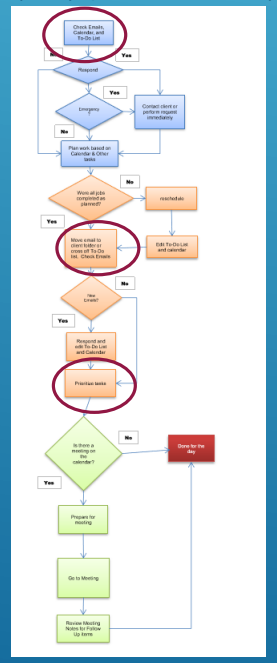
Key Dates →	Define	Measure	Analyze	Improve	Control
	July 19	August 24	August 27	September 14	September 17

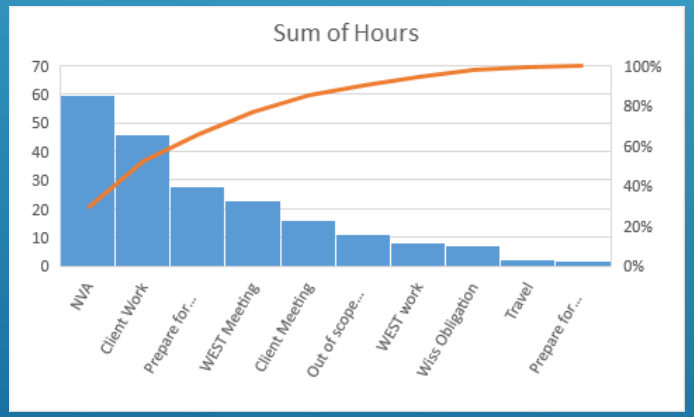
Define

- The WEST department is currently spending $175 an hour on a contracted IT manager.
- A 10% reduction in NVA activities, could lead to 2 hours a week I can spend on IT projects, to save the company $18,200 annually.



Measure

- Collect Data on variables: NVA activities(Y), Client Meeting (X1), Client Work (X2), Out of Scope Work (X3), Prepare for Client Meeting (X4), Prepare for WEST Meeting (X5), Travel to/from Meeting (X6), WEST Meeting (X7), WEST Work (X8), and Wiss Obligation (X9).
- Discrete Data is if the office is over 72 degree.
- 29.4% of time is spent on NVA activities



Analyze

Hypothesis Testing

H0: μ1 <= μ2
Ha: μ1 > μ2

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$df = n_1 + n_2 - 2$$

Y = 4.876 – .511(X2) - .433(X4) - .637(X7)

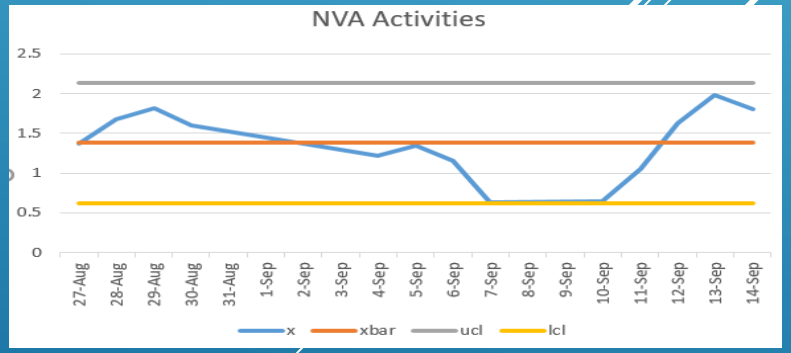
Improve

Changes Made to Process:

1. Eat lunch at desk
2. Write a daily To Do List to limit time spent reviewing emails.

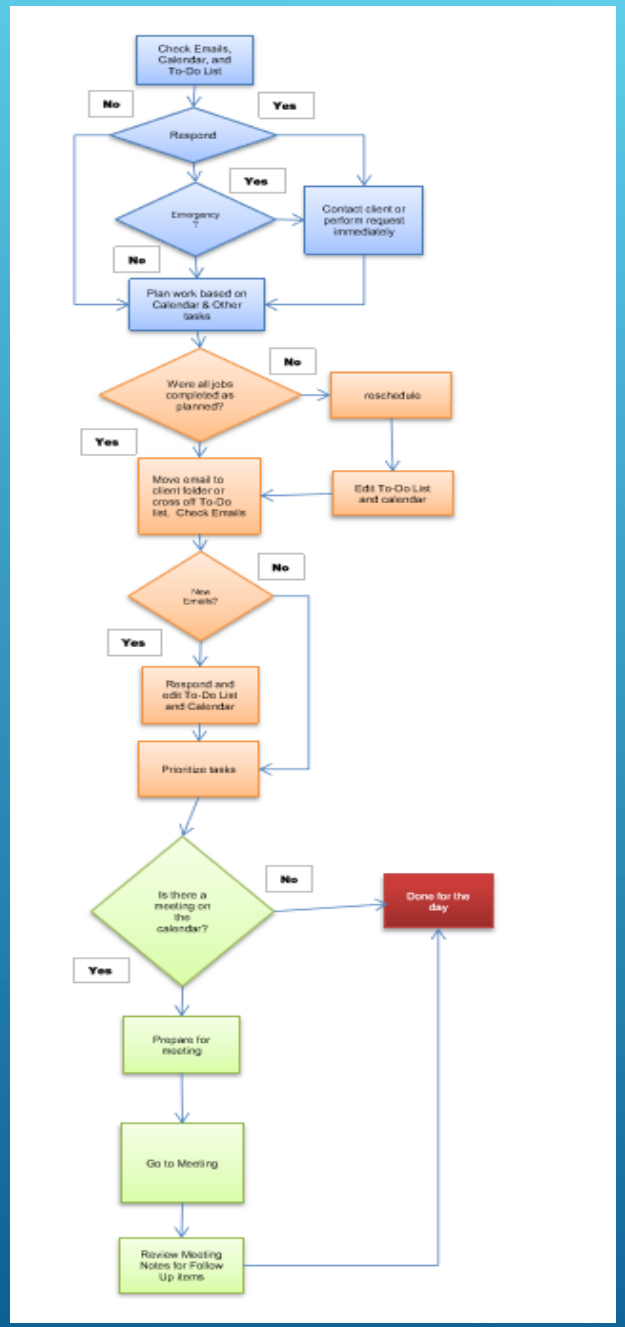
Before the Improvement	
Defect Opportunities per unit	1
Units Produced	25
Total Possible defect	25
Total Actual Defects	19
Defect per opportunity rate	19/25 = .76
DPMO	760,000
SQL Value	0.8
After the Improvement	
Defect Opportunities per unit	1
Units Produced	13
Total Possible defect	13
Total Actual Defects	0
Defect per opportunity rate	0/13 = 0
DPMO	0
SQL Value	0

Control



PROCESS IMPROVEMENT PROJECT – TIME MANAGEMENT

PROCESS OWNER – KELLY SCHILLACI



Current Process

The process map is graphical tool for documenting a process. Each step or activity is mapped out as it occurs in the real-live process.

The current process shows inefficient use of time by how I read, check, and organize my emails.

DATA MEASUREMENT PLAN

Performance Measure	Data Source	How Data are Allocated	Data Collector	Data Collection Timeframe	Sample Size
Client Meeting	Excel	Time is entered in minutes by client and by day and summed together in a Pivot Table.	Kelly	7/23 – 9/14	38
Client Work	Excel	Time is entered in minutes by client and by day, summed together in a Pivot Table.	Kelly	7/23 – 9/14	38
NVA	Excel	Time is entered in minutes in subcategories and summed together	Kelly	7/23 – 9/14	38
Out of Scope Work	Excel	Time is entered in minutes by day.	Kelly	7/23 – 9/14	38
Prepare for Meeting	Excel	Time is entered in minutes by day and client, summed together in Pivot Table.	Kelly	7/23 – 9/14	38
Prepare for WEST Meeting	Excel	Time is entered in minutes by day	Kelly	7/23 – 9/14	38
Travel to/from Meeting	Excel	Time is entered in minutes by client and day, summed together in Pivot Table.	Kelly	7/23 – 9/14	38
WEST Meeting	Excel	Time is entered in minutes by day	Kelly	7/23 – 9/14	38
WEST Work	Excel	Times is entered in minutes by day.	Kelly	7/23 – 9/14	38
Wiss Obligation	Excel	Time is entered in minutes by day.	Kelly	7/23 – 9/14	38
Is Office Temperature above 72?	Excel	Temperature on Thermostat	Kelly	7/23 – 9/14	38

DATA COLLECTION METHOD

- I collected continuous data from 7/23 – 9/14. 7/23 - 8/24 were before my process improvement and 8/27 – 9/14 were after the improvement. I also collected discrete data if the office temperature was over 72 degrees.
- I made an Excel Spreadsheet with my main categories that contained formulas to total each activity for the day. Each activity was recorded in increments of minutes. I always have my laptop at work so tracking was very easy.
- My Continuous Data Variables: NVA activities(Y), Client Meeting (X1), Client Work (X2), Out of Scope Work (X3), Prepare for Client Meeting (X4), Prepare for WEST Meeting (X5), Travel to/from Meeting (X6), WEST Meeting (X7), WEST Work (X8), and Wiss Obligation (X9).

SAMPLE SIZE

- Total Sample Size was 38. 25 before the process improvement and 13 after.
- With 95% confidence and margin of error of .174, I would need 97 samples before the improvement and 50 samples after the improvement.
- I could reduce my margin of error by increasing my sample size.
- I did not have close to enough samples for an accurate project.

- My margin of error (3.86) was calculated by taking the standard deviation (19.31) and dividing by the square root of my sample size (25).
- My sample size was calculated by taking my z* value 1.96 for a confidence level of 95%, multiplied by my standard deviation, divided by my margin of error, then that calculation is squared. The answer is rounded up to the next day.
- Before the improvement
  - Standard Deviation = .868
  - Margin of Error = .868/sqrt(25) = .174
  - [(1.96*.868)/.174]^2 = 96.04
- After the improvement
  - Standard deviation = .429
  - Margin of Error = .429/sqrt(13) = .119
  - [(1.96*.429)/.119]^2 = 49.94

SUCCESS MEASURES

GOAL

- A 10% reduction in NVA activities, could lead to 2 hours a week I can spend on IT projects, to save the company $18,200 annually.

OPERATIONAL DEFINITION

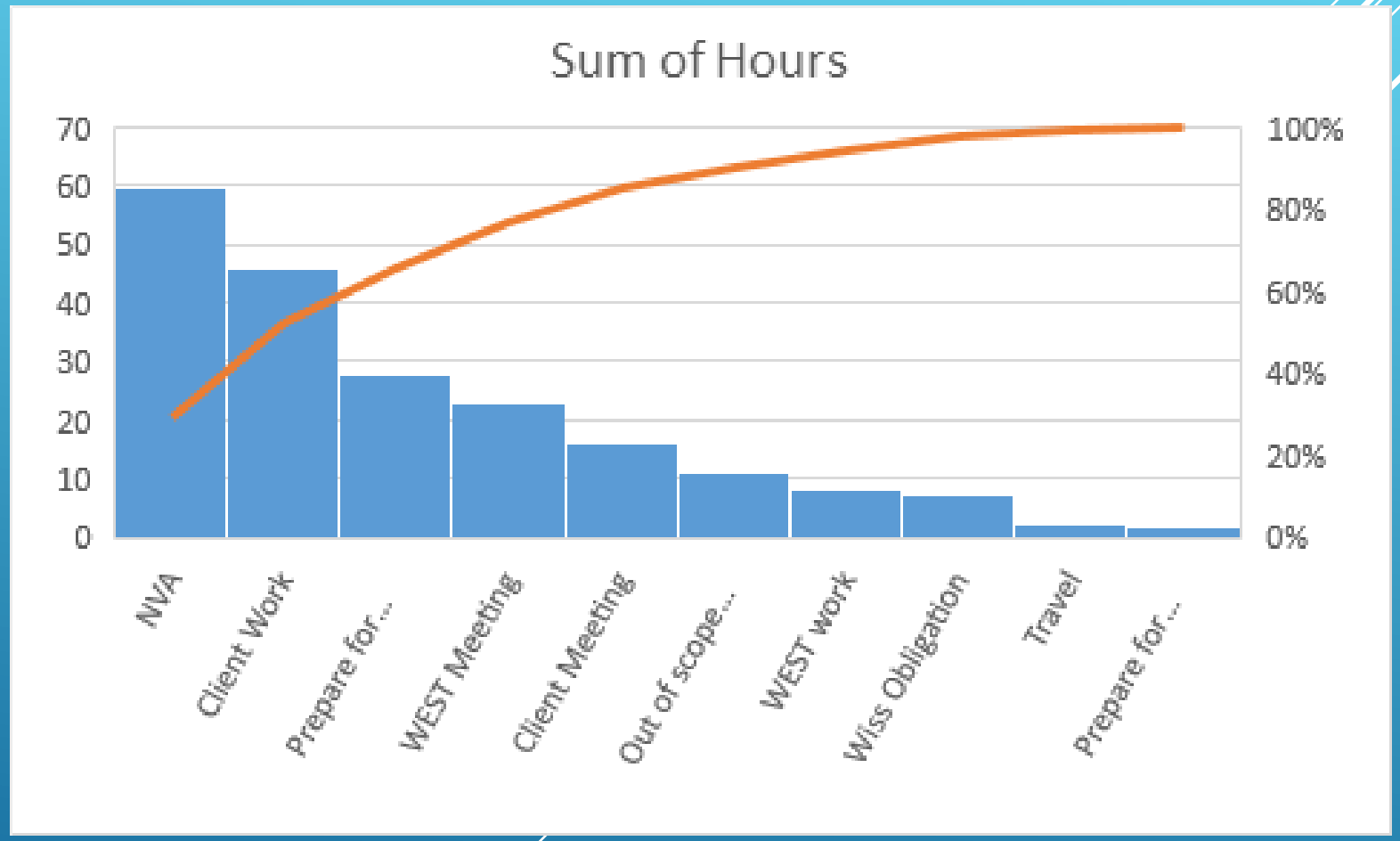
- NVA activities (Y) is the total hours spent on non-value added activities each during the data collection period. A defect is defined as spending more than 2 hours a day on NVA activities. Measured in minutes.
- Client Meeting (X1), Client Work (X2), Out of Scope Work (X3), Prepare for Client Meeting (X4), Prepare for WEST Meeting (X5), Travel to/from Meeting (X6), WEST Meeting (X7), WEST Work (X8), and Wiss Obligation (X9). Measured in minutes.
- Office temperature above 72 is observed on the thermostat.

BASELINE

- I spent an average of 2.446 hours per day on NVA activities before the improvement. The SQL was .8, with a number of DPMO of 760,000, before the improvement

PARETO CHART

- The Pareto Chart identifies how much time I spend on activities.
- The chart shows that the activities I spend the most time on are NVA.
- For my process improvement I decided to look at what NVA activities I can eliminate or complete more efficiently.



DESCRIPTIVE STATISTICS

Before the Improvement	
Mean	2.446
Standard Error	0.173644
Median	2.17
Mode	2.17
Standard Deviation	0.868221
Sample Variance	0.753808
Kurtosis	1.529976
Skewness	1.299014
Range	3.52
Minimum	1.2
Maximum	4.72
Sum	61.15
Count	25

- Descriptive Statistics Summarize the data. They provide a nice overview of the data you are analyzing. They are useful because they give you most of the information you need to perform your calculations
- After my process improvement, my mean of time spent on NVA activities decreased 44%. The standard deviation decreased significantly as well. I would love to say that my new process is the reason for such dramatic improvements, but the beginning of the month is when I have all my client meetings and I was a little behind from the long weekend for Labor Day. I definitely need more time to analyze my new process.

After the Improvement	
Mean	1.378462
Standard Error	0.119018
Median	1.37
Mode	#N/A
Standard Deviation	0.429124
Sample Variance	0.184147
Kurtosis	-0.57281
Skewness	-0.53114
Range	1.35
Minimum	0.63
Maximum	1.98
Sum	17.92
Count	13

SQL

- SQL is used to provide a baseline to compare.
- The defect was spending 2 or more hours on NVA Activities.
- The SQL value went from .8 to 0, which is obviously not realistic. The 13 days observed after the improvement were incredibly busy with client meetings. My firm closes the office Friday and Monday for Labor Day. I lost 2 days to prepare for the client meetings.

Before the Improvement	
Defect Opportunities per unit	1
Units Produced	25
Total Possible defect	25
Total Actual Defects	19
Defect per opportunity rate	19/25 = .76
DPMO	760,000
SQL Value	0.8
After the Improvement	
Defect Opportunities per unit	1
Units Produced	13
Total Possible defect	13
Total Actual Defects	0
Defect per opportunity rate	0/13 = 0
DPMO	0
SQL Value	0

HYPOTHESIS TESTING

- H0: μ1 <= μ2
- Ha: μ1 > μ2
- T = (2.446-1.378)/sqrt[(.868)^2/25+(.429)^2/13] = 5.071
- P = .000006
- H0 is rejected because the 2nd process has less NVA activities
- I used the hypothesis test to determine if my new process was an improvement

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$df = n_1 + n_2 - 2$$

CHI SQUARE TEST

- The Chi Square Test was used to determine if the office temperature and amount of time spent on NVA activities are related.
- Null hypothesis: Temperature and amount of time spent on NVA activities are independent.
- Alternative Hypothesis: Temperature and amount of time spent on NVA activities are dependent.
- P is higher than .05 before the improvement and resulted in an error after the improvement due to running out of time. There are also instances where we have less than 5 samples.

Before					After			
NVA Activities Time	Under 72	72 and Over	Total		NVA Activities Time	Under 72	72 and Ove	Total
0-2	4	2	6		0-2	9	4	13
2+	12	7	19		2+	0	0	0
Total	16	9	25		Total	9	4	13
Before Expected					After Expected			
NVA Activities Time	Under 72	72 and Over	Total		NVA Activities Time	Under 72	72 and Ove	Total
0-2	3.84	2.16	6		0-2	9	4	13
2+	12.16	6.84	19		2+	0	0	0
Total	16	9	25		Total	9	4	13
0.875956062					#DIV/0!			

REGRESSION ANALYSIS - BEFORE

- The Regression Analysis shows which inputs have a relationship with the output.
- All of the P values are below .05 so they are all in equation.
- F is also below .05
- The R is a strong relationship and the adjusted R squared is a strong relationship as well.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.969749
R Square	0.940413
Adjusted R Square	0.90466
Standard Error	0.268082
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	17.013381	1.890375679	26.30346776	1.31814E-07
Residual	15	1.0780189	0.071867926		
Total	24	18.0914			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	7.28944	0.3707837	19.65955044	4.04578E-12	6.499133712	8.079747115	6.4991337	8.079747115
Client Work	-0.83568	0.0781559	-10.69247696	2.05635E-08	-1.002264882	-0.669094378	-1.002265	-0.669094378
Prepare for meeting	-0.92915	0.078278	-11.86980799	5.01701E-09	-1.09599112	-0.762299697	-1.095991	-0.762299697
WEST Meeting	-0.8137	0.0706937	-11.51028393	7.62325E-09	-0.964384289	-0.663024281	-0.964384	-0.663024281
Client Meeting	-0.83811	0.0845967	-9.907098567	5.649E-08	-1.018421638	-0.657794373	-1.018422	-0.657794373
Out of scope work	-0.81789	0.0738119	-11.08073213	1.27451E-08	-0.97521667	-0.660563847	-0.975217	-0.660563847
WEST work	-0.9157	0.0999671	-9.160023854	1.56467E-07	-1.128775453	-0.702625943	-1.128775	-0.702625943
Wiss Obligation	-0.79832	0.1133928	-7.040311447	4.00201E-06	-1.04001136	-0.556629435	-1.040011	-0.556629435
Travel	-1.30678	0.2278385	-5.735557878	3.941E-05	-1.792407478	-0.821154777	-1.792407	-0.821154777
Prepare for WEST Meeting	-0.63241	0.192177	-3.290770566	0.004951728	-1.04202626	-0.222794893	-1.042026	-0.222794893

REGRESSION ANALYSIS - AFTER

- The predictive equation:

Y = 4.876 – .511(X2) - .433(X4) - .637(X7)

- Preparing for the client meeting, the client meeting, and Wiss obligations are the variables with a low P value which is why I used them in my equation.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.967796055
R Square	0.936629205
Adjusted R Square	0.74651682
Standard Error	0.216051562
Observations	13

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	2.069734398	0.229970489	4.926713244	0.1082377
Residual	3	0.140034833	0.046678278		
Total	12	2.209769231			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ver 95.(*	*Upper 95.0%*
Intercept	4.875528992	1.133149388	4.302635684	0.023102546	1.2693419	8.481716074	1.269	8.481716074
Client Work	-0.531521755	0.196897074	-2.699490371	0.073817889	-1.158136	0.09509261	-1.16	0.09509261
Prepare for meeting	-0.511014342	0.131272	-3.892790083	0.03006527	-0.92878	-0.093248249	-0.93	-0.093248249
WEST Meeting	-0.38518653	0.22771609	-1.691520924	0.189315581	-1.109881	0.339507698	-1.11	0.339507698
Client Meeting	-0.431137616	0.1397931	-3.084112279	0.053961773	-0.876022	0.013746418	-0.88	0.013746418
Out of scope work	0	0	65535	#NUM!	0	0	0	0
WEST work	-0.640142121	0.253334974	-2.52686043	#NUM!	-1.446367	0.166082831	-1.45	0.166082831
Wiss Obligation	-0.637293094	0.153541377	-4.150627715	0.025414491	-1.12593	-0.148655907	-1.13	-0.148655907
Travel	-0.639648302	0.276730261	-2.311450509	0.103893012	-1.520327	0.241030894	-1.52	0.241030894
Prepare for WEST Meeting	-0.672284928	0.275381521	-2.441285547	0.092394221	-1.548672	0.204101977	-1.55	0.204101977

CONTROL LIMITS CHART

The control limit chart is an excellent analysis tool. The new process seems to be controlled. There are no data outside the limits.