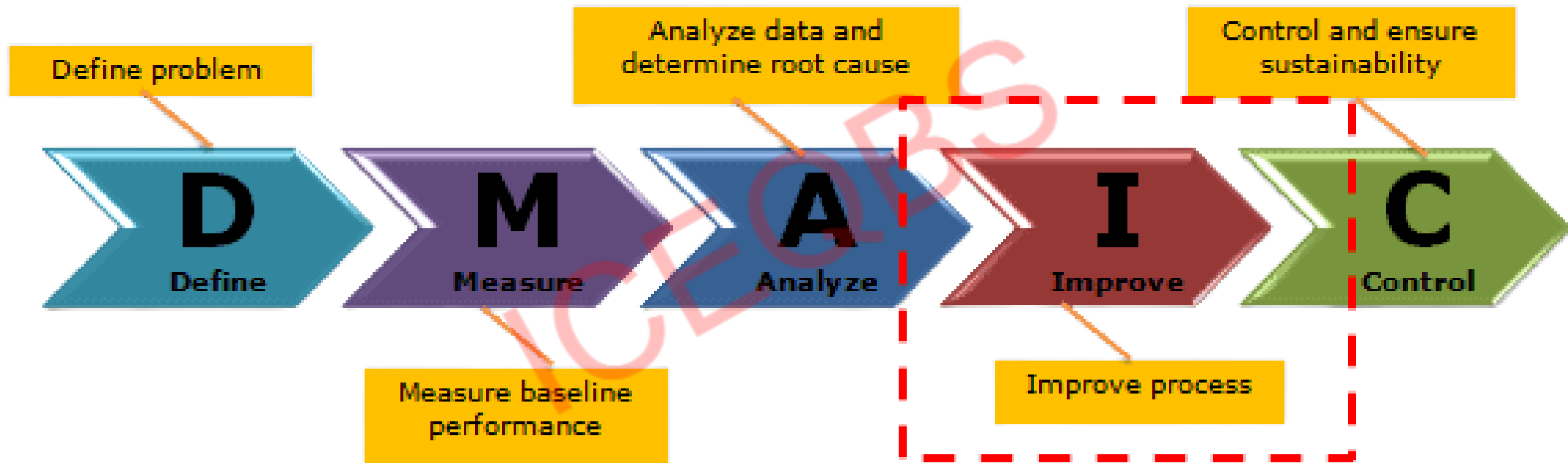
Inference :

- Since $p < 0.05$, Denial delay and follow up time are critical

Summary of Statistically validated Root causes

- Denial delay and follow up time are critical

IMPROVE PHASE



Improve

Root Cause	Proposed Action	Owner	Timeline	Success Metric
High Denial_Delay	- Analyze top reasons for denial delay (e.g. missing info, slow response from payers) - Automate denial tracking & alerts - Conduct denial root cause training for staff	Revenue Cycle Manager	4 weeks	Avg. Denial Delay reduced by 25%
High System_Downtime	- Improve system uptime with proactive IT maintenance - Setup monitoring & automated alerts - Create fallback manual process checklist	IT Manager	6 weeks	Downtime reduced to <1 day/month
High Followup_Time	- Implement auto-escalation rules for old claims - Review and rebalance workload of A/R staff - Use RPA/bots for follow-ups where applicable	A/R Team Lead	3 weeks	Follow-up time $\leq$ 10 days on avg
Lack of Early Identification of AR>90 Risk	- Build dashboards to flag at-risk accounts - Predictive model to forecast AR>90 risk - Integrate alerts into EHR/practice management system	Data Analytics / IT	8 weeks	20% drop in accounts aging >90 days
No Accountability or Metrics	- Set daily/weekly AR follow-up targets - Publish team dashboards - Incentivize early resolution	Revenue Cycle Director	Ongoing	%AR>90 improved to <10%

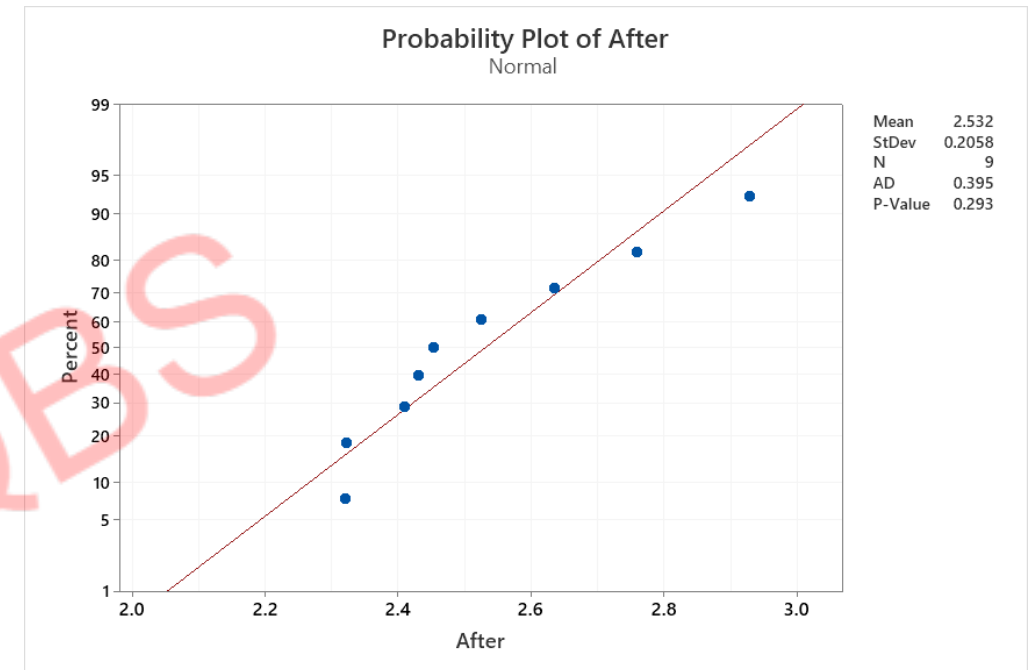
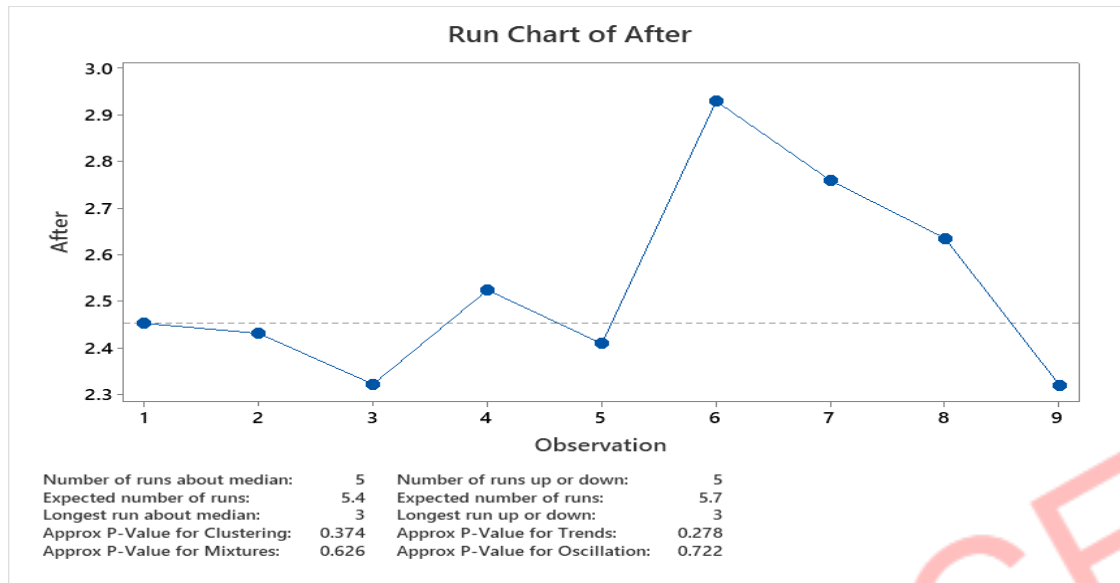
Inference:

- Run chart – process is stable there is no special causes in the process (p value > 0.05)

Inference:

- Normality test – Data are normally distributed

Improve - Run chart and Normality Test (After Improvement)



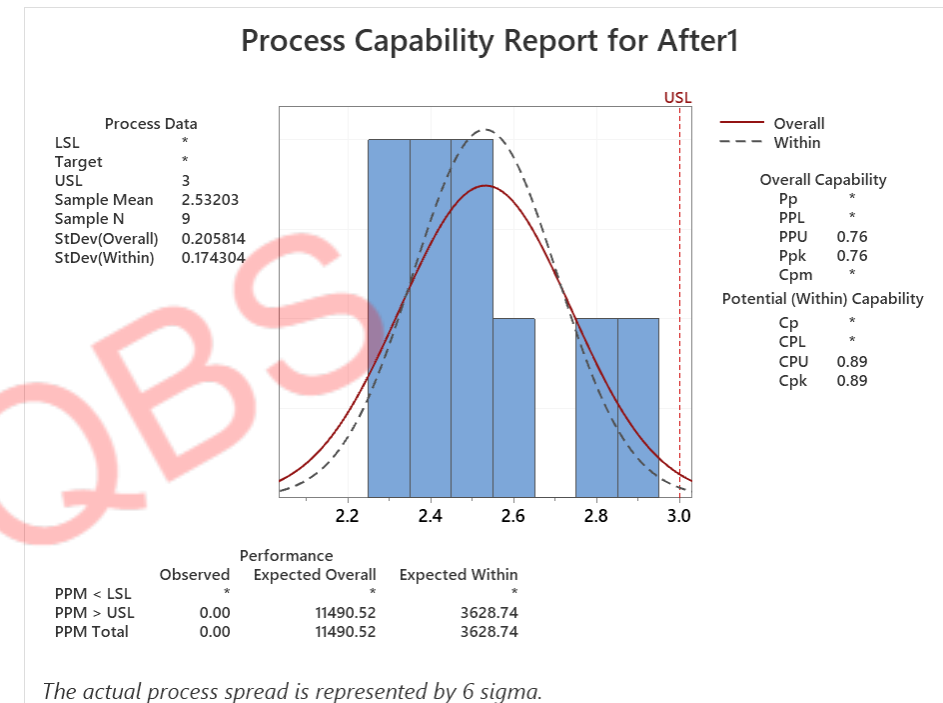
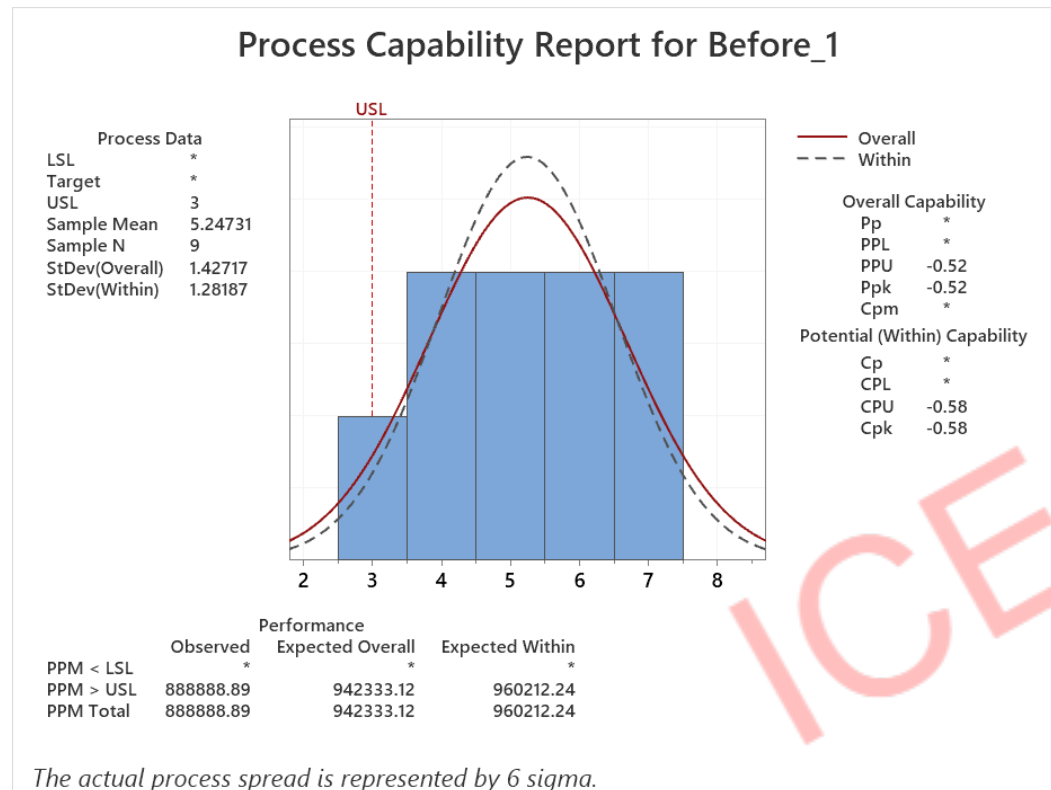
Inference:

- Run chart – process is stable there is no special causes in the process (p value > 0.05)

Inference:

- Normality test – Data are normally distributed

Improve - Process capability – Before & After Improvement



Inference :

- Before $C_{pk} < \text{After } C_{pk}$, which shows process is much more capable after improvement
- There is less variability in system since stdev reduced after improvement
- After improvement the data are normally distributed near the target within specified limit

Improve –After Improvement (Statistical validation for Improvement – Hypothesis Testing)

Two-Sample T-Test and CI: Before, After

Difference: $\mu_1 - \mu_2$

Equal variances are not assumed for this analysis.

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
Before	9	5.25	1.43	0.48
After	9	2.532	0.206	0.069

Estimation for Difference

Difference	95% CI for Difference
2.715	(1.607, 3.824)

Test

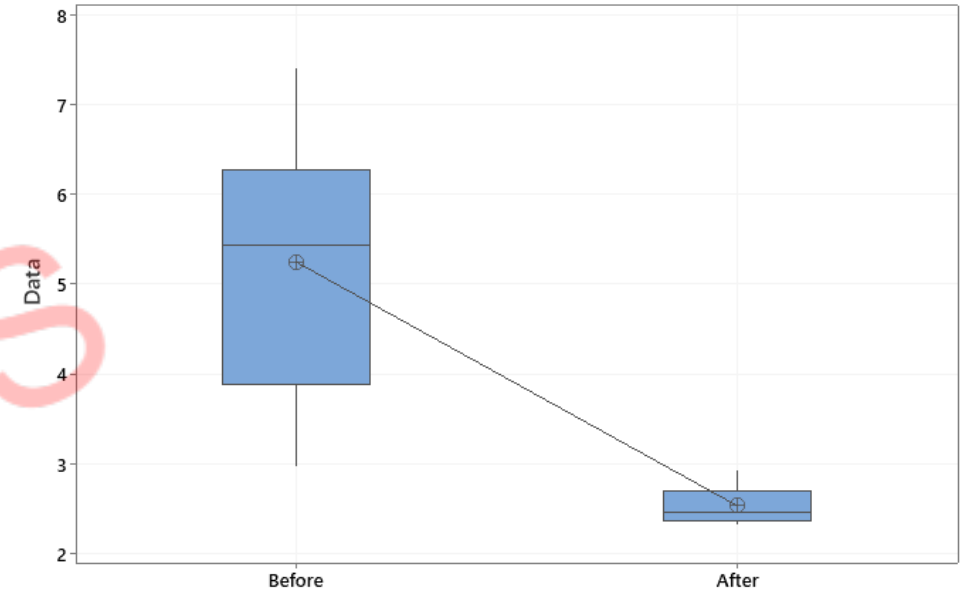
Null hypothesis $H_0: \mu_1 - \mu_2 = 0$
Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
5.65	8	0.000

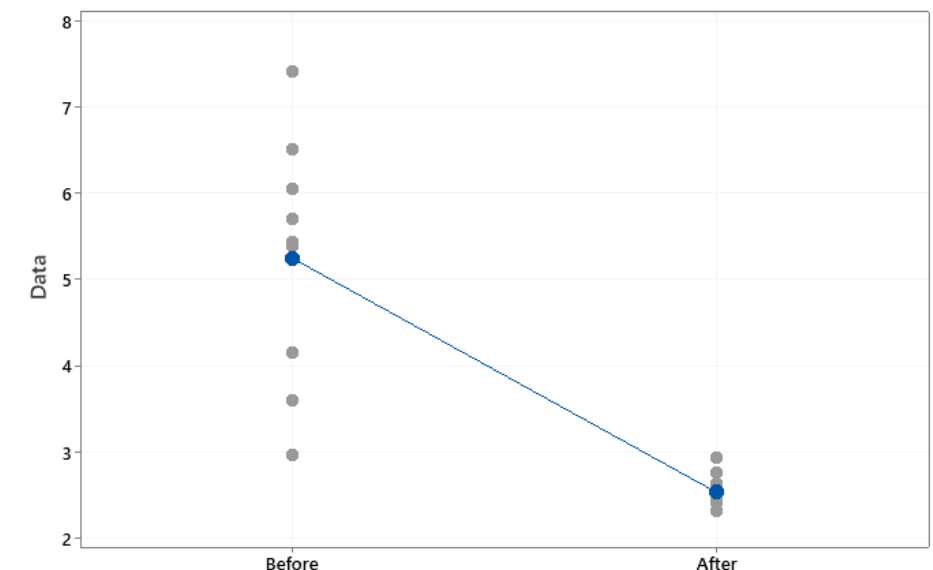
Inference:

- Since P value is less than 0.05, there is enough evidence to reject the null hypothesis and we can conclude that the difference between the population means is statistically significant.
- It is also visible from the individual value plot & box plot, there is clear difference in mean after improvement which is closer to required % scrap

Boxplot of Before, After



Individual Value Plot of Before, After

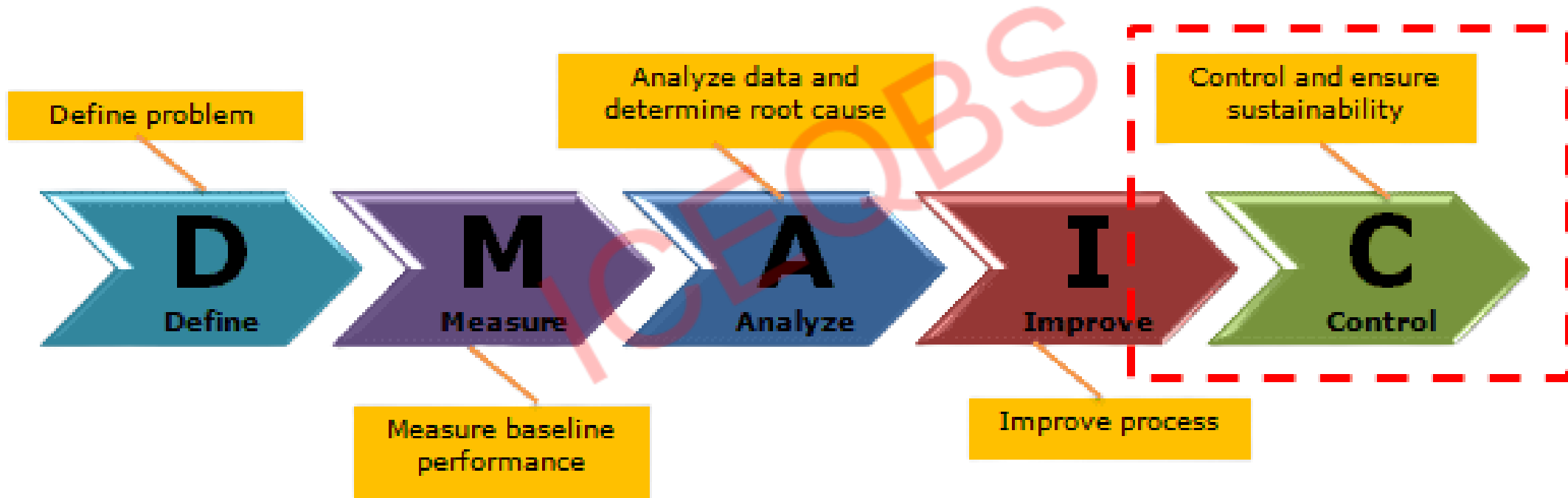


FMEA

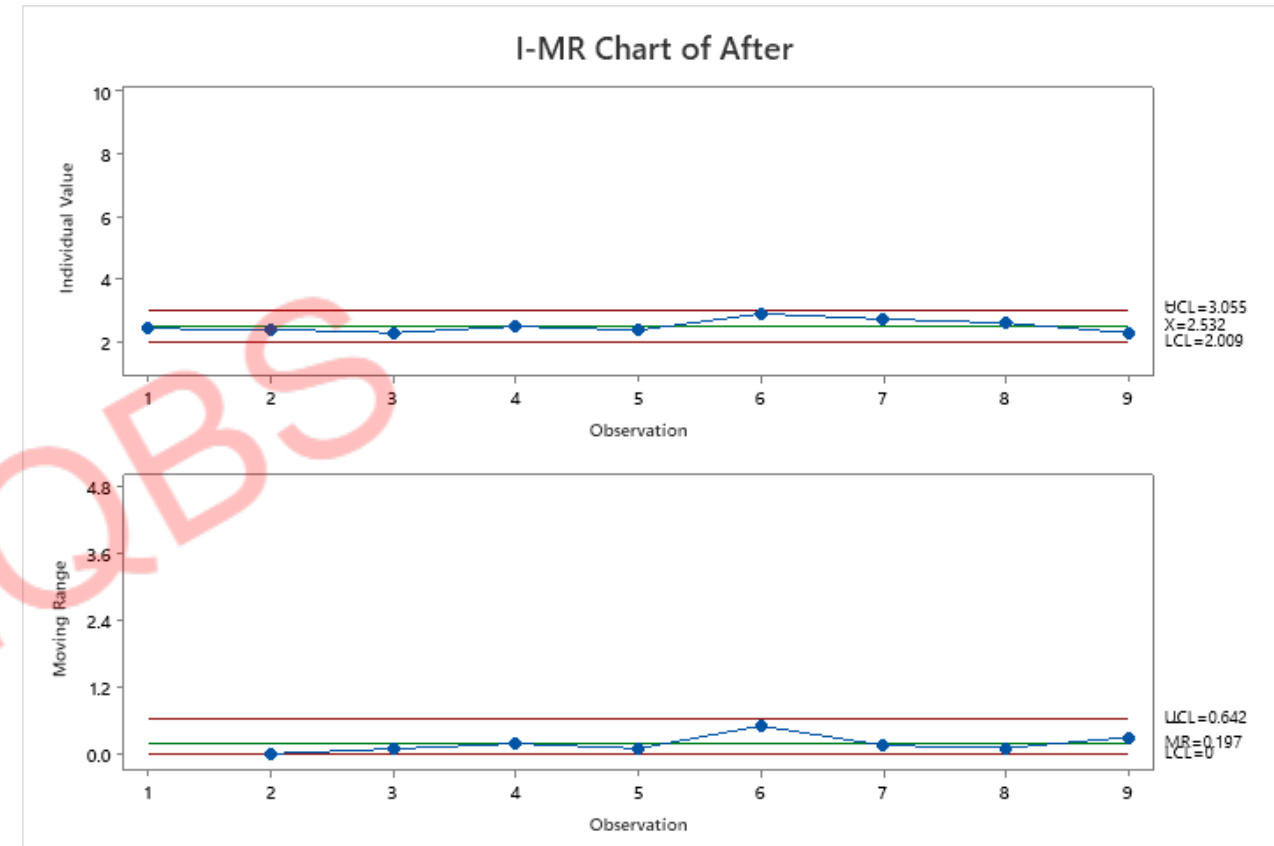
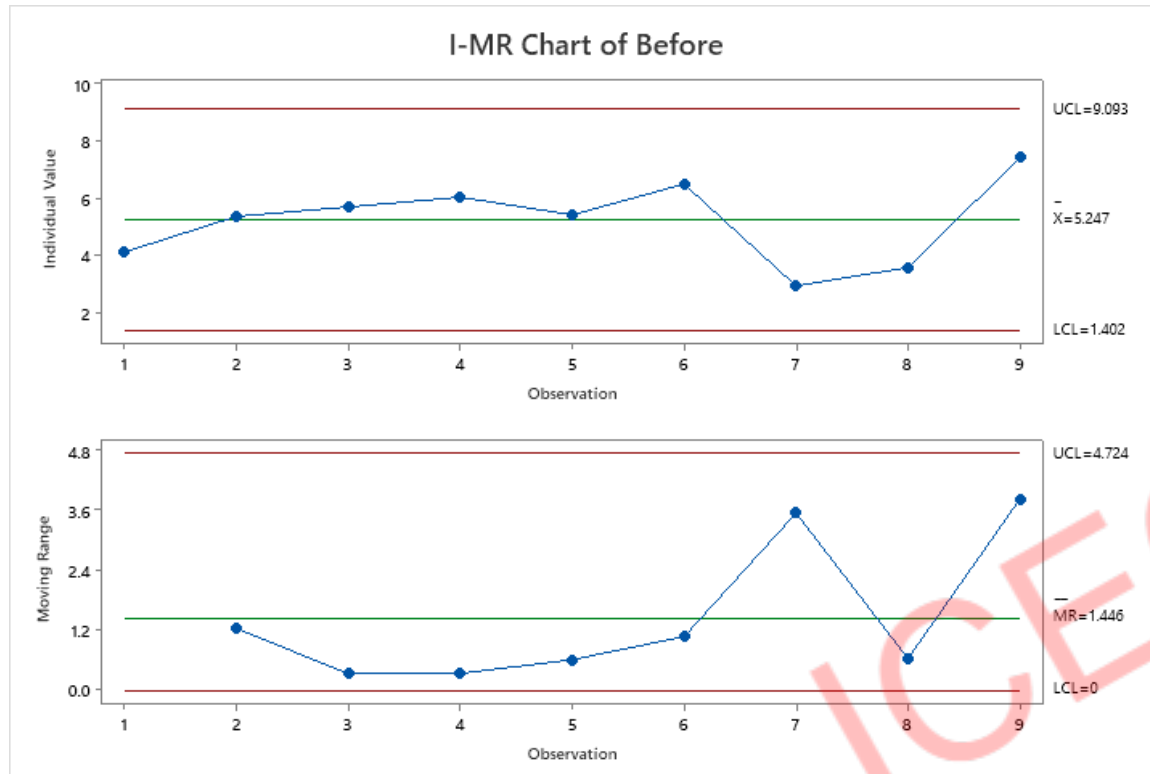
Process Step	Potential Failure Mode	Potential Effects	Cause(s)	Current Controls	S (Severity)	O (Occurrence)	D (Detection)	RPN (S×O×D)	Recommended Action
1. Claim data entry	Incomplete or incorrect data	Denial or delay	Manual error, unclear SOP	Staff training	8	6	6	288	Implement field validation (Poka-Yoke), mandatory fields
2. System downtime	Inability to access system	Delayed claims/follow-ups	Lack of preventive maintenance	Monthly IT checks	9	5	7	315	Set automated alerts, system redundancy, IT SLAs
3. Claim follow-up	Delayed follow-up >30 days	AR age increases	High workload, no tracking	Manual follow-up logs	7	8	5	280	Auto-reminders, escalation workflows, RPA for follow-ups
4. Denial analysis	Missed root causes	Repeating denials	Poor denial coding	Periodic review	6	7	6	252	Create standardized denial reason templates, dashboards
5. Staff training	Inconsistent knowledge	Process variation	One-time training only	Initial onboarding	5	6	7	210	Quarterly refreshers, e-learning modules
6. Action monitoring	Actions not sustained	Reversion to old process	No owner or audit	Sporadic reviews	8	5	6	240	Assign owners, set KPIs, monthly audits with leadership
7. Prioritization of claims	High risk claims missed	Increased AR > 90	No risk stratification	Manual tracking	7	5	5	175	Use dashboards to flag at-risk claims automatically

High RPN Item	Action
Claim data entry (RPN 288)	Implement form validation, train staff, mandatory checks
System downtime (RPN 315)	Set up automated alerts, IT maintenance calendar, backup systems
Claim follow-up (RPN 280)	Auto-reminders, escalation paths, RPA tools
Denial analysis (RPN 252)	Build dashboards, standardized denial reasons, team review huddles

CONTROL PHASE



Improve (Statistical validation for Improvement – I-MR Chart)



Inference:

- As seen in control chart, before improvement mean was high and there was high variability and after improvement, it has achieved less variability
- There is a significant reduction in variation

Control Plan

Process Step	Critical Parameter	Specification / Target	Monitoring Method	Frequency	Responsible Owner	Reaction Plan (If Out of Control)
Claim Entry	Completeness of data	100% required fields	EHR/Claim form validation report	Daily	RCM Analyst	Escalate to team lead, re-train staff, log issue
System Uptime	Downtime per month	< 2 hours/month	IT system log & downtime tracker	Weekly	IT Manager	Trigger preventive maintenance; open IT ticket
Claim Follow-Up	Days to follow-up	< 25 days	Auto-reminders & AR aging dashboard	Daily	AR Executive	Escalate aged claims >25 days to supervisor
Denial Rate	% of denied claims	< 5%	Denial dashboard & monthly report	Monthly	Denial Analyst	Root cause analysis, revise SOPs, re-training
Denial Categorization Accuracy	Coding accuracy	100% alignment with denial code standards	QA audit of denial reasons	Weekly	Quality Auditor	Conduct refresher training; update denial matrix
% AR > 90 Days	Aging % > 90	< 10% of total AR	AR Aging Report	Weekly	Revenue Cycle Manager	Deep dive claims, escalate payers with delays
Follow-up Closure Rate	% closed within 30 days	> 95%	Follow-up tracker & RPA logs	Weekly	Team Lead	Assign rework tasks; alert for payer issues
Staff Knowledge Level	SOP/Tool usage proficiency	100% trained	Training tracker + post-tests	Quarterly	Training Coordinator	Conduct re-training; update training content



Results after improvement

- Project has achieved its intended results after reducing the rejection percentage of Accounts Receivable