Reduction In Average Handling Time

PROJECT BY Towsif Ahmed, Abu Nayeem Choudhury, Fahmida Iqbal & MD.Sazid Hasan Dip

Define Phase

Voice of Customer - VOC

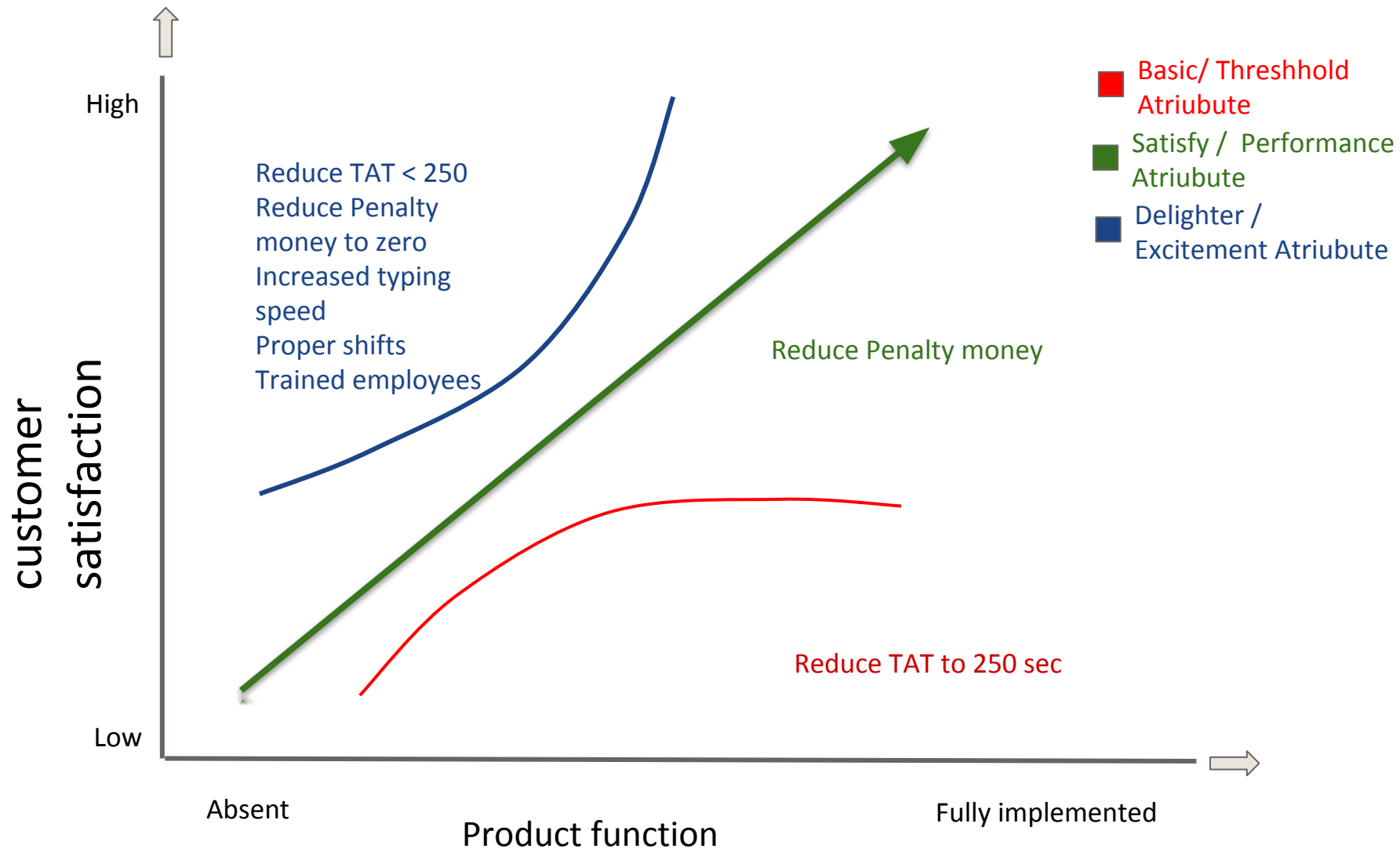| CUSTOMER	Comments	Critical to Quality-CTQ's
Client	TAT is very high	Reduce TAT in second
VP, Finance	We are giving high penalty	Reduce penalty money
CEO	We are losing our reputation and might lose business	Regain reputation
Worker	Typing speed is slow	Increase typing speed
Mode of Communication	It takes time to get the proper translation	Train employee
Shift	From 2nd shift is getting non responsive	Specified the duties based on the shift

Customer / Stakeholder Personal Interviews
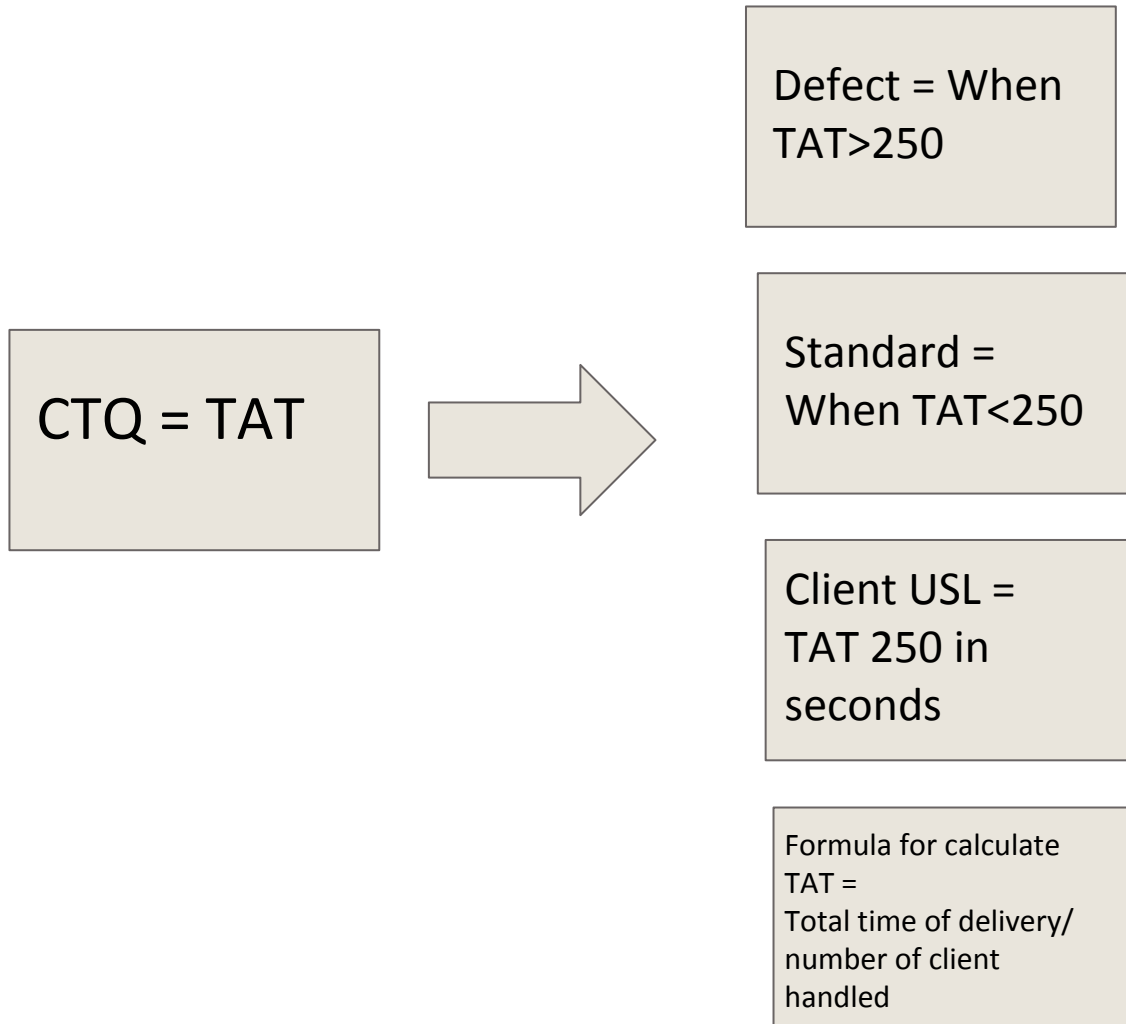
VOC Classification – Affinity Diagram

Staff	Delivery	Quality	Capacity
Lack of staff as per the shift	Take long time to process file	Dutoriating Service Quality among customers	Unable to complete in time
Lack of Staff Training	Variance of English & Hindi Language take long time		Language complexity
Less motivated from the 2nd shift			

VOC Prioritization – Kano Model

customer satisfaction

High

Reduce TAT < 250
Reduce Penalty money to zero
Increased typing speed
Proper shifts
Trained employees

Reduce Penalty money

Reduce TAT to 250 sec

Low

Absent

Fully implemented

Product function

Basic/ Threshhold Atriubute

Satisfy / Performance Atriubute

Delighter / Excitement Atriubute

CTQ Drilldown Tree – VOC to CTQ

CTQ = TAT

Defect = When TAT>250

Standard = When TAT<250

Client USL = TAT 250 in seconds

Formula for calculate TAT =
Total time of delivery/ number of client handled

Project Charter

Business case:
Due to month-on-month inefficient turn around time our customer is highly dissatisfied as we are not meeting clients requirements. This is resulting in shifting of customer base to our competitors. We are also facing heavy penalties for non conformance of agreed service level agreement. Our market share has also been impacted badly which in turn has resulted in huge financial loss. This may cause layoffs of our valuable employees as we may not have money to run business if we continue the same.

Team:

Name	Role
Towsif Ahmed	Team Leader
Abu Nayeem Choudhury	Coordinator
Fahmida Iqbal	Member
MD.Sazid Hasan Dip	Member

Problem Statement:
Company ABC is a leading Insurance company in Bangladesh. They deal in medical, car and other insurance claims. They have outsourced their back office claims processing work to Company XYZ. Since last 3 months, XYZ has not been meeting the target of 250 sec target because of which they have been paying penalty of 50000 taka per month. The management is really concerned as it may cost them the entire business.

Goal Statement
To Reduce the TAT to 250 second by 30 October 2019

In Scope :
Out Scope :Everybody else other than in scop

Milestones	Start Date	End date
D	**4th july**	**11 july**
M	12 july	20 july
A	22 july	**31 july**
I	1 aug	**2 sep**
C	3 oct	3 dec

Communication Plan

Information	Target Audience	Information Channel	Who	Back Up	When
Product Update	Sponsor, VP - Operations, Manager – Operations, Team Members	E-mails , Meetings	GB (Mr. Shiva)	BB (Mayank Aggarwal)	BI-Weekly
Tollgate Review	BB,LBB,MBB & Sponsor (VP- Operations)	E-mails , Meetings	GB	BB (Mayank Aggarwal)	As per Project Plan
Daily Updates	BB,LBB,MBB & Manager.	E-mails , Meetings	GB	BB (Mayank Aggarwal)	1 hour before End of the Day
Group Discussion	BB,LBB,MBB,GB & Team Members	E-mails , Meetings	GB	BB (Mayank Aggarwal)	Every Sat
All new Requirements	Sponsor (VP-Operations)	E-mails , Meetings	Manager - Operation	Supervisor – Operations (Mr. Ravi)	As per Requirement stage
Leave Requirements	Manager - Operations	E-mails , Meetings	Manager - Operation	Supervisor – Operations (Mr. Ravi)	As per Requirement stage
Project Deliverables o Activities	All Members	E-mails , Meetings	GB	BB (Mayank Aggarwal)	Weekly
Feedbacks	Manager – Operations, BB	E-mails , Meetings	Manager - Operation	Supervisor – Operations (Mr. Ravi)	Weekly

RASIC

RASIC Chart

Role	Description
Responsible	Solely and directly responsible for the activity (Owner) - Includes approving authority (A)
Approve	Reviews and assures that the activity is being done as per expectations
Support	Provides the necessary help and support to the owner
Inform	Is to be kept informed of the status/progress being made
Consult	Is to be consulted for this activity for inputs

Activities

Pre- DMAIC

Project Team

Roles	Vice President Ajit Singh	Process Owner Sunil Jain	Project Champion Manij Arora	Project Leader Ajit Singh	Master Blackbelt Mentor Shashi Prakash	Black Belt Tausif Ahmed	Green Belt Shiva	Team Member Ram, Jay, Anjana
Identify Steckholders	I	I	A		R	S		
VOC			A	S	R			
Identify CTQ			A	S	R			
CTQ prioritization			A	S	R		S	

SIPOC

Suppliers	Inputs	Processes	Outputs	Customers
System Operator of XYZ	Claim Processing request from ABC Insurance Officer	System Operator receives the claim processing request	System Operator Opens the claim processing request	ABC Insurance Officer
	System Operator Opens the claim processing request	System Operator analyze the claim processing request	Looks for the appropriate claim processing	
	Looks for the appropriate claim processing	Process the Claim	Claim Processing Request served	
	Claim Processing Request served	Documents the claim processing	Ready to take next claim processing request	
		Closes the claim processing		

Process Map

Measure Phase

Cause & Effect Diagram
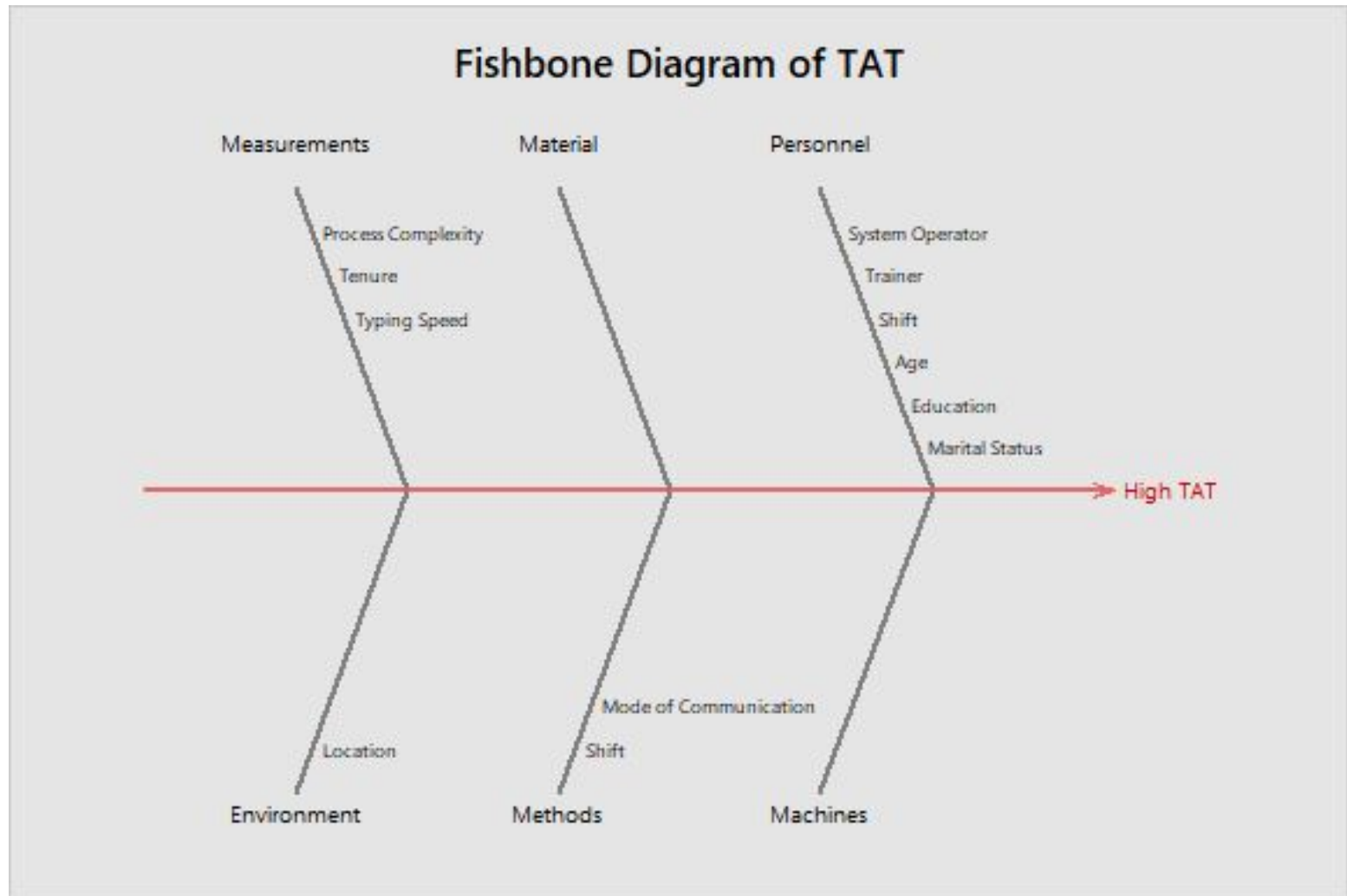
Data Collection Plan

KPI	Operational Definition	Defect Def	Performance Std	Specification Limit		Opportunity
				LSL	USL	
AHT	Total Call Time/Number of Calls	Greater than 250 seconds	250	N/A	250 sec	Monthly

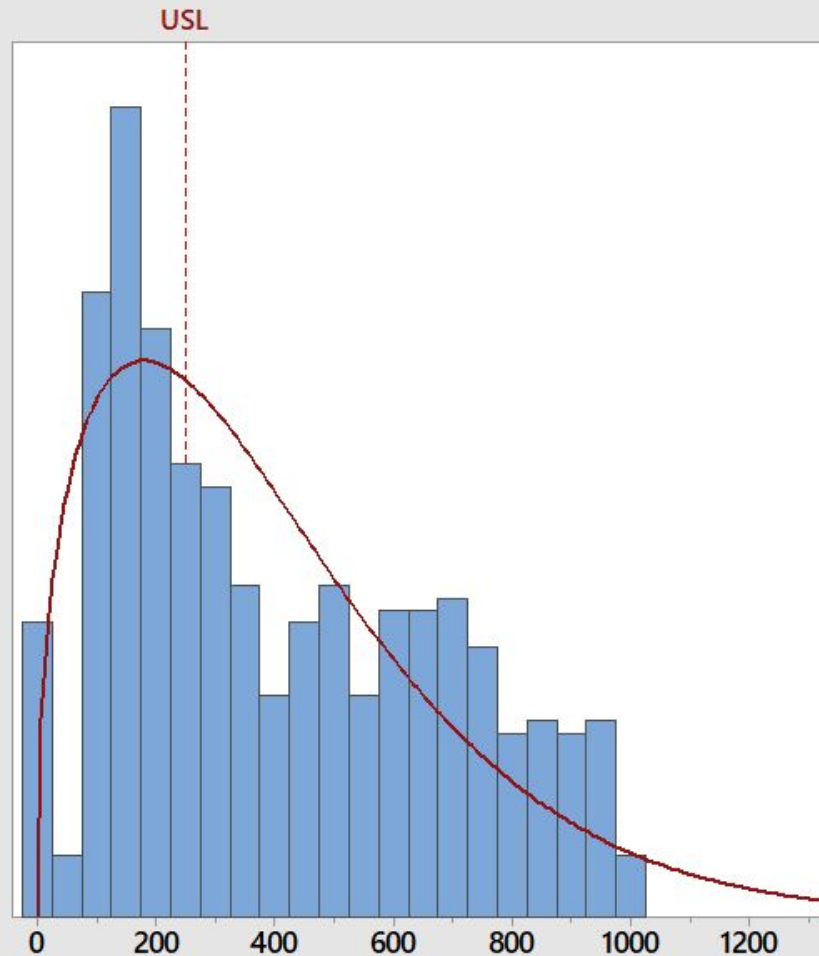| KPI	Data Type	Data Items Needed	Formula to be used	Unit	Plan to collect Data				Plan to sample
					What Database or Container will be used to record this data?	Is this an existing database or new?	If new, When will the database be ready for use?	When is the planned start date for data collection?	
AHT	Continuous	N/A	Total Call Time/Number of Calls	Seconds	EXCEL	Existing	N/A	N/A	JAN to MARCH

Process Capability

Process Capability Report for TAT (In Seconds)
Calculations Based on Weibull Distribution Model

Process Capability

Process Capability Report for TAT (In Seconds)
Calculations Based on Weibull Distribution Model

Process Capability

Process Capability

Analyze Phase

Hypothesis Test Planner
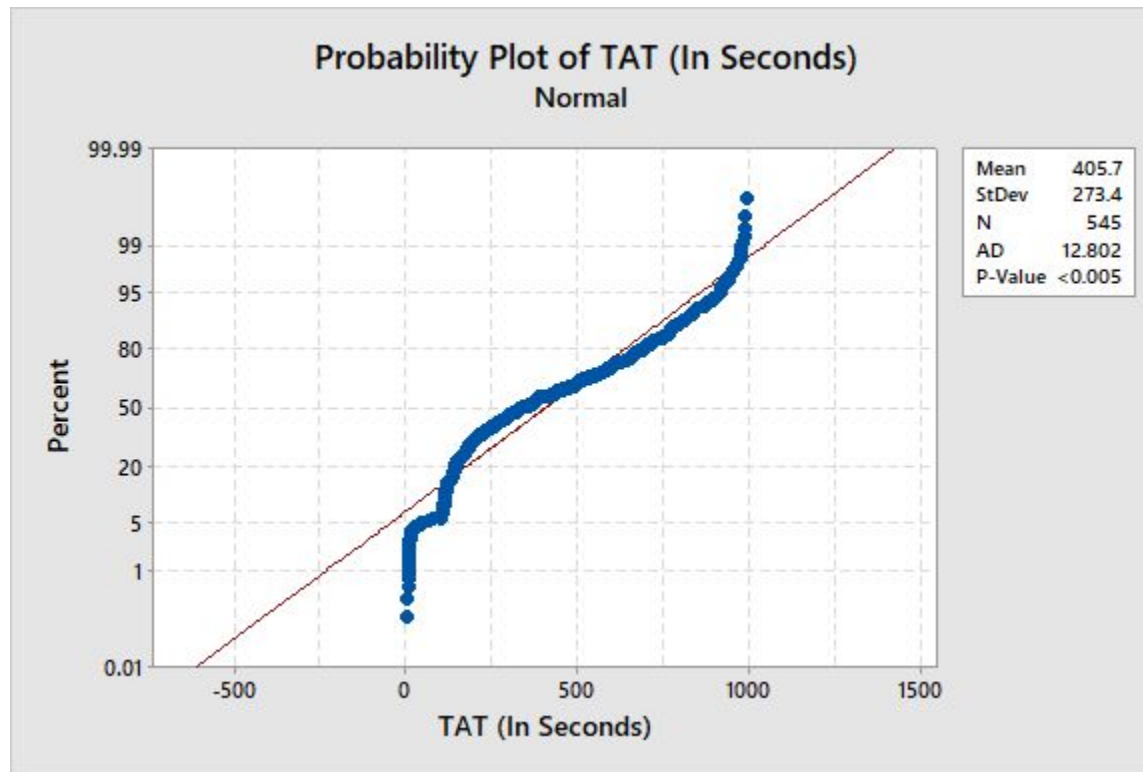
P Value <0.005. So our data set of Y (TAT) is non-normal

Hypothesis Test Planner

Sl. No.	Potential X's	Source	Data Type	Hypothesis Test	Graphical Tool
1	System Operator	HR	Categorical	Kruskal Walis, Moods Median	Boxplot
2	Process Complexity	MIS/Operations	Categorical	Mann Whitney	Boxplot
3	Trainer	HR	Categorical	Kruskal Walis, Moods Median	Boxplot
4	Shift	HR	Categorical	Kruskal Walis, Moods Median	Boxplot
5	Gender	HR	Categorical	Mann Whitney	Boxplot
6	Location	HR	Categorical	Mann Whitney	Boxplot
7	Age	HR	Numerical	Correlation Coefficient, Regression Analysis	Scatterplot
8	Tenure	HR	Numerical	Correlation Coefficient, Regression Analysis	Scatterplot
9	Education	HR	Categorical	Mann Whitney	Boxplot
10	Marital Status	HR	Categorical	Mann Whitney	Boxplot
11	Mode of Communication	MIS	Categorical	Mann Whitney	Boxplot
12	Typing Speed	MIS	Numerical	Correlation Coefficient, Regression Analysis	Scatterplot

TAT (In Seconds) Vs System Operator

Kruskal-Wallis Test: TAT (In Seconds) versus System Operator

```
Kruskal-Wallis Test on TAT (In Seconds)

System
Operator    N   Median   Ave Rank      Z
Binny     110    391.0      290.4    1.30
Jai       108    315.0      266.1   -0.50
Ravi      112    325.0      265.0   -0.60
Shishir   103    369.0      287.9    1.07
Sunny     112    292.0      256.8   -1.22
Overall   545               273.0

H = 3.95   DF = 4   P = 0.413
H = 3.95   DF = 4   P = 0.413   (adjusted for ties)
```

Since the P Value > 0.05, hence null cannot be rejected.
Hence we are safe to conclude that System Operator
has no impact on TAT

TAT (In Seconds) Vs System Operator

Mood Median Test: TAT (In Seconds) versus System Operator

```
Mood median test for TAT (In Seconds)
Chi-Square = 3.30     DF = 4     P = 0.508

System                                  Individual 95.0% CIs
Operator  N≤  N>  Median  Q3-Q1  ---------+---------+---------+-------
Binny     49  61    391    516             (--------*----------)
Jai       58  50    315    401          (----*-------)
Ravi      61  51    325    400        (------*---)
Shishir   48  55    369    544         (-----------*-------------)
Sunny     57  55    292    507   (-------*-------------)
                                 ---------+---------+---------+-------
                                        300       400       500

Overall median = 336
```

Since the P Value > 0.05, hence null cannot be rejected.
Hence we are safe to conclude that System Operator
has no impact on TAT

TAT (In Seconds) Vs System Operator

Boxplot of TAT (In Seconds)

TAT (In Seconds) Vs Process Complexity

Mann-Whitney Test and CI: TAT (In Seconds)_L1, TAT (In Seconds)_L2

```
                          N   Median
TAT (In Seconds)_L1     241   355.00
TAT (In Seconds)_L2     304   319.00


Point estimate for η1 - η2 is -11.00
95.0 Percent CI for η1 - η2 is (-55.01,26.01)
W = 64612.0
Test of η1 = η2 vs η1 ≠ η2 is significant at 0.5179
The test is significant at 0.5179 (adjusted for ties)
```


Boxplot of TAT (In Seconds)
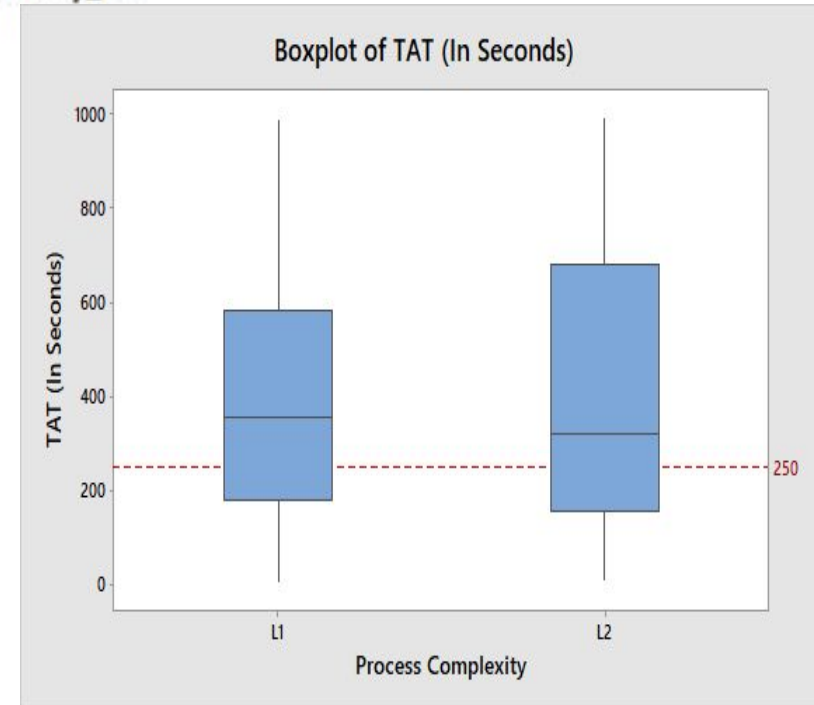
Since the P Value > 0.05, hence null cannot be rejected. Hence we are safe to conclude that Process Complexity has no impact on TAT
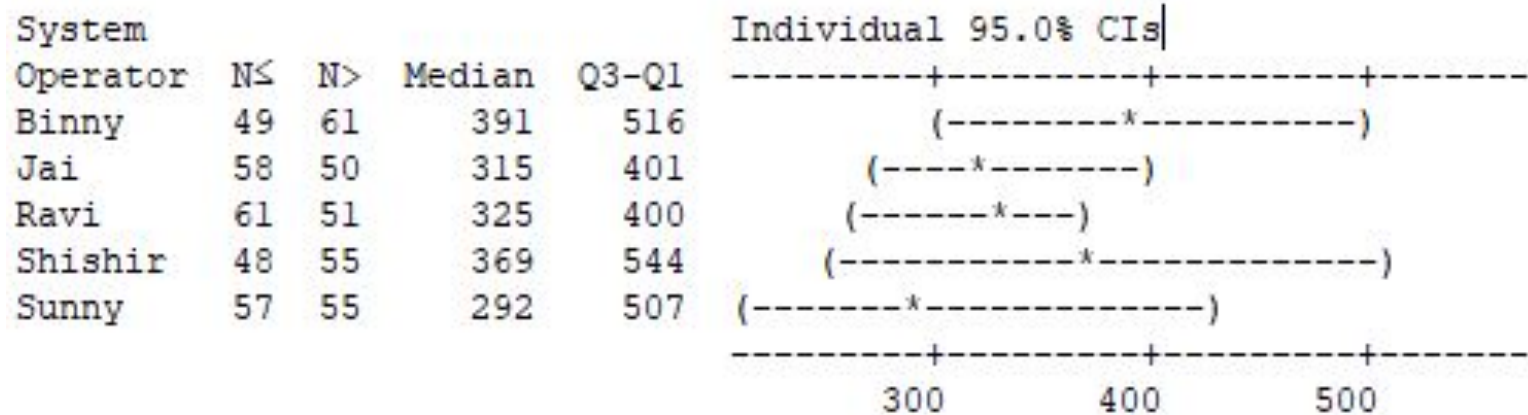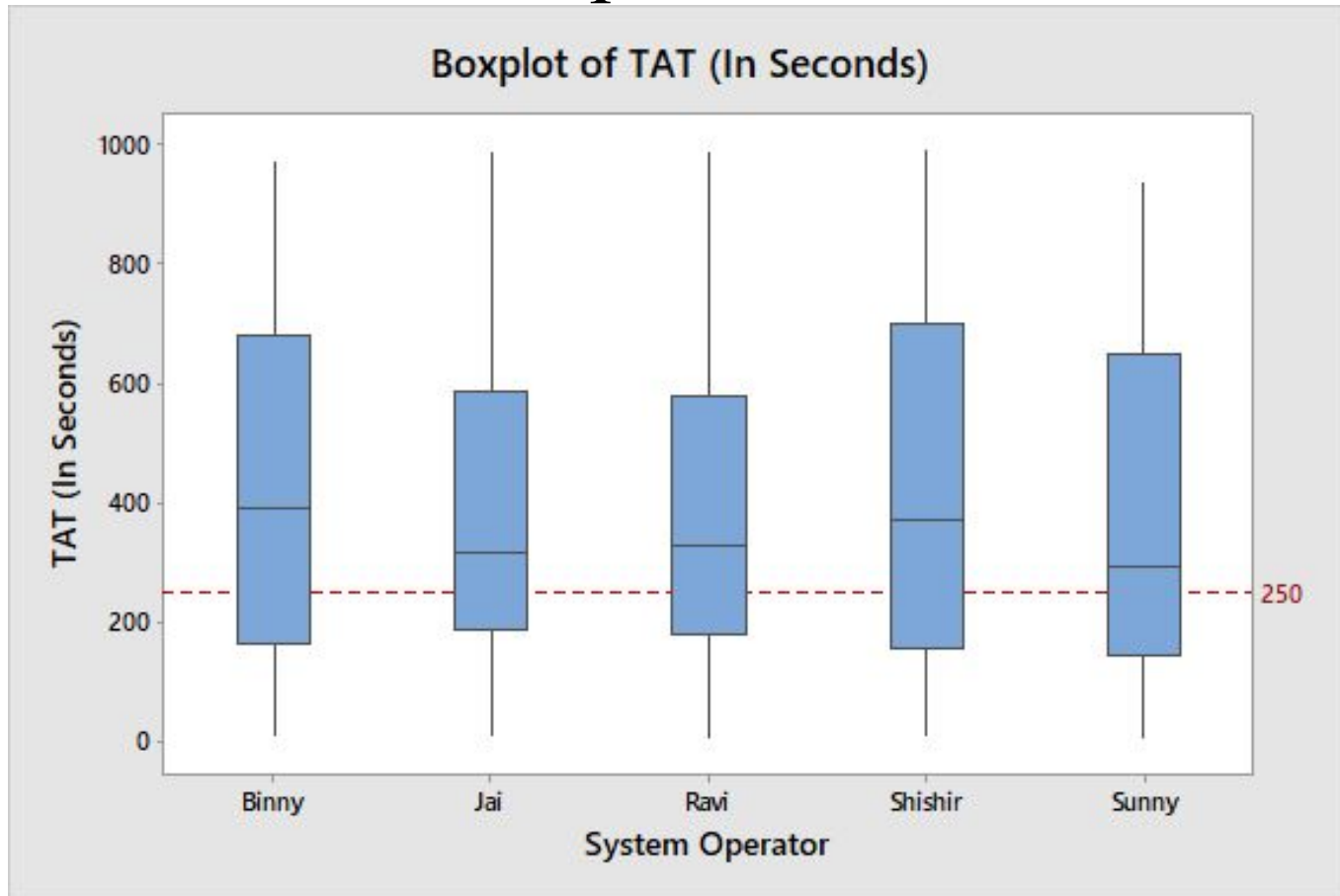
TAT (In Seconds) Vs Trainer

Boxplot of TAT (In Seconds)

Kruskal-Wallis Test: TAT (In Seconds) versus Trainer

```
Kruskal-Wallis Test on TAT (In Seconds)

Trainer    N   Median   Ave Rank        Z
Amit       88   247.0      232.7    -2.62
Atul       76   193.5      199.3    -4.40
Daniel    118   269.5      245.5    -2.14
Rashid     64   535.0      334.4     3.32
Ruby      133   494.0      329.0     4.72
Sonia      66   434.5      288.3     0.84
Overall   545              273.0

H = 53.15  DF = 5  P = 0.000
H = 53.15  DF = 5  P = 0.000   (adjusted for ties)
```

Mood Median Test: TAT (In Seconds) versus Trainer

```
Mood median test for TAT (In Seconds)
Chi-Square = 53.57      DF = 5      P = 0.000

                                        Individual 95.0% CIs
Trainer   N≤   N>   Median   Q3-Q1    +---------+---------+---------+------
Amit      56   32      247     367        (--*-----)
Atul      56   20      194     247    (--*-)
Daniel    69   49      270     459        (---*----)
Rashid    21   43      535     517                           (-------*------)
Ruby      42   91      494     454                      (------*------)
Sonia     29   37      435     359                 (---------*----)
                                      +---------+---------+---------+------
                                     150       300       450       600

Overall median = 336
```

Since the P Value < 0.05, hence null is rejected. Hence
we are safe to conclude that Trainer has significant
impact on TAT

TAT (In Seconds) Vs Trainer
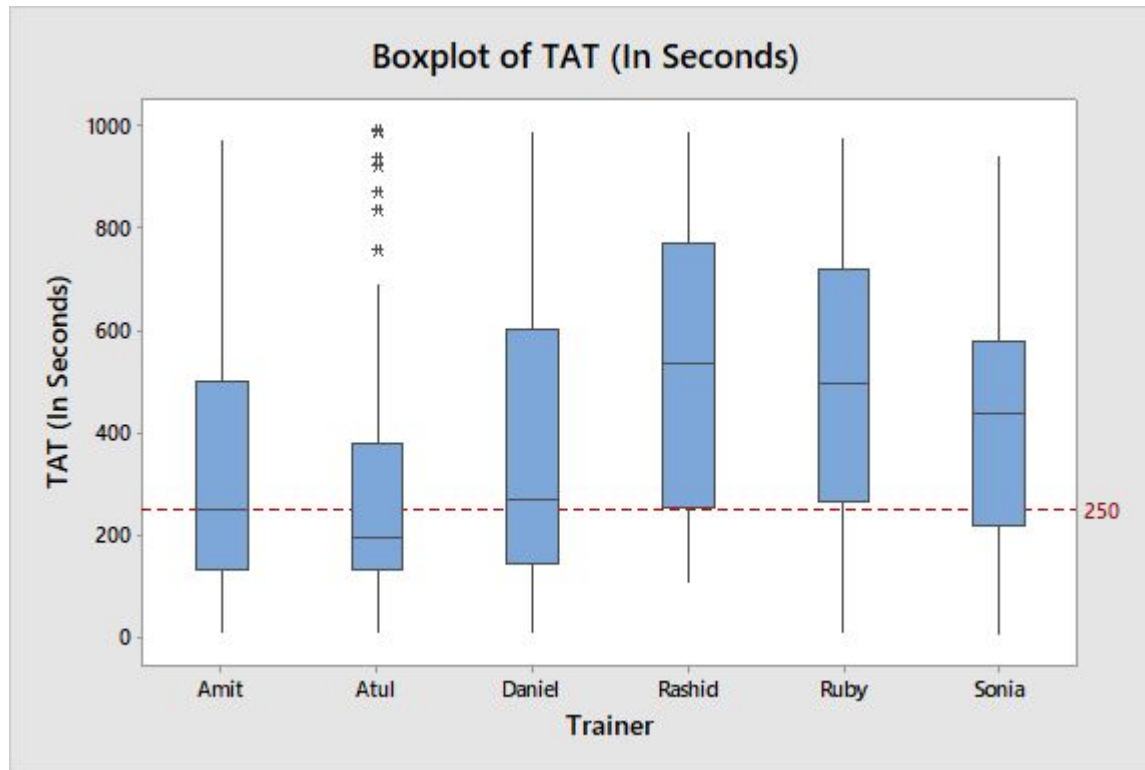
TAT (In Seconds) Vs Shift

Kruskal-Wallis Test: TAT (In Seconds) versus Shift

Kruskal-Wallis Test on TAT (In Seconds)

Shift	N	Median	Ave Rank	Z
Evening	239	297.0	261.9	-1.45
Morning	153	298.0	261.9	-1.03
Night	153	429.0	301.4	2.63
Overall	545		273.0	

H = 6.91 DF = 2 P = 0.032
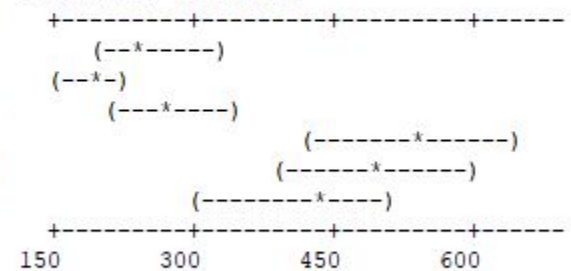H = 6.91 DF = 2 P = 0.032 (adjusted for ties)

Mood Median Test: TAT (In Seconds) versus Shift

Mood median test for TAT (In Seconds)
Chi-Square = 6.80   DF = 2   P = 0.033

Shift	N≤	N>	Median	Q3-Q1
Evening	129	110	297	483
Morning	81	72	298	440
Night	63	90	429	441

Individual 95.0% CIs

```
                   +---------+---------+---------+------
Evening  (------*-------)
Morning  (------*-----------)
Night                              (-------*--------)
                   +---------+---------+---------+------
                 240       320       400       480
```
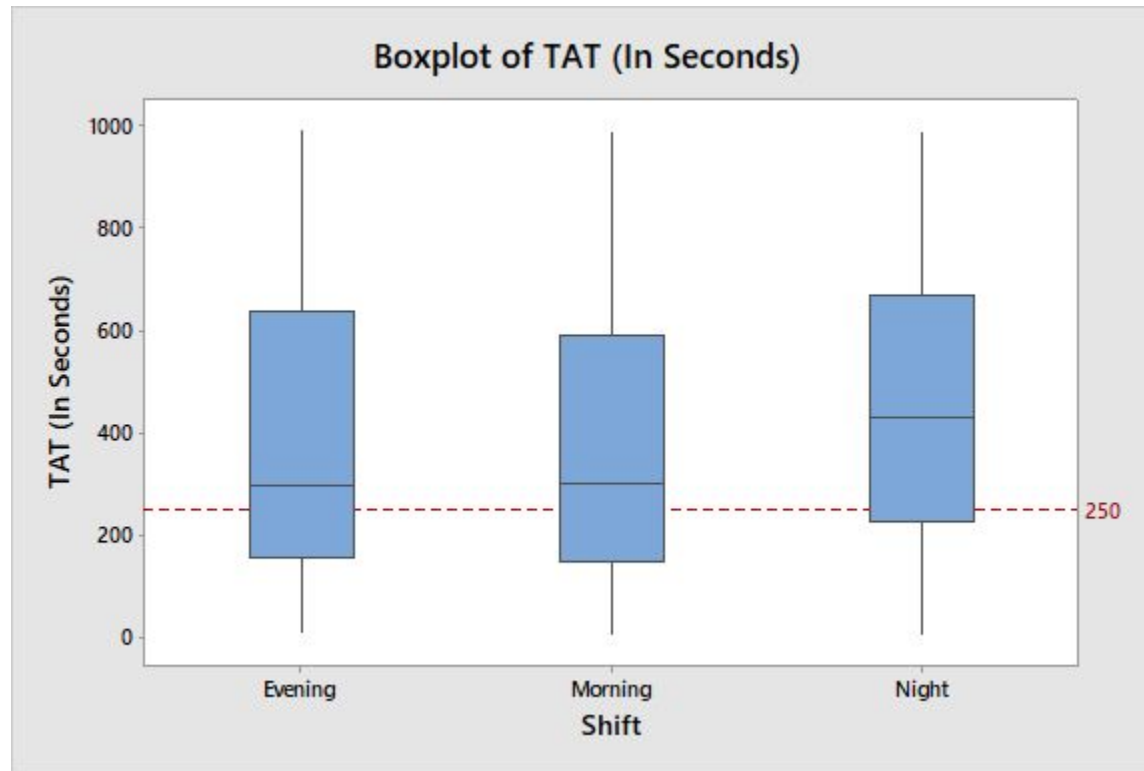
Overall median = 336

Since the P Value < 0.05, hence null is rejected. Hence
we are safe to conclude that Shift has significant
impact on TAT

TAT (In Seconds) Vs Shift

Boxplot of TAT (In Seconds)

TAT (In Seconds) Vs Gender

Mann-Whitney Test and CI: TAT (In Seconds)_F, TAT (In Seconds)_M

```
                       N    Median
TAT (In Seconds)_F    234   334.50
TAT (In Seconds)_M    311   344.00


Point estimate for η1 - η2 is 3.00
95.0 Percent CI for η1 - η2 is (-35.97,41.01)
W = 64169.0
Test of η1 = η2 vs η1 ≠ η2 is significant at 0.8749
The test is significant at 0.8749 (adjusted for ties)
```


Boxplot of TAT (In Seconds)
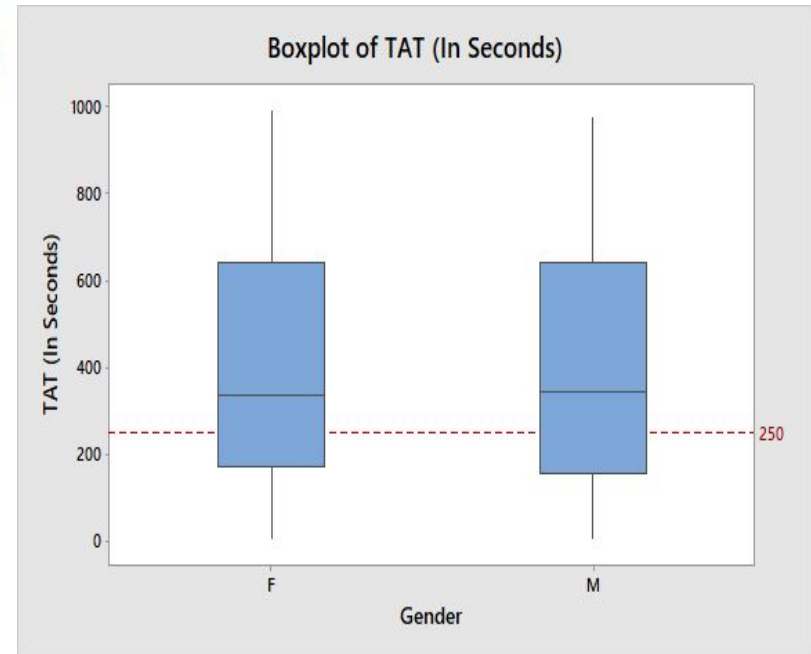
Since the P Value > 0.05, hence null cannot be rejected.
Hence we are safe to conclude that Gender has no
impact on TAT

TAT (In Seconds) Vs Location

Mann-Whitney Test and CI: TAT (In Seconds)_C5, TAT (In Seconds)_C6

```
                       N  Median
TAT (In Seconds)_C5   303  363.00
TAT (In Seconds)_C6   242  299.00


Point estimate for η1 - η2 is 8.00
95.0 Percent CI for η1 - η2 is (-30.01,49.02)
W = 83501.0
Test of η1 = η2 vs η1 ≠ η2 is significant at 0.6688
The test is significant at 0.6688 (adjusted for ties)
```
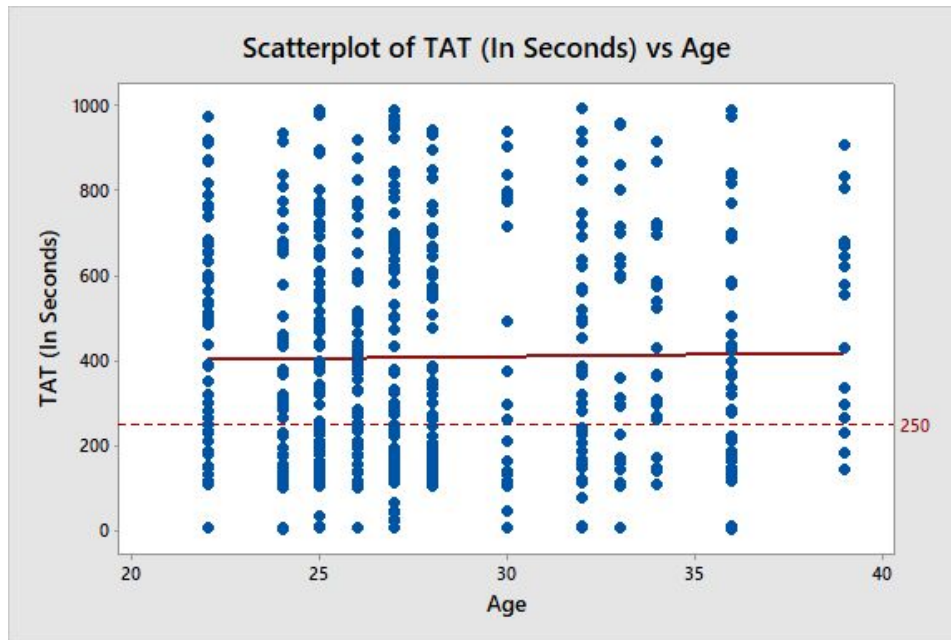

Boxplot of TAT (In Seconds)
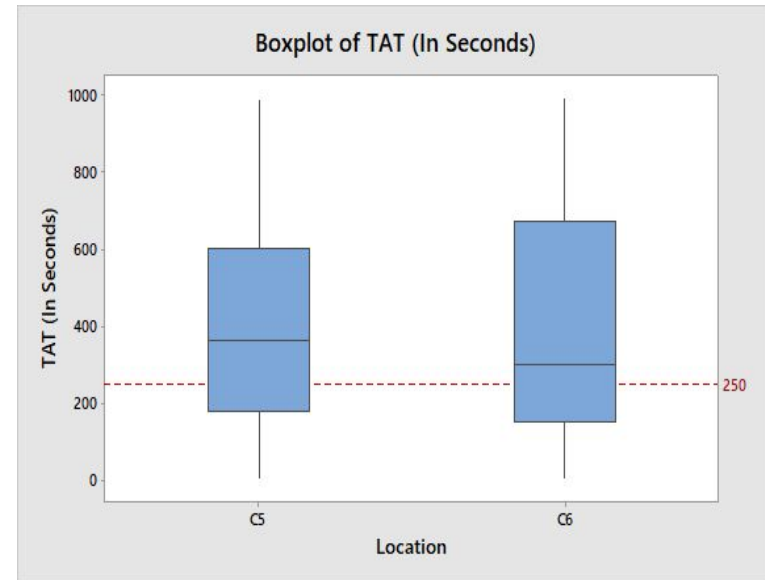
Since the P Value > 0.05, hence null cannot be rejected.
Hence we are safe to conclude that Location has no impact on TAT

TAT (In Seconds) Vs Age

Correlation: TAT (In Seconds), Age

Pearson correlation of TAT (In Seconds) and Age = 0.016
P-Value = 0.703

Scatterplot of TAT (In Seconds) vs Age

Regression Analysis: TAT (In Seconds) versus Age

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	10905	10905	0.15	0.703
Age	1	10905	10905	0.15	0.703
Error	543	40656738	74874		
Lack-of-Fit	10	585321	58532	0.78	0.650
Pure Error	533	40071417	75181		
Total	544	40667643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
273.632	0.03%	0.00%	0.00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	377.0	75.9	4.96	0.000	
Age	1.03	2.69	0.38	0.703	1.00

Regression Equation

TAT (In Seconds) = 377.0 + 1.03 Age

Since r=.016 & the P Value (0.703)> 0.05, hence null cannot be rejected. Hence we are safe to conclude that Age has no impact on TAT
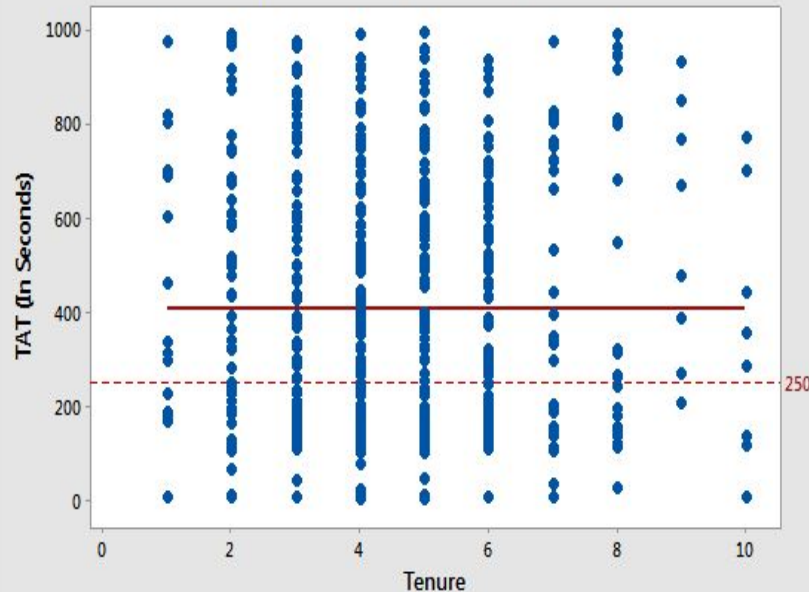
TAT (In Seconds) Vs Tenure

Correlation: TAT (In Seconds), Tenure

Correlations

Pearson correlation	0.000
P-value	0.993

Scatterplot of TAT (In Seconds) vs Tenure

Regression Analysis: TAT (In Seconds) versus Tenure

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	6	6.2	0.00	0.993
Tenure	1	6	6.2	0.00	0.993
Error	543	40667637	74894.4		
Lack-of-Fit	8	441201	55150.1	0.73	0.662
Pure Error	535	40226436	75189.6		
Total	544	40667643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
273.668	0.00%	0.00%	0.00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	405.4	31.6	12.83	0.000	
Tenure	0.06	6.38	0.01	0.993	1.00

Regression Equation

TAT (In Seconds) = 405.4 + 0.06 Tenure

Since r=0 & the P Value (0.993)> 0.05, hence null cannot be rejected. Hence we are safe to conclude that Tenure has no impact on TAT

TAT (In Seconds) Vs Education

Mann-Whitney: TAT (In Seconds)_G, TAT (In Seconds)_UG

Method

η_1: median of TAT (In Seconds)_G
η_2: median of TAT (In Seconds)_UG
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
TAT (In Seconds)_G	304	334.5
TAT (In Seconds)_UG	241	337.0

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
3	(-35, 43)	95.00%

Test

Null hypothesis	H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis	H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	83362.50	0.839
Adjusted for ties	83362.50	0.839

Boxplot of TAT (In Seconds)
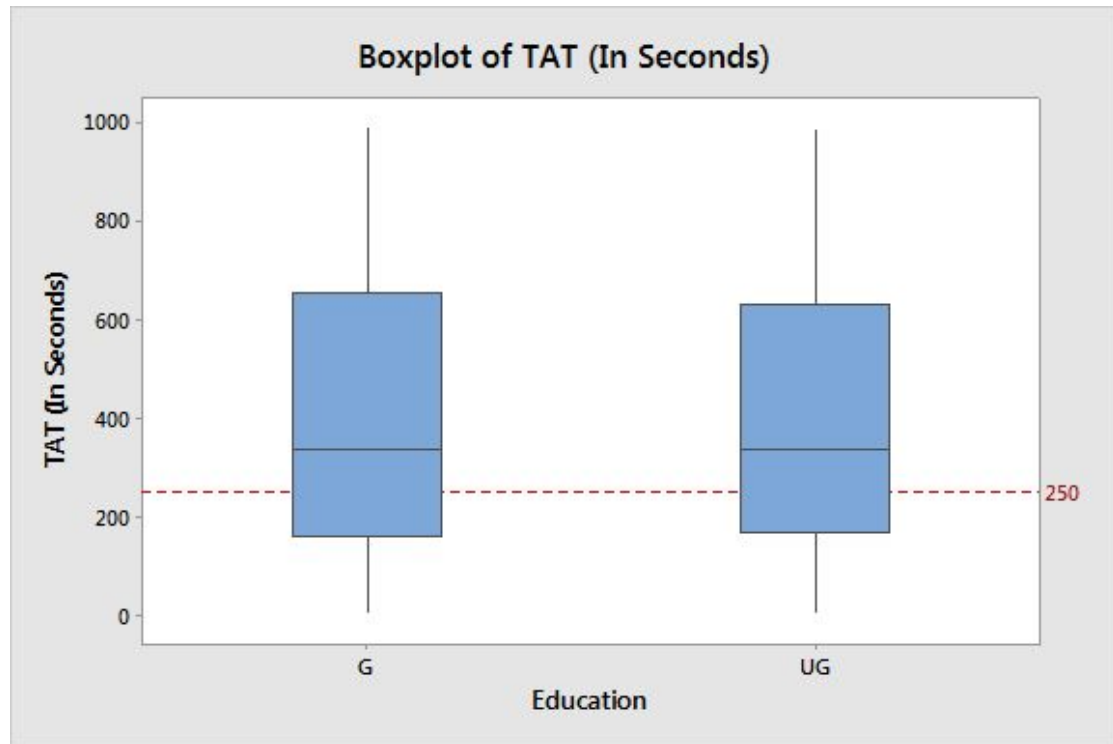
Since the P Value (0.839)> 0.05, hence null cannot be rejected. Hence we are safe to conclude that Education has no impact on TAT

TAT (In Seconds) Vs Marital Status

Mann-Whitney: TAT (In Seconds)_M, TAT (In Seconds)_S

Method

η_1: median of TAT (In Seconds)_M
η_2: median of TAT (In Seconds)_S
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
TAT (In Seconds)_M	227	330.0
TAT (In Seconds)_S	318	340.5

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
0.0000000	(-40, 37)	95.00%

Test

Null hypothesis	H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis	H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	62014.00	0.981
Adjusted for ties	62014.00	0.981

Boxplot of TAT (In Seconds)
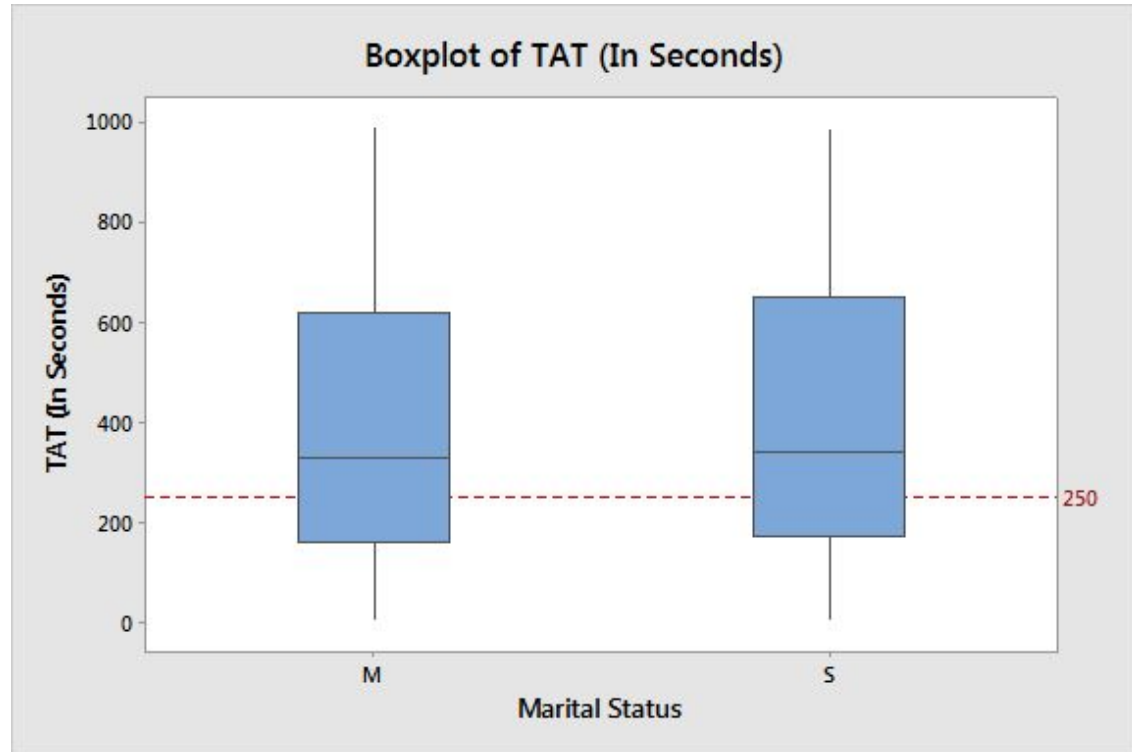
Since the P Value (0.981)> 0.05, hence null cannot be rejected. Hence we are safe to conclude that Marital Status has no impact on TAT

TAT (In Seconds) Vs Mode of Communication

Mann-Whitney: TAT (In Seconds)_E, TAT (In Seconds)_H

Method

η_1: median of TAT (In Seconds)_E
η_2: median of TAT (In Seconds)_H
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
TAT (In Seconds)_E	303	366.0
TAT (In Seconds)_H	242	317.5

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
4	(-33, 44)	95.00%

Test

Null hypothesis	H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis	H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	83167.00	0.806
Adjusted for ties	83167.00	0.806

Boxplot of TAT (In Seconds)
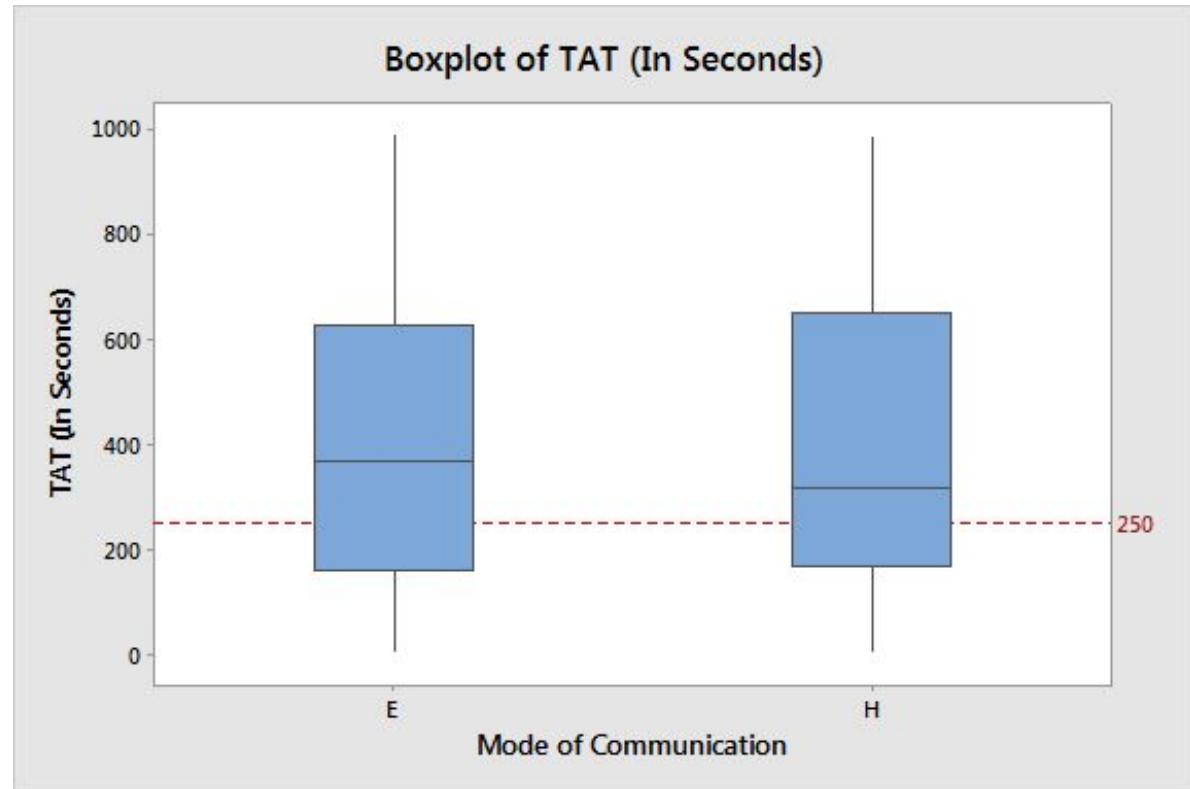
Since the P Value (0.806)> 0.05, hence null cannot be rejected. Hence we are safe to conclude that Mode of Communication has no impact on TAT

TAT (In Seconds) Vs Typing Speed

Correlation: TAT (In Seconds), Typing Speed

Correlations

Pearson correlation   -0.147
P-value   0.001

Scatterplot of TAT (In Seconds) vs Typing Speed

Regression Analysis: TAT (In Seconds) versus Typing Speed

Analysis of Variance

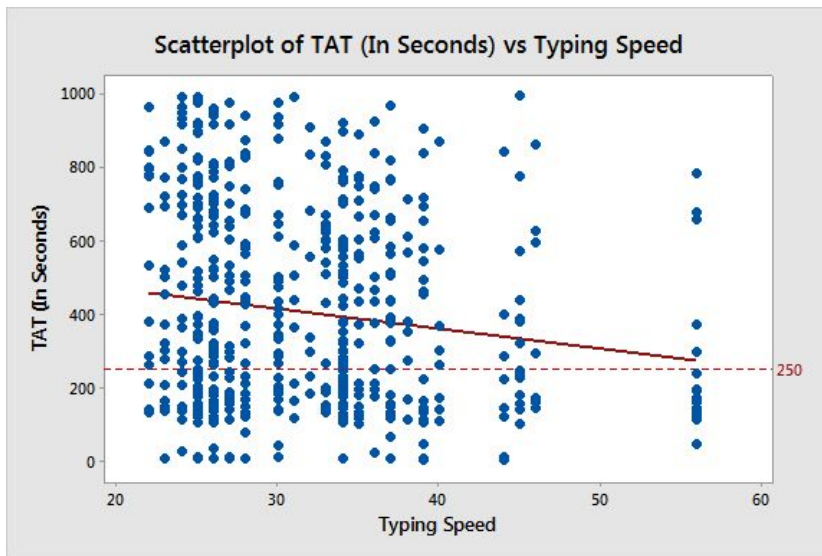| Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	877472	877472	11.97	0.001
Typing Speed	1	877472	877472	11.97	0.001
Error	543	39790171	73278		
Lack-of-Fit	20	1086120	54306	0.73	0.792
Pure Error	523	38704051	74004		
Total	544	40667643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
270.700	2.16%	1.98%	1.46%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	578.3	51.2	11.29	0.000	
Typing Speed	-5.45	1.57	-3.46	0.001	1.00

Regression Equation

TAT (In Seconds) = 578.3 - 5.45 Typing Speed

Since r= -0.147 & the P Value (0.001)< 0.05, hence null is rejected. Hence we are safe to conclude that Typing Speed has significant impact on TAT

Hypothesis Test Summary

Sl. No.	Potential X's	Source	Data Type	Hypothesis Test	Graphical Tool	P Value	Inference
1	System Operator	HR	Categorical	Kruskal Walis, Moods Median	Boxplot	0.413	No Impact
2	Process Complexity	MIS/Operations	Categorical	Mann Whitney	Boxplot	0.518	No Impact
3	Trainer	HR	Categorical	Kruskal Walis, Moods Median	Boxplot	0	Significant Impact
4	Shift	HR	Categorical	Kruskal Walis, Moods Median	Boxplot	0.032	Significant Impact
5	Gender	HR	Categorical	Mann Whitney	Boxplot	0.875	No Impact
6	Location	HR	Categorical	Mann Whitney	Boxplot	0.669	No Impact
7	Age	HR	Numerical	Correlation Coefficient, Regression Analysis	Scatterplot	0.703	No Impact
8	Tenure	HR	Numerical	Correlation Coefficient, Regression Analysis	Scatterplot	0.993	No Impact
9	Education	HR	Categorical	Mann Whitney	Boxplot	0.839	No Impact
10	Marital Status	HR	Categorical	Mann Whitney	Boxplot	0.981	No Impact
11	Mode of Communication	MIS	Categorical	Mann Whitney	Boxplot	0.806	No Impact
12	Typing Speed	MIS	Numerical	Correlation Coefficient, Regression Analysis	Scatterplot	0.001	Significant Impact

Improve Phase

Idea / Solution Generation

❖ **Techniques used for Idea Generation:**

1. Gemba walk (in the training classes and the 3 shifts)
2. Brainstorming (Round Robin) within the project team
3. Feedback from Subject Matter Experts (Using **Delphi method**)
4. **Process Flow Diagram**

Idea / Solution Generation: Hypothesis Testing

Regression Analysis: TAT (In Seconds) versus Typing Speed

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	877472	877472	11.97	0.001
Typing Speed	1	877472	877472	11.97	0.001
Error	543	39790171	73278		
Lack-of-Fit	20	1086120	54306	0.73	0.792
Pure Error	523	38704051	74004		
Total	544	40667643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
270.700	2.16%	1.98%	1.46%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	578.3	51.2	11.29	0.000	
Typing Speed	-5.45	1.57	-3.46	0.001	1.00

Regression Equation

TAT (In Seconds) = 578.3 - 5.45 Typing Speed

Idea / Solution Generation:
Hypothesis Testing

Regression Analysis: TAT (In Seconds) versus Trainer

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	3695733	739147	10.78	0.000
Trainer	5	3695733	739147	10.78	0.000
Error	539	36971910	68594		
Total	544	40667643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
261.904	9.09%	8.24%	7.07%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	340.7	27.9	12.20	0.000	
Trainer					
Atul	-56.7	41.0	-1.38	0.167	1.60
Daniel	19.2	36.9	0.52	0.603	1.83
Rashid	176.7	43.0	4.11	0.000	1.52
Ruby	157.5	36.0	4.38	0.000	1.90
Sonia	78.7	42.6	1.84	0.066	1.54

Regression Equation

TAT (In Seconds) = 340.7 + 0.0 Trainer_Amit − 56.7 Trainer_Atul + 19.2 Trainer_Daniel
                 + 176.7 Trainer_Rashid + 157.5 Trainer_Ruby + 78.7 Trainer_Sonia

Idea / Solution Generation: Hypothesis Testing

Regression Analysis: TAT (In Seconds) versus Shift

Method

Categorical predictor coding   (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	393119	196559	2.65	0.072
Shift	2	393119	196559	2.65	0.072
Error	542	40274525	74307		
Total	544	40667643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
272.594	0.97%	0.60%	0.00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	389.1	17.6	22.07	0.000	
Shift					
Morning	-0.6	28.2	-0.02	0.982	1.18
Night	59.5	28.2	2.11	0.035	1.18

Regression Equation

TAT (In Seconds) = 389.1 + 0.0 Shift_Evening - 0.6 Shift_Morning + 59.5 Shift_Night

Quality Function Deployment

Vital Xs	Rating (1 to 10) 1 Lowest 10 Maximum **From R square value in regression	Best trainer should share best training practice	Standard training SOP need to be created for all the trainers	Employee shift rotation	Additional benefir for night shift for motivation	Good lighting condition, snacks, beverages to be offered in night shift	HR to hire people with >40 wpm typing speed	Install typing tutor and allow daily 15 min practice at least	Bonus for highest typing speed
Trainer	8.8	9	9	1	1	1	1	1	1
Shift	6.3	3	3	9	9	9	1	6	3
Typing Speed	7.7	3	3	6	6	9	9	9	9
Deployment Matrix		121.2	121.2	111.7	111.7	134.8	84.4	115.9	97

**Can use any scale

1-no impact   3 low imapct   6 average impact   9 high impact

** Deployment Matrix gives the order to implement action plan

High Priority 120+   **Medium Priority** 100-120   **Low Priority**   Less Than 100

FMEA

Defined "X"s	Items	Failure Mode	Effect on EDR	Severity	Historical Evidence / Possibility of Occurrence	Occurrence	Detection	RPN (S*O*D)	RMS	RTP	Responsibility	Deadline
Trainer	Best trainer should share best training practice	Difference of opinion between trainers and ego issues	Reduce the impact	7		8	8	448	Reduce/Mitigate	Sit with the trainers and mitigate	Training Head	28th-29th November 2019
		Best trainers resign	Fatal Error	10	His salary lowest among the trainers	1	1	10	Reduce/Mitigate	Increase best trainer's salary	HR Head	29th-30th November 2019
		Schedule challenges	Improvement will be delayed	5		5	3	75	Reduce/Mitigate	Sit with the trainers and mitigate	HR Team	28th-29th November 2019
		Trainer has apprehensions sharing best practice	Reduce the impact	7		7	8	392	Reduce/Mitigate	Sit with the trainer and mitigate	Training Department	28th-29th November 2019
	Standard training SOP need to be created for all the trainers	Trainers don't follow the SOP	Reduce the impact	7		8	5	280	Reduce/Mitigate	Sit with the trainers and mitigate	Training Department	28th-29th November 2019
		SOP not being a good one	Reduce the impact	6	Company's low focus on SOP	1	2	12	Transfer	Hire expert to make the best SOP	Training Head	30th November-1st December 2019

FMEA

Defined "X"s	Items	Failure Mode	Effect on EDR	Severity	Historical Evidence / Possibility of Occurrence	Occurrence	Detection	RPN (S*O*D)	RMS	RTP	Responsibility	Deadline
Shift	Employee shift rotation	Morning Shift People not comfortable to come at night shift	Reduce the impact	7		5	2	70	Reduce/Mitigate	Incentive for morning shift people to work at night	HR Team	1st December-2nd December 2019
		Night Shift people afraif of losing night allowance	Reduce the impact	6		4	2	48	Reduce/Mitigate	Convince to come and also introduce benefits for day shift	HR Team	1st December-2nd December 2019
		Health issue with rotational shift	Reduce the impact	5		4	2	40	Reduce/Mitigate	Introduce relaxing program/time for employees of rotational shift	HR Team	2nd December-3rd December 2019
		Personal Issues specially with female employees	Reduce the impact	5		4	1	20	Reduce/Mitigate	Policies to consider genuine female personal issues	HR Team	2nd December-3rd December 2019
	Additional benefit for night shift for motivation	Budget unavailability	Improvement will be delayed	6		1	1	6	Reduce/Mitigate	Include in annual/quarterly budget	Finance Team	3rd December-4th December 2019
	Good lighting condition, snacks, beverages to be offered in night shift	Budget unavailability	Improvement will be delayed	5		1	1	5	Reduce/Mitigate	Include in annual/quarterly budget	Finance Team	3rd December-4th December 2019

FMEA

Defined "X"s	Items	Failure Mode	Effect on EDR	Severity	Historical Evidence / Possibility of Occurrence	Occurrence	Detection	RPN (S*O*D)	RMS	RTP	Responsibility	Deadline
Typing Speed	HR to hire people with >40 wpm typing speed	Cost Constraint	Reduce the impact	6		1	1	6	Reduce/Mitigate	Include in annual/quarterly budget	Finance Team	3rd December-4th December 2019
		Performance reduce after hiring	Reduce the impact	6		5	5	150	Reduce/Mitigate	Monitor their performance and give training iif required	Ops Manager	3rd December-10th December 2019
		Attrition Issue	Reduce the impact	7		9	1	63	Reduce/Mitigate	Talk with operators. Check if there is any dissatisfaction and act accordingly	OPS Manager & HR Team	3rd December-10th December 2019
		Lack of people with this qualification	Reduce the impact	7		3	1	21	Accept	Involve HR as an integral part of all discussions	Ops Manager	3rd December-4th December 2019
	Install typing tutor and allow daily 15 min practice at least	Softaware not compatible with system	Fatal Error	10		10	1	100	Transfer	IT Vendor needs to take part and ensure	IT Vendor	10th December-11th December 2019
		Not the priority of reporting managers	Fatal Error	8		7	1	56	Reduce/Mitigate	Ops Manager needs to make surprise visit to check	Ops Manager	11th December-15th December 2019
	Bonus for highest typing speed	Budget unavailability	Improvement will be delayed	6		1	1	6	Reduce/Mitigate	Include in annual/quarterly budget	Finance Team	3rd December-4th December 2019

Pilot Testing - Target Validation

Sign Test for Median: Improved TAT

Method

η: median of Improved TAT

Descriptive Statistics

Sample	N	Median
Improved TAT	40	238

Test

Null hypothesis	H_0: $\eta = 250$
Alternative hypothesis	H_1: $\eta < 250$

Sample	Number < 250	Number = 250	Number > 250	P-Value
Improved TAT	21	0	19	0.437

Since the P Value (0.437)> 0.05, hence null cannot be rejected. Hence we are safe to conclude that improved TAT is still not meeting the target

Before & After Analysis-Normality Test of Old & New TAT
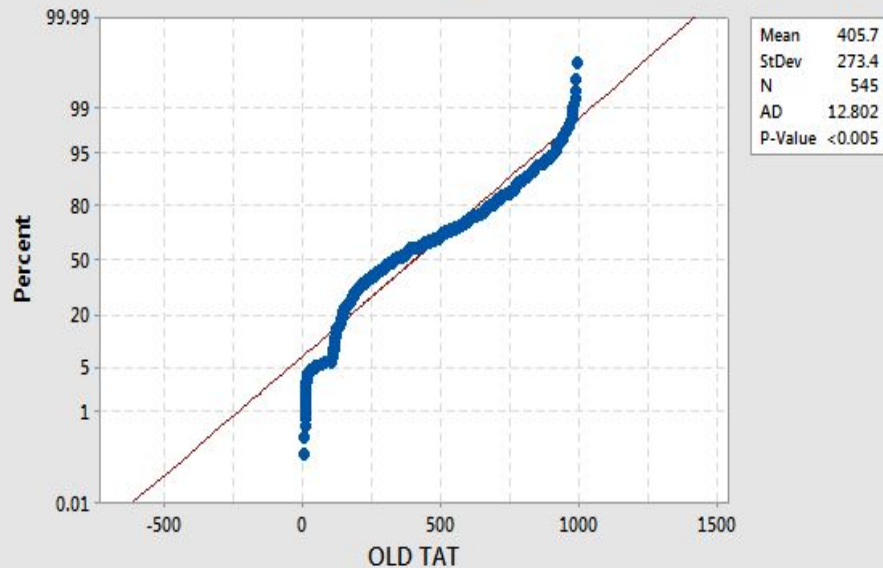
Earlier P<0.005. So was highly non-normal data
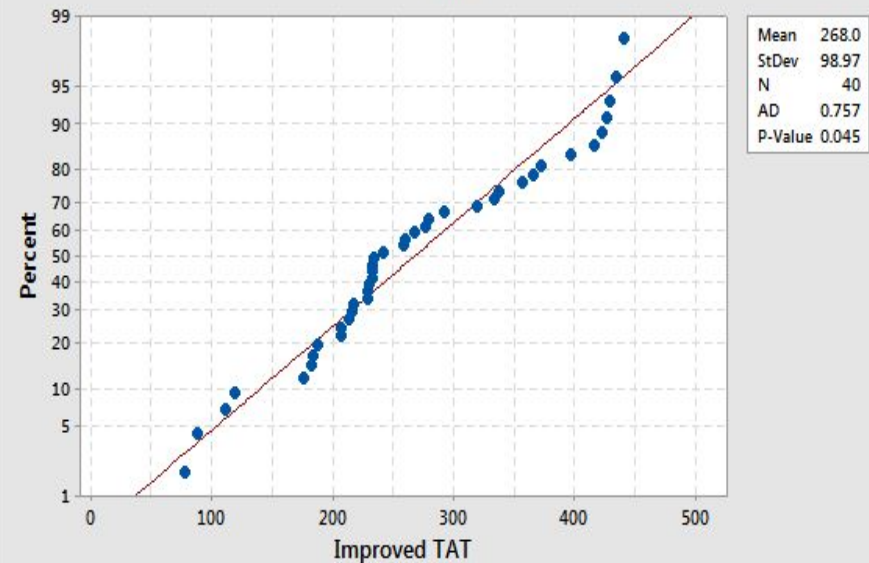
Current P Value is 0.045 which is shaping towards normality

Before & After Analysis-Randomness Test of Old & New TAT
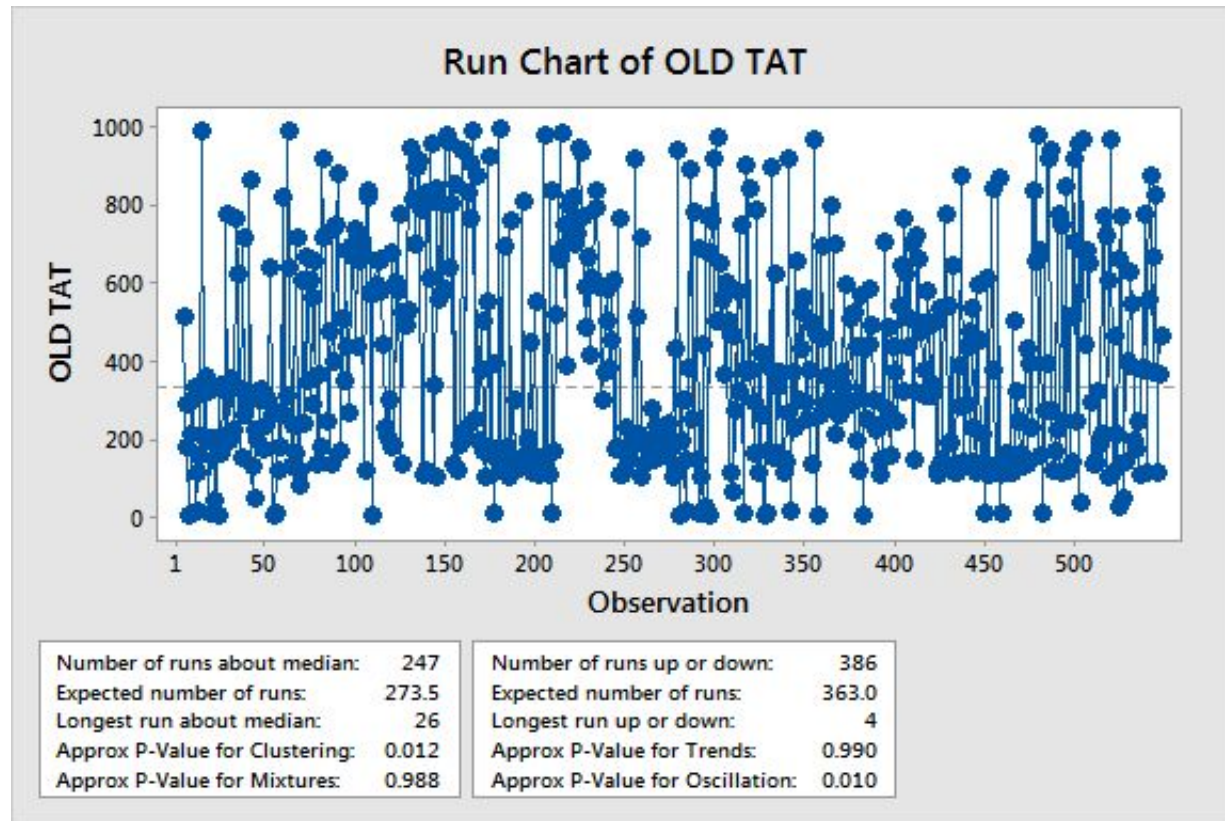
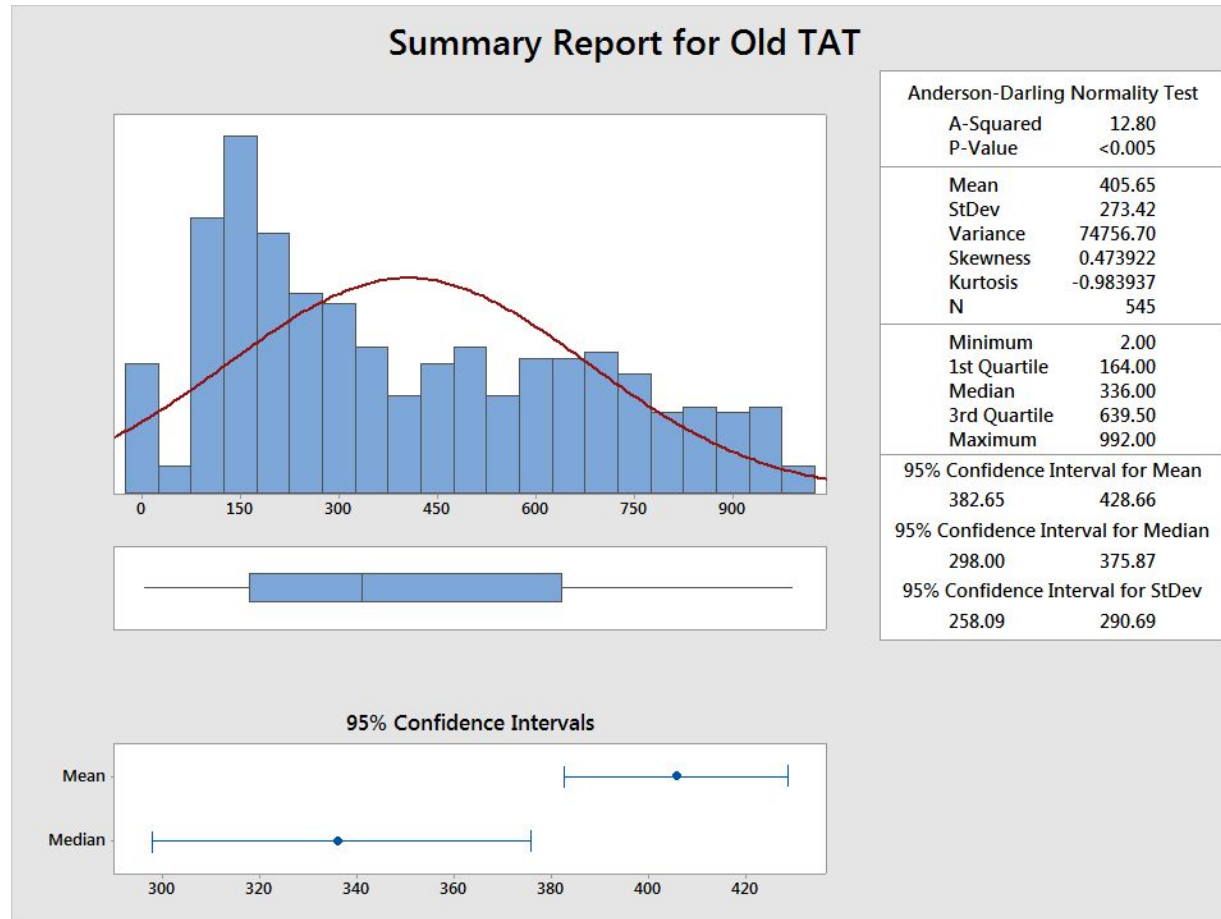Because of Clustering & Oscillation pattern Old TAT was non-random data

Before & After Analysis-Randomness Test of Old & New TAT
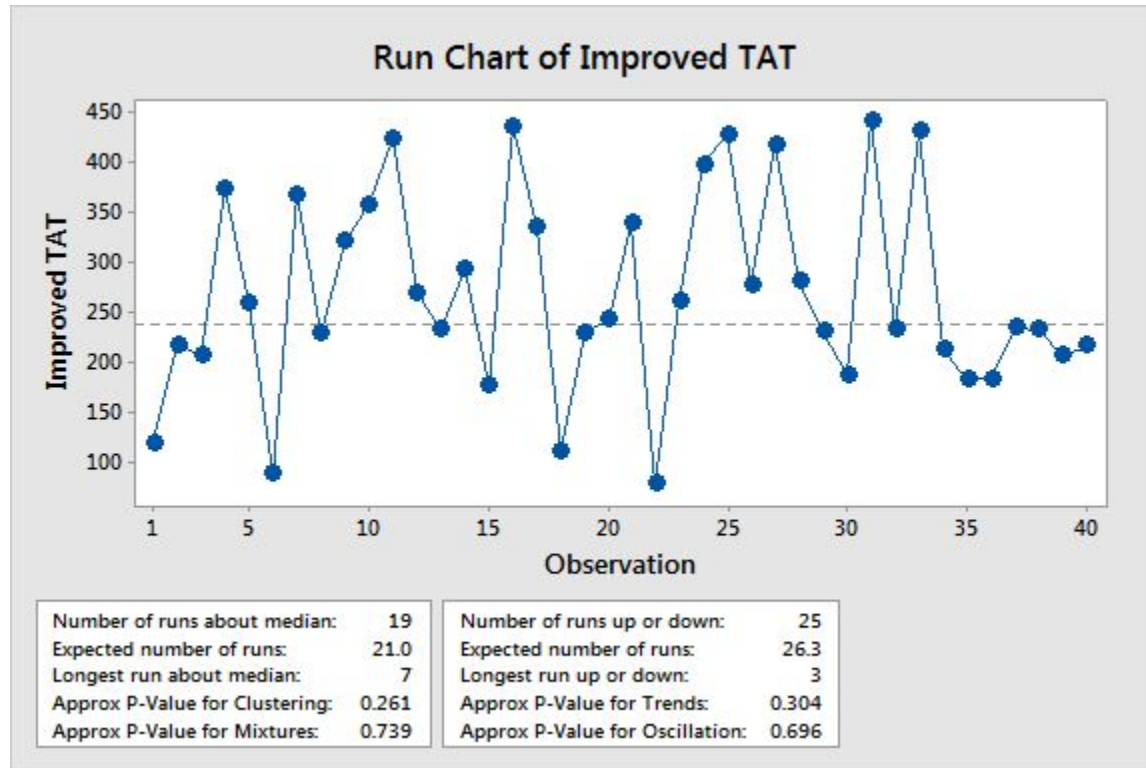
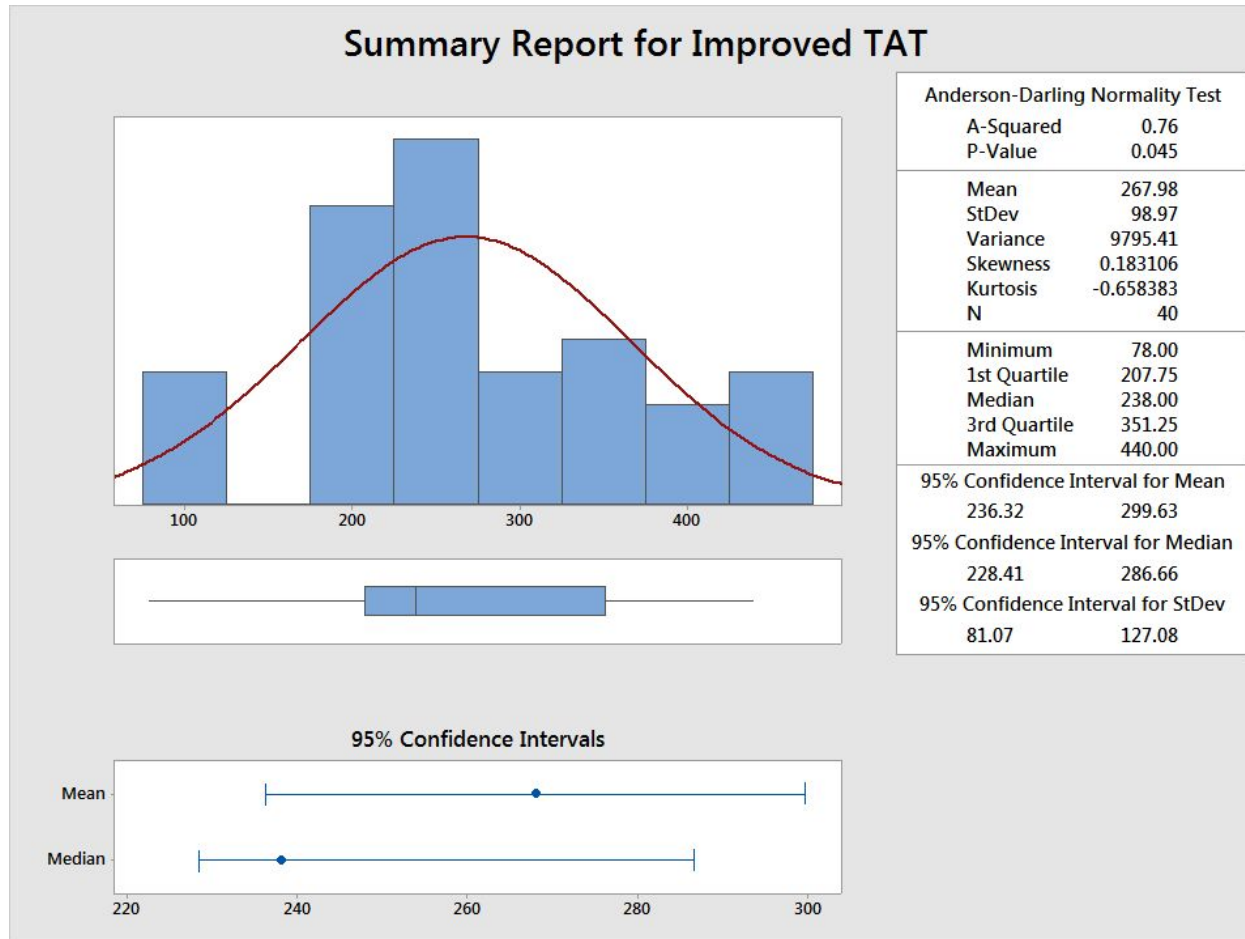As suggested by 4 P of 4 types of pattern, improved TAT data has become random

Before & After Analysis-Graphical Summary of Old & New TAT

The median & 95% CI of old TAT was 336 and 298 to 375.87 respectively, which was too high as against the target of 250

Before & After Analysis-Graphical Summary of Old & New TAT

The median & 95% CI of improved TAT is 238 and 228.41 to 286.66 respectively, which was improved and crossed the target of 250

Before & After Analysis-Mann Whitney Test of Old & New TAT

Mann-Whitney: Old TAT, Improved TAT

Method

η_1: median of Old TAT
η_2: median of Improved TAT
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
Old TAT	545	336
Improved TAT	40	238

Estimation for Difference

Difference	Lower Bound for Difference	Achieved Confidence
85	21	95.00%

Test

Null hypothesis	$H_0: \eta_1 - \eta_2 = 0$
Alternative hypothesis	$H_1: \eta_1 - \eta_2 > 0$

Method	W-Value	P-Value
Not adjusted for ties	162015.50	0.012
Adjusted for ties	162015.50	0.012

Our assumption that new TAT is significantly lower than the old TAT has been validated by P value 0.012. Hence we reject null (which is n1=n2)

Before & After Analysis-Box Plot of Old & New TAT
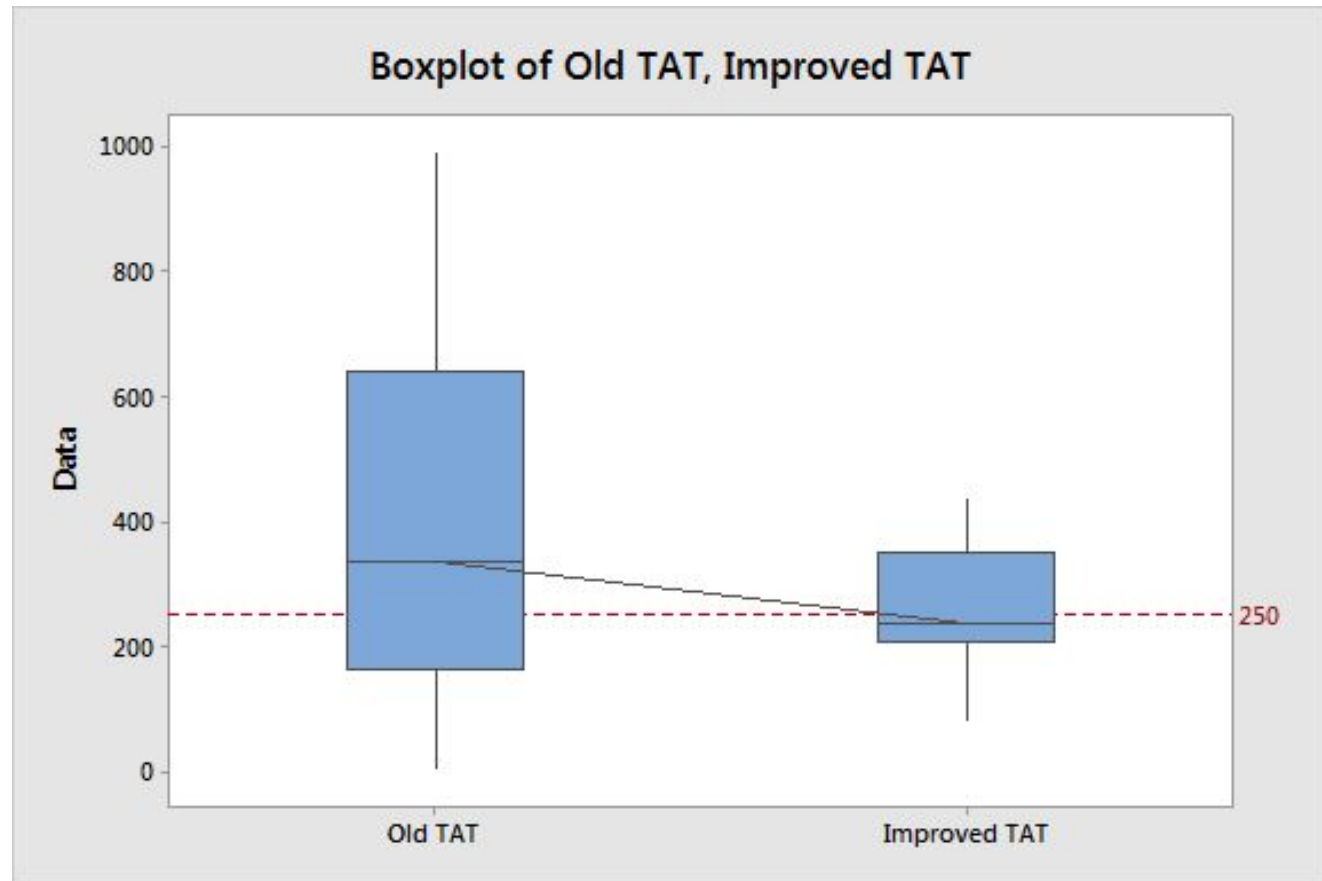
It is clearly evident from Box Plot that there is significant improvement from old TAT to new TAT
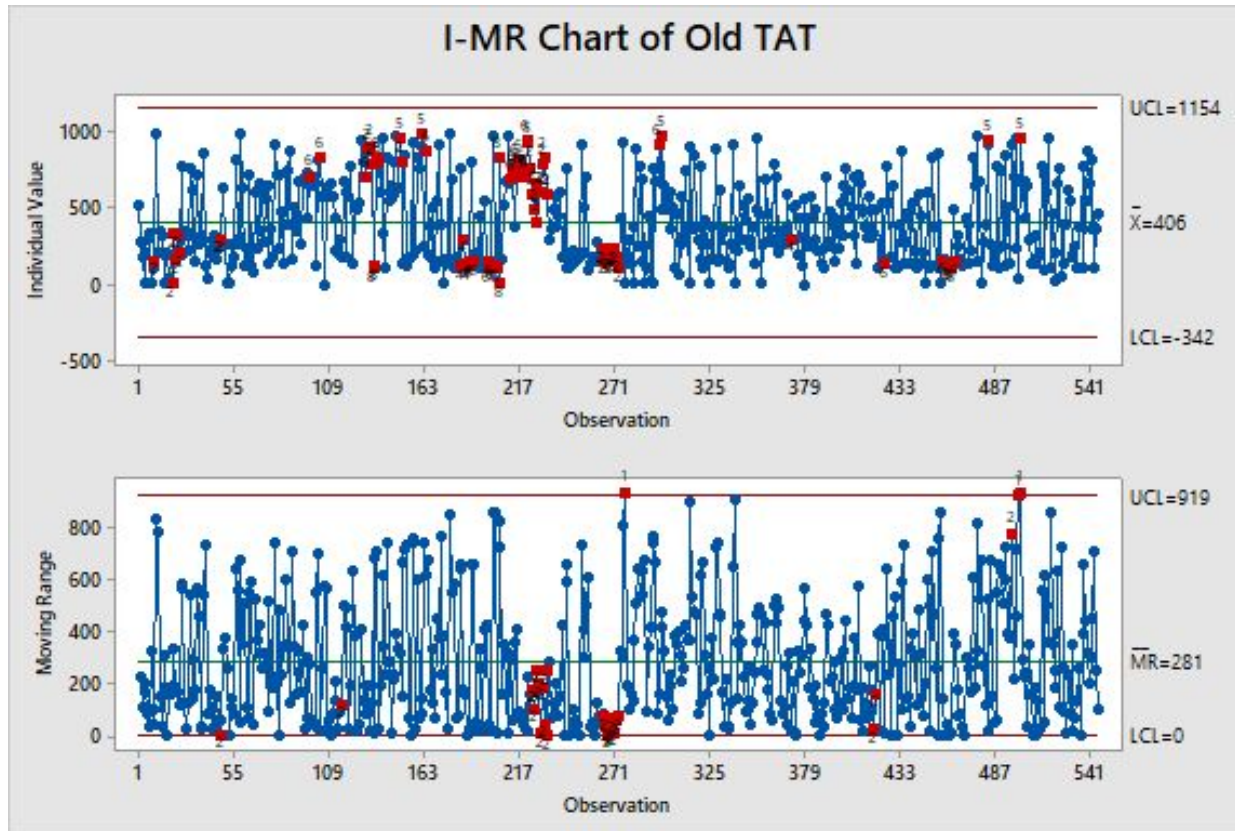
Cost Benefit Analysis

Control Phase

Control Plan
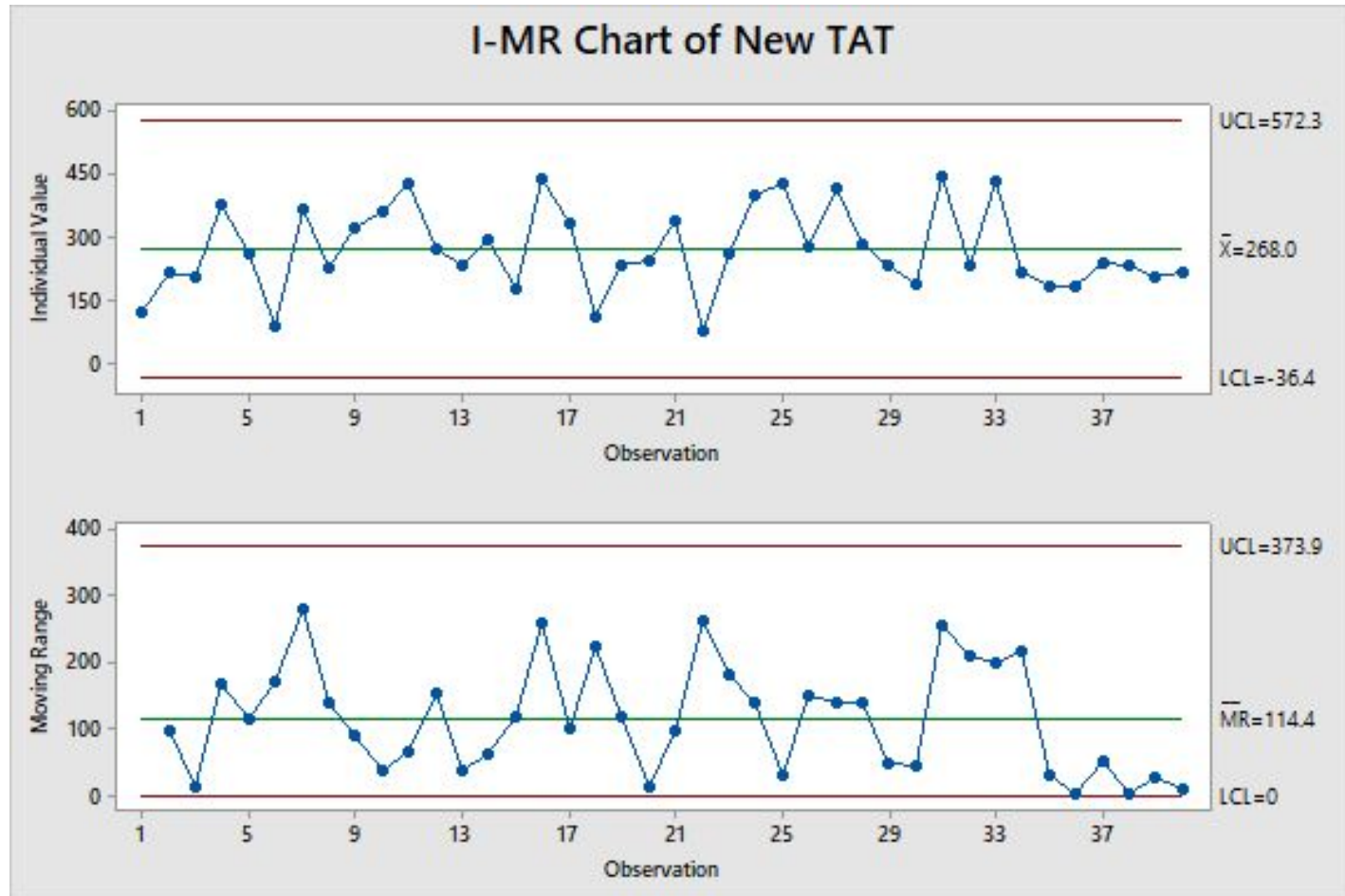
Control Charts
I-MR Control Chart for Old TAT

There are lots of special cause variation and the process is out of control

Control Charts
I-MR Control Chart for New TAT

The process is stable and in control and are within limits. There are control measures in place to treat special cause variation