

Workshop: Process Improvement Using Lean Six Sigma

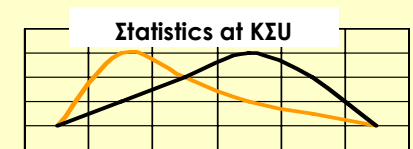
Victor E. Kane
Jennifer Lewis Priestley

Department of Mathematics and Statistics
Kennesaw State University



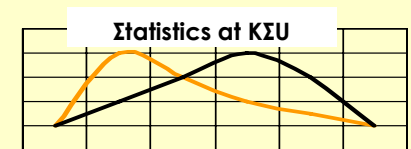
Complete Questionnaire

- Check Box "Before Workshop"



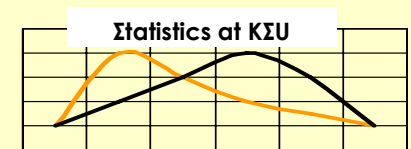
Introduction to Six Sigma

- Six Sigma Improves a **work PROCESSES**
- Examples : Dummies p.12
 1. **GE** – Profitted \$7 - \$10B in 5 yrs.
 2. **Dupont** – added \$1 - \$2.4B in 4 yrs
 3. **Bank of America** – saved several Million by reducing cycle time and number of processing errors.
 4. **Honeywell** – Saved \$2B in operating costs.



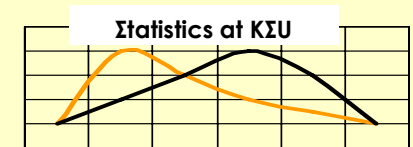
Common Themes - DMAIC

- Performance is **D**efined by **M**easurements for a Work Process
- Data is the focus of Analysis (**A**nalyze)
- **I**mprovement is conducted by Teams
- Process **C**ontrol is an outcome



Workshop Topics

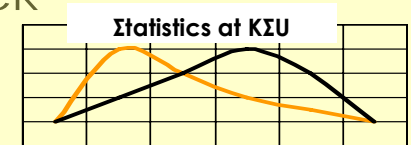
1. **Workshop Learning Outcomes.**
2. **The Governor's Customer Service Improvement Initiative – What does it mean for us?**
3. **Are there any good examples of what others have done?**
4. **What is Six Sigma and How will it help?**
5. **Review and Table Exercise.**



Workshop Learning Outcomes

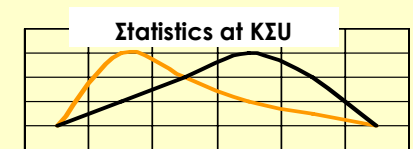
By the end of the workshop, participants will be able to:

- ✓ Understand Georgia's Customer Service Improvement Initiative (CSI).
- ✓ Get started on a CSI project for their work unit.
- ✓ Identify customers and define the work processes that service these customers.
- ✓ Develop customer surveys to define customer requirements and satisfaction.
- ✓ Apply Six Sigma DMAIC to improvement projects.
- ✓ Identify the role of benchmarking and competitive assessment in improvement efforts.
- ✓ Use Baldrige Education Criteria to identify improvement opportunities.
- ✓ Use simple statistical tools to analyze and track performance.



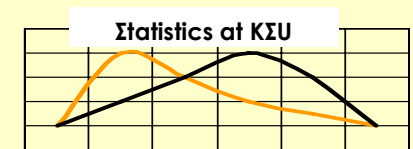
Workshop Topics

1. Workshop Learning Objectives.
- 2. The Governor's Customer Service Improvement Initiative – What does it mean for us?**
3. Are there any good examples of what others have done?
4. What is Six Sigma and How will it help?
5. Review and Table Exercise.



Customer Service Improvement Initiative

- Governor Perdue launched the CSI initiative Aug 1, 2006
- Goal: "Make Georgia the best-managed state in the country by 2007."
- The Governor stated:
 - *"I want to change the culture of state government to be principle-centered, results-driven and customer focused."*
 - *"Right now, 42 state agencies are launching new CSI Plans to make Georgia's service to citizens faster, friendlier and easier."*



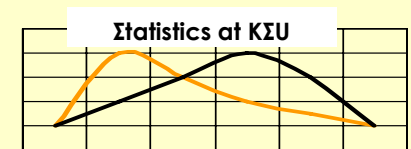
Customer Service Improvement Initiative

Erroll Davis stated:

" ...the 38,000 faculty and staff employed by Georgia's 35 public colleges and universities to provide faster, friendlier, and more efficient service to the USG's customers including more than 253,000 students."

The USG web site says:

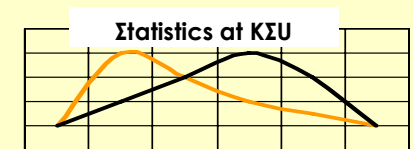
The students of the University System of Georgia are our ultimate and most important customers. While the focus of USG CSI plans will be upon students, we must not forget we also serve businesses, government, communities, and individual citizens.



Customer Service Improvement Initiative

Dr. Davis asked each USG institution to appoint a Customer Service Champion. KSU appointed Linda Lyons as its CS Champion. She will be responsible for developing a CSI plan which:

- ✓ Measures progress
- ✓ Sets clear lines of accountability
- ✓ Creates metrics which measure customer needs and Customer Satisfaction
- ✓ Answers question "How well is the University System filling those needs?"
- ✓ What works? What doesn't?



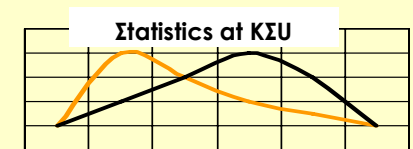
Customer Service Improvement Initiative

USG Projects:

- ✓ Application Process – GA Research Associates
- ✓ Basic Customer Service - Many
- ✓ Bookstore - UGA
- ✓ Dissemination of Data – Medical College of Georgia
- ✓ Enrollment Services – GA Southern
- ✓ Financial Aid – Armstrong Atlantic
- ✓ Residential Life – Columbus State
- ✓ Staff & Faculty HR – GA Tech
- ✓ Student Advisement – GA Tech

Web Sites:

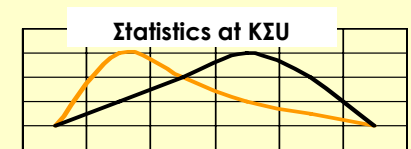
- ✓ www.kennesaw.edu/customerservice
- ✓ <http://customerfocus.usg.edu/proj/index.phtml>



Customer Service Improvement Initiative

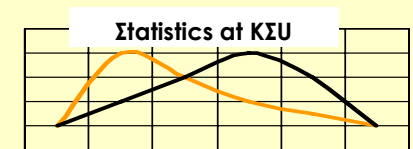
- What should we be doing?
- How do we get started?
- Are there any examples of other educational organizations working on CSI-like initiatives?

Let's see what's available...



Workshop Topics

1. Workshop Learning Objectives.
2. The Governor's Customer Service Improvement Initiative – What does it mean for us?
- 3. Are there any good examples of what others have done?**
4. What is Six Sigma and How will it help?
5. Review and Table Exercise.



Relevant Example - MBNQA

Baldrige Criteria Mirror Some Georgia's CSI Initiative Requirements:

Work Process Management and Improvement –

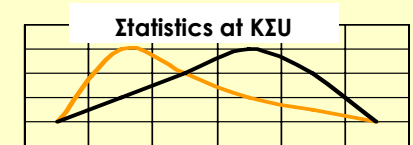
6.2.b.1 How do you improve work processes to maximize student success to improve educational programs, offerings and student services...

Note 2 – “To improve process performance, you might implement approaches such as Plan-Do-Study-Act methodology or other process improvement tools (e.g. ISO9000-2000 standards, Six Sigma methodology, or a Lean Enterprise System.”

Student and Stakeholder Relationships and Satisfaction–

3.2.b.1 How do you determine student and stakeholder satisfaction, dissatisfaction, and loyalty?

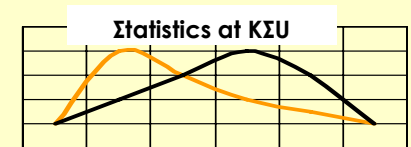
3.1a(2) How do you use voice of the customer to determine students' and stakeholders' key requirements, needs and changing expectations?



Relevant Example - MBNQA

Baldrige Education Winners:

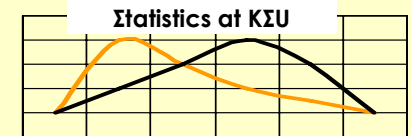
- *Richland College (2005) – 14,000 students (see handouts)
<http://www.rlc.dcccd.edu/baldrigeApp.pdf>
- *University of Wisconsin—Stout (2001) – 8,000 students
http://www.quality.nist.gov/PDF_files/UWStout_Application_Summary.pdf
- *Kenneth W. Monfort College of Business (2004)
- *Jenks Public Schools (2005)
- *Community Consolidated School District 15 (2003)
- *Chugach School District (2001)
- *Pearl River School District (2001)



Relevant Example - MBNQA

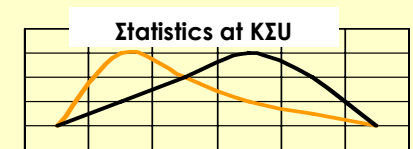
Common MBNQA Activities Useful for CSI Projects:

- ✓ Understand Customers and Stakeholders
- ✓ Identify Key Customer Requirements
- ✓ Measure Internal and External Customer Satisfaction and Dissatisfaction
- ✓ Establish a Customer Complaint Process
- ✓ Focus on Work Processes for Improvement
- ✓ Define Key requirements for all Work Processes
- ✓ Establish a Performance Improvement System (e.g. Six Sigma, Lean)
- ✓ Establish Teams within Organizational Units to Work on Improvement of Their Work Processes.
- ✓ Train Teams and Management in Performance Improvement Process
Establish Management Reviews with Teams to Support and Celebrate their Work.
- ✓ Benchmark Competition to Establish Goals. (See Criteria Booklet)



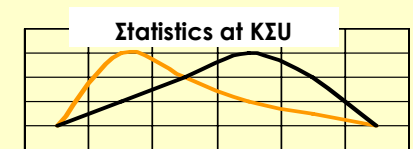
KSU Improvement Projects

1. Conference Planning/Registration
– measured response times,
satisfaction
2. New Hire Orientation –
implemented web site; measured
start up problems, satisfaction



KSU Projects con't

3. Banner Improvement – measured No. days to establish INB Account, Measured satisfaction & No. Days and improved process from 25 days to 9 days (Improved 282%).
4. On-Time Completion Rate Design of Promotionals completion time (improved 40%)
5. Bookstore book adoption time improved from 24.92 days to 2.55 days (90% improvement).

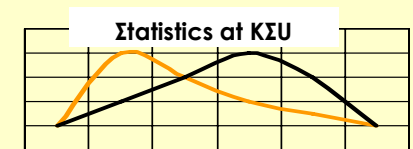


KSU Awards

2008 Governor's Commendation for Customer Service Excellence

- KSU, Institution of Excellence
- Lynda Lyons, Leadership award

- Office of Student Financial Aid, Unit award,
- Gold Award: KSU, Linda Lyons, Coles College , Process Improvement
- Silver Award: New Hires Project, Process Improvement



Six Sigma – DMAIC Improvement Process

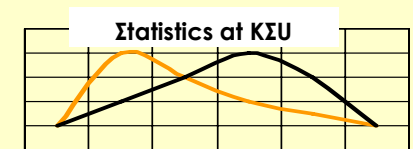
Define – Select a Project to Improve a performance measure

Measure – Define the process and CTQ variables.
Sample Process and Customers

Analyze – Evaluate measures, find opportunities for improvement

Improve – Experiment with solutions

Control – monitor results, hold gains



Six Sigma – DMAIC Improvement Process

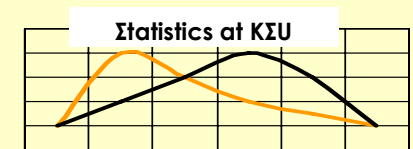
DEFINE: The Opportunity for Improvement

- ✓ Identify Measure to be Improved (Y variable)
Examples:
 - Customer Dissatisfaction
 - Wait Time for Services
 - Cycle Time for Completing an Activity
 - Errors in Processing

- ✓ Establish Team of Subject Experts

- ✓ Develop Process Flowchart that Influences Measure
- ✓ Identify Benchmarks for Better Performance

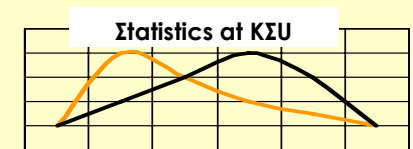
- ✓ Develop Problem Statement and Goal



Six Sigma – DMAIC Improvement Process

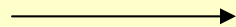
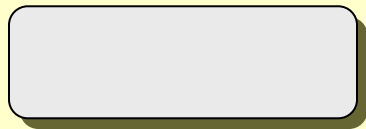
DEFINE: Preparing a Flowchart

- ✓ Form a team of process experts
- ✓ Identify key process requirements
- ✓ Identify (preliminary) Critical to Quality (CTQ) customer requirements.
- ✓ Identify all suppliers and other processes that provide input into the process.
- ✓ Develop a sequence of normal process steps.
- ✓ For each step note if ERRORS are possible and possible sources of VARIABILITY.
- ✓ Indicate where Personnel (& how many) are involved in processing.
- ✓ Define ALTERNATE paths by which work is accomplished.

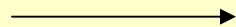
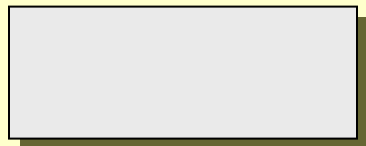


Six Sigma – DMAIC & Process Mapping

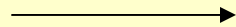
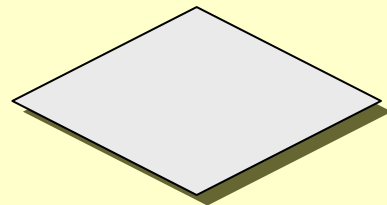
DEFINE: Common Flowchart Symbols



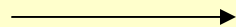
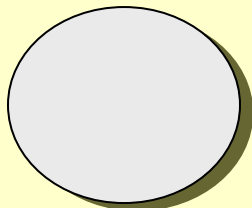
Boundary (Start/End): Identifies the beginning or the end of a process. "Start" or "End" may be written inside.



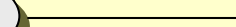
Operation: Identifies an activity or task in the process which changes an input. Usually the name of the activity is written inside



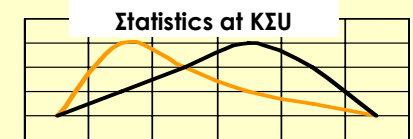
Decision: Identifies a decision or branch point in a process. Write the decision inside. Label each path emerging from a decision block with the options, such as yes, no, or complete, incomplete, etc.



Inspection: Identifies that the flow has stopped in order to evaluate the quality of the output or to obtain an approval to proceed.

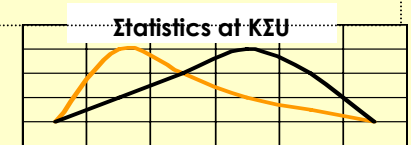
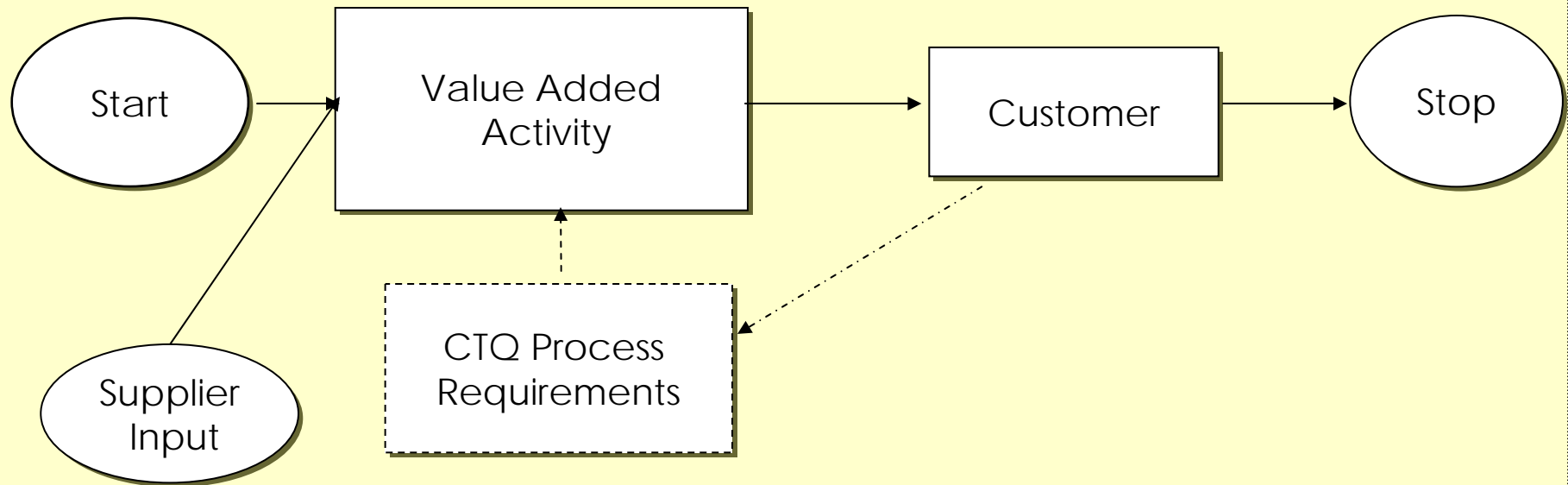


Delay: Identifies when something must wait.



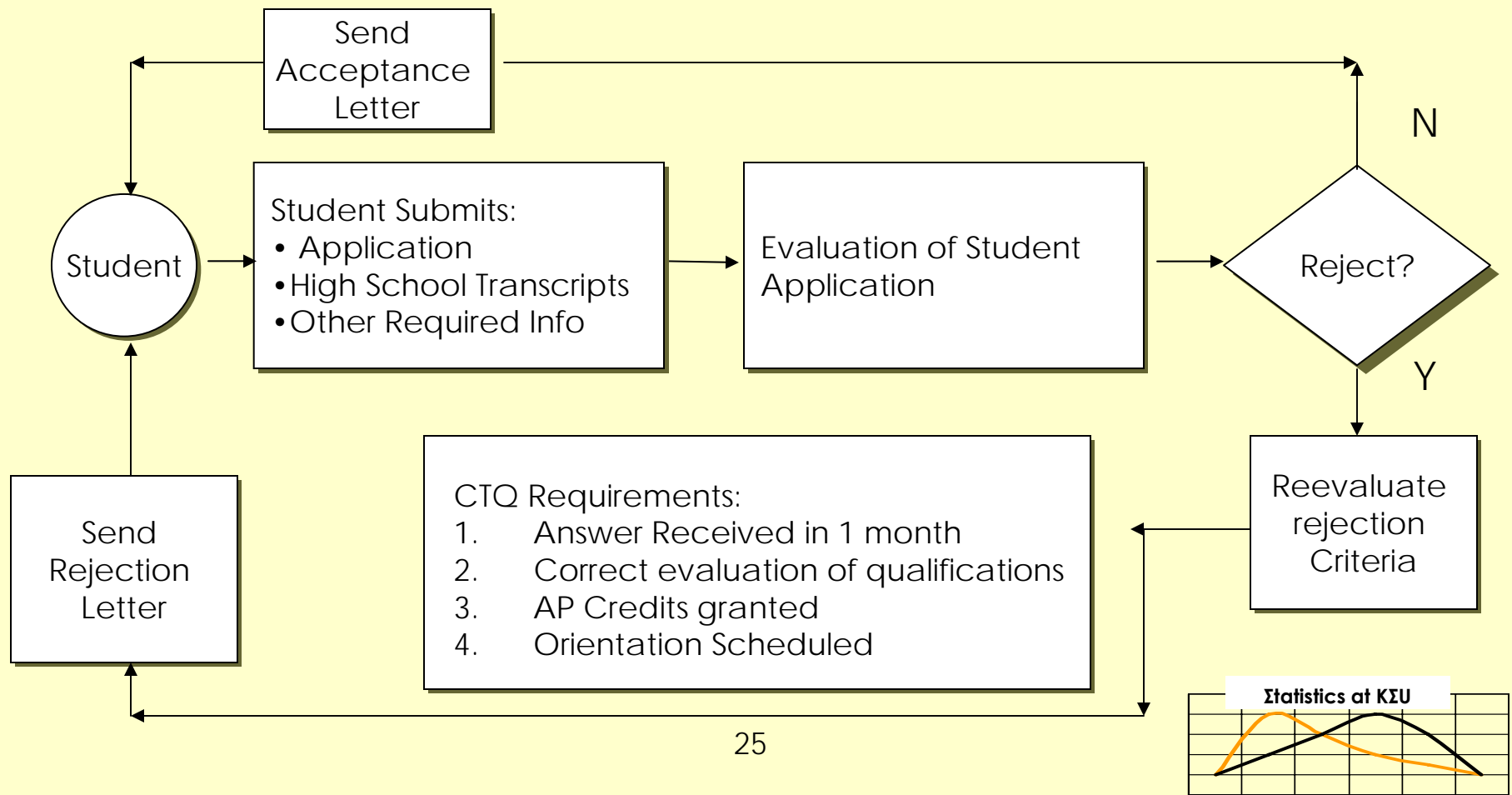
Six Sigma – DMAIC Start by Defining Work Process

Example of simple flowchart:

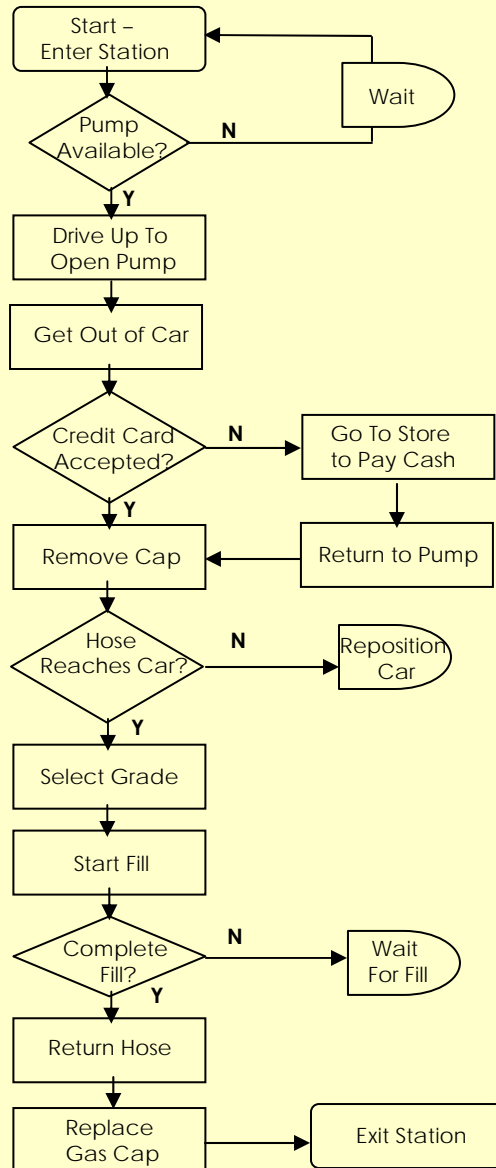


Six Sigma – DMAIC Improvement Process

Example flowchart of an application process:



DMAIC: Process Flowchart – Purchase Gas for Car



Possible Variability:

- Station Out of Gas
- Pumps Inoperable
- User Error



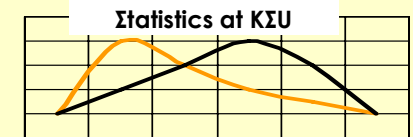
Possible Variability:

- Card Reader Not Working
- Only Cash Accepted

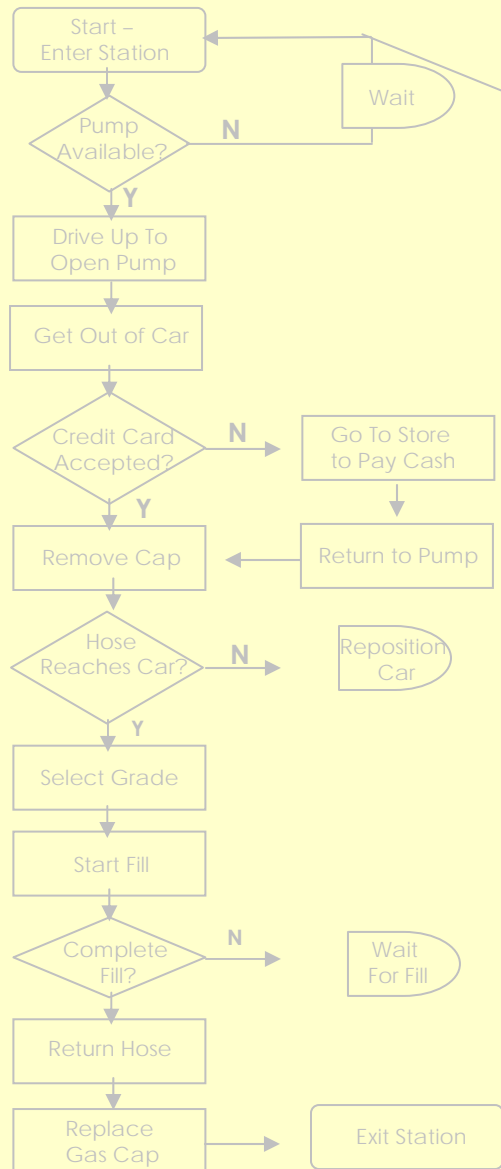


Possible Variability:

- Gas Cap on other Side
- Kink in Hose



Six Sigma – DMAIC Improvement Process



CTQ Customer Requirements:

- Station Open When Start or Finish Trip
- Gas Quality Meets Standards
- Pumps Functioning
- Hose Length Sufficient
- Cashiers Trained
- Safe Environment

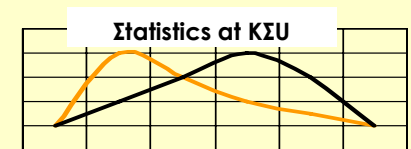
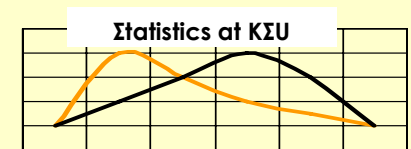


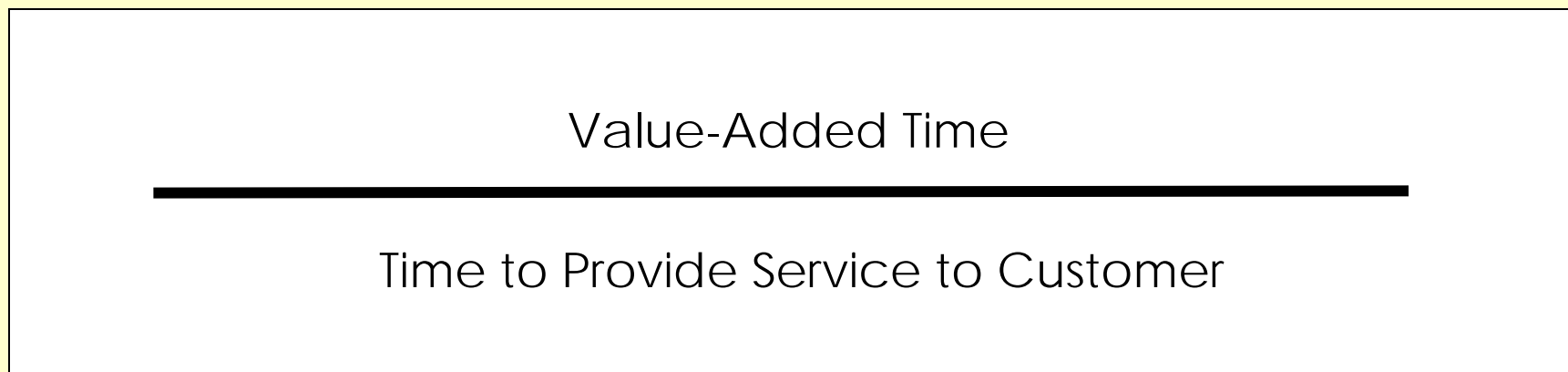
Table Exercise – Making AM Coffee

- Flowchart your teams' process for making AM coffee
- Identify CTQ characteristics
- What is your process measurement method – (i.e. define a “good Cup”)
- Identify the process points where data collection might be useful.

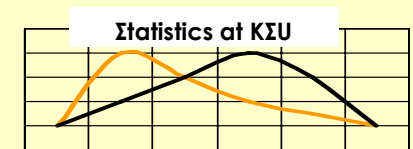


Six Sigma – DMAIC Improvement Process

Process Efficiency:



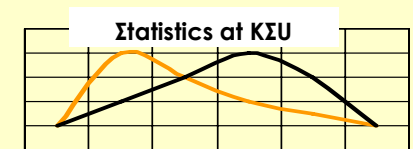
Example from Admissions: 2 hours to evaluate Acceptance criteria, average of 10 days to get back to student ($2/(10 \times 24) = 0.8\%$ efficiency)



Six Sigma – DMAIC Improvement Process

LEAN Concepts that Can Be Used for Six Sigma Projects

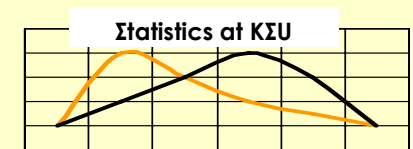
- ✓ Improve PROCESS SPEED or CYCLE TIME
- ✓ Improve FLOW of Work or Information Between Units
- ✓ Identify and eliminate WASTE – non Valued-Added Activity
- ✓ Reduce or Eliminate INVENTORY
- ✓ Standardize Work
- ✓ Use Team-Based Kaizen Events
- ✓ Use Visual Management
- ✓ Engage in 5S (Sort, Shine, Set in Order, Standardize and Sustain) Activities



Six Sigma – DMAIC Improvement Process

Typical Metrics Used in Six Sigma Projects:

- ✓ Customer Satisfaction or Dissatisfaction
- ✓ Cycle Time (e.g. to develop a new course)
- ✓ Wait Time for a Service to be Completed
- ✓ Delay Time for an event to occur
- ✓ Process Speed to provide a product or service
- ✓ Throughput – units processed per day
- ✓ Rework or Errors– Do Overs



Six Sigma – DMAIC Improvement Process

Fast Food Metrics – AJC Jan 2007

WHO'S ACCURATE, FAST

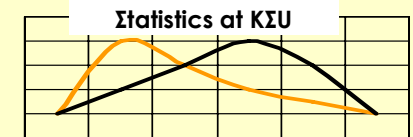
QSR magazine, a leading source in the fast-food industry, surveyed drive-through customers across the nation to gauge performance for 2006. Here are their results, including the ranking of some Atlanta-based companies.

Most accurate and their accuracy percentage:

1. Chick-fil-A	98.1%
1. Whataburger	98.1%
3. Jack in the Box	95.5%
4. Carl's Jr.	95.2%
5. Tacó John's	94.7%
9. Church's	93.2%
15. Arby's	91.4%
21. Popeyes	88.1%
National average	91.3%

Fastest drive-throughs and their speed in seconds:

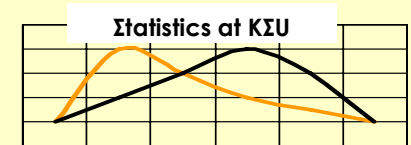
1. Checker's	125.5
2. Wendy's	135.1
3. Taco Bell	156.2
4. McDonald's	163.9
5. Burger King	166.0
7. Arby's	180.3
11. Chick-fil-A	191.9
20. Popeyes	232.5
22. Church's	235.2
National average	198.5



Six Sigma – DMAIC Improvement Process

Six Sigma – Example Metrics for Universities

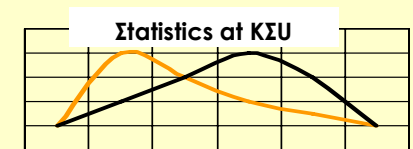
<u>Metric</u>	<u>Application Area</u>
Satisfaction	CAPS: Student satisfaction with advising or orientation
Cycle Time	UPCC: Time to approve a new course
Wait Time	HR: Time to replace clerical staff
Throughput	Admissions: Number of students process per day
Do Overs	Registrar: Number of students applying for graduation that don't qualify



Six Sigma – DMAIC Improvement Process

MEASURE: What Data is Needed & How Good are the measurements?

- ✓ Assemble prior data
- ✓ Start Collection (Flowchart Data Check Points) on key *process* measures
- ✓ Assess process variability (e.g. multiple personnel, duplicate processes)
- ✓ Assess repeatability and accuracy of measurements
- ✓ Outputs, Internal & External Customers Identified
- ✓ Critical to Quality (CTQ) Process Requirements Located in Work Flow
- ✓ Decide what customer data is needed
- ✓ Develop sampling plan and survey instrument JP

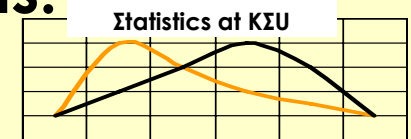


Six Sigma – DMAIC Improvement Process

Why is Sampling Correctly so important?
...ask George Gallup in 1948...



Bad sampling leads to bad decisions.

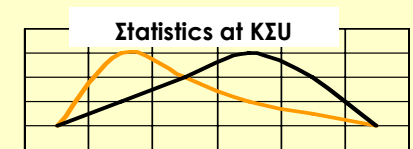


Six Sigma – DMAIC Improvement Process

MEASURE: Sampling

- ✓ Non-Probability Sampling – selection is based upon convenience and availability
 - Cheap and fast and may be the only option
 - May not be representative of the population

- ✓ Probability Sampling – Every element has a known, non-zero chance of being included in the sample.
 - Primary method used to select large, representative samples.
 - Statistical projection methods CAN (and should) be used.



Six Sigma – DMAIC Improvement Process

MEASURE: Non-Probability Sampling

Convenience Sample

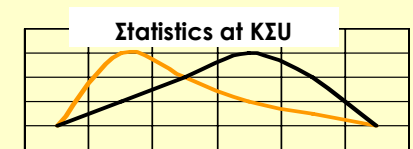
- Sampling whoever is handy
- “Person on the Street” polls

Quota Sample (Used by Gallup)

- A convenience sample where people are selected to match a predefined set of characteristics (60% male/40% female)

Snowball Sample

- Each qualified element identifies new potential elements.
- Used heavily when the incidence rate is low or the desired behavior is stigmatized (i.e., drug use, alcoholism, shoplifting)



Six Sigma – DMAIC Improvement Process

MEASURE: Probability Sampling

Simple Random Sampling

- Works like a lottery – everyone has a $1/N$ chance of selection

Stratified Sampling

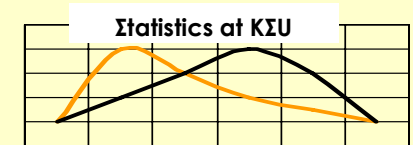
- Population is divided into distinct strata (subgroups), then a random sample from every strata is taken

Systemic Sampling

- Number the elements in the sampling frame.
- Choose the sample size.
- Compute the skip interval (i) by dividing the frame size by the sample size.
- Choose a random number between 1 and i .
- Starting with that randomly chosen element, take every i th element on the frame.

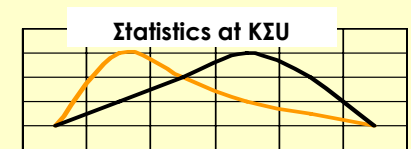
Cluster Sampling

- Population is divided into similar strata (clusters), then a random sample from every cluster is taken.



Six Sigma – DMAIC Improvement Process

Fun Sampling Example!

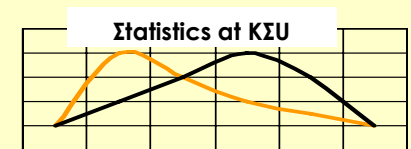


Six Sigma – DMAIC Improvement Process

MEASURE: Probability Sampling

The number one question we receive when clients develop surveys is:

How big does my response rate need to be?



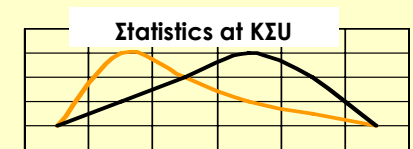
Six Sigma – DMAIC Improvement Process

MEASURE: Probability Sampling

The short answer is...look for at least 10-15%...and at least 30 responses. The issue is less one of numbers and more of representation (non-response bias):

Are my respondents different from my non-respondents?

The long answer is...we look forward to seeing you in STAT 3120 ☺

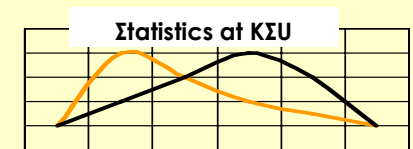


Six Sigma – DMAIC Improvement Process

MEASURE: Developing A Survey

Survey design is easy to do...but difficult to do well. It is actually more science than art.

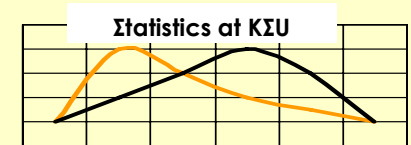
Just typing a series of questions and handing them out will probably not provide you with the results that you need.



Six Sigma – DMAIC Improvement Process

MEASURE: The Major Decisions in Survey Design

1. *What should be asked?*
2. *How will the results be actionable?*
3. *How should each question be phrased?*
4. *How should the questionnaire be pre-tested?*
5. *Does the questionnaire need to be revised?*



Six Sigma – DMAIC Improvement Process

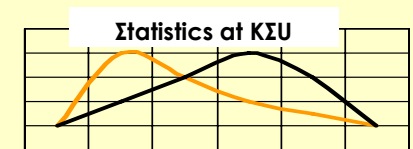
MEASURE: Key Issues and Solutions

Guidelines

- ✓ Avoid ambiguity
- ✓ Avoid complexity

Solution

- ✓ Be clear and concise
- ✓ Response choices that are
 - mutually exclusive
 - exhaustive
 - not “double-barrelled”
- ✓ Use conversational, familiar language



Six Sigma – DMAIC Improvement Process

MEASURE: Key Issues and Solutions

Guidelines

- ✓ Avoid bias
(i.e., leading or loaded questions, order bias)

- ✓ Avoid making assumptions

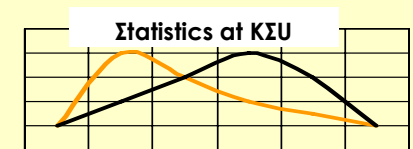
- ✓ Avoid questions that can't or won't be answered
 - Omissions
 - Telescoping
 - Creation
 - Unaided versus Aided

Solution

- ✓ Be objective
- ✓ Be open to unpopular response
- ✓ Alternate order of questions

- ✓ Offer explicit alternatives

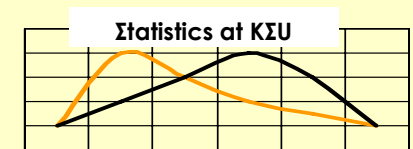
- ✓ Limit recall to reasonable time periods/events



Six Sigma – DMAIC Improvement Process

What's Wrong?

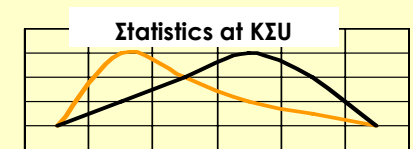
Q. How much red meat do you eat each day?



Six Sigma – DMAIC Improvement Process

What's Wrong?

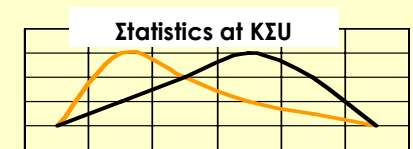
Q. When was the last time you used your wife's hairspray?



Six Sigma – DMAIC Improvement Process

What's Wrong?

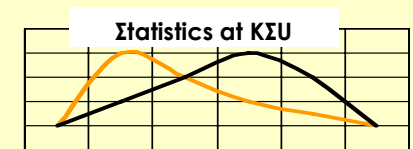
Q. If taxes must be raised to support education, would you prefer a regressive or progressive tax?



Six Sigma – DMAIC Improvement Process

What's Wrong?

Q. How do you spend your leisure time? Watching TV or reading?

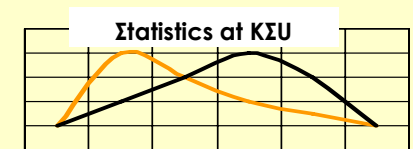


Six Sigma – DMAIC Improvement Process

What's Wrong?

Q. At what type of restaurant do you eat?

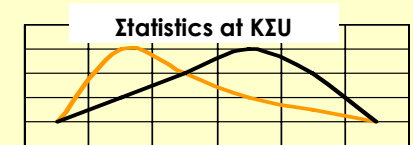
- ✓ *Inexpensive*
- ✓ *Expensive*
- ✓ *Very expensive*
- ✓ *All of the above*



Six Sigma – DMAIC Improvement Process

Guidelines for Survey Format

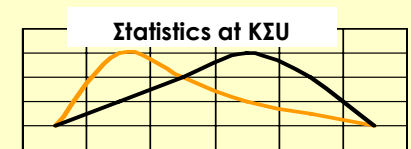
- ✓ Determine response format for each set of questions - open-ended (respondent fills in response) or closed-ended (responses are provided for the respondent).
- ✓ Screening questions should be done first - don't work for completed questionnaires by ineligible people.
- ✓ When asking demographic questions or income questions, always include one category higher or lower than you think will be needed.
- ✓ Always include adequate instructions, and be sure they are noticeable and in the proper place.



Six Sigma – DMAIC Improvement Process

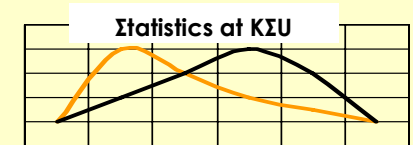
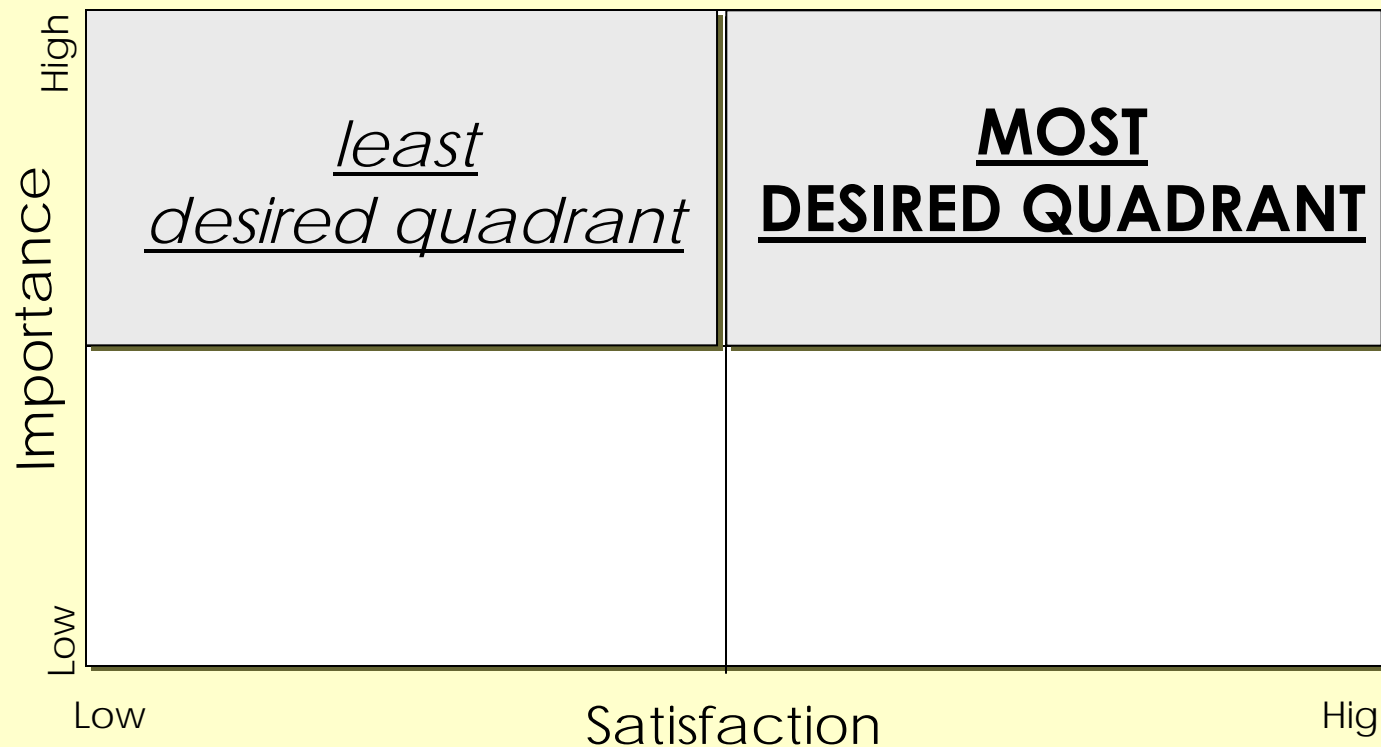
Guidelines for Survey Format

- ✓ Never split question wording or response categories across pages - avoid splitting groups of questions.
- ✓ Use proper response category formats - use plenty of spacing between categories and use boxes where possible. Using grids can save space and make filling out the survey less complicated for the respondent.
- ✓ Number the questions.
- ✓ Pre-code response categories and assign data layouts before administering the survey.
- ✓ Always think about how the data will be analyzed.



Six Sigma – DMAIC Improvement Process

MEASURE: One Suggested Framework for Survey Development



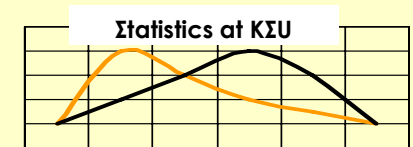
Six Sigma – DMAIC Improvement Process

1. Please indicate how important each of the following factors are when choosing a restaurant:

	Not Important			Very Important	
	1	2	3	4	5
Quality of food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of wine/liquor selection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Variety of menu selection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Atmosphere	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Duration/speed of meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Now, considering your recent dining experiences at The Club, please indicate how satisfied you were with each of the following factors:

	Not Satisfied			Very Satisfied	
	1	2	3	4	5
Quality of food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of wine/liquor selection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Variety of menu selection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Atmosphere	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Duration/speed of meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Six Sigma – DMAIC Improvement Process

MEASURE: Another Suggested Framework for Survey Development

Is there an improvement before and after a process or change (a pre-post analysis)?

How comfortable are you with EXCEL?

Do you understand the difference between descriptive and inferential statistics?

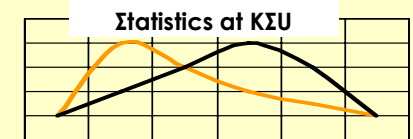
Can you construct a frequency chart?

Do you understand the measurements of central tendency and when to apply it?

Do you understand the different classifications of data (nominal, ordinal, ratio)?

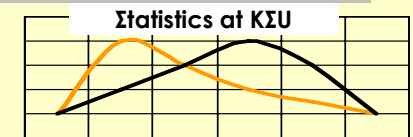
Do you understand the normal distribution and why is it important?

Do you play the lottery?



Six Sigma – DMAIC Improvement Process

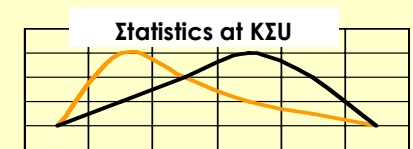
T/TH Results	MEAN
How comfortable are you with EXCEL? (PRE)	3.44
How comfortable are you with EXCEL? (POST)	4.68
Ttest Result - Significant Difference	0.001
Do you understand the difference between descriptive and inferential statistics? (PRE)	5.39
Do you understand the difference between descriptive and inferential statistics? (POST)	5.89
Ttest Result - Not Significant Difference	0.117
Can you construct a frequency chart? (PRE)	2.86
Can you construct a frequency chart? (POST)	6.00
Ttest Result - Significant Difference	0.000
Do you understand the measurements of central tendency and when to apply it? (PRE)	4.89
Do you understand the measurements of central tendency and when to apply it? (POST)	5.08
Ttest Result - Not Significant Difference	0.618
Do you understand the different classifications of data(nominal, ordinal, ratio)? (PRE)	4.09
Do you understand the different classifications of data(nominal, ordinal, ratio)? (POST)	4.92
Ttest Result - Significant Difference	0.011
Do you understand the normal distribution and why is it important? (PRE)	3.41
Do you understand the normal distribution and why is it important? (POST)	5.67
Ttest Result - Significant Difference	0.000
Do you play the lottery? (PRE)	2.46
Do you play the lottery? (POST)	2.08
Ttest Result - Not Significant Difference	0.320



Six Sigma – DMAIC Improvement Process

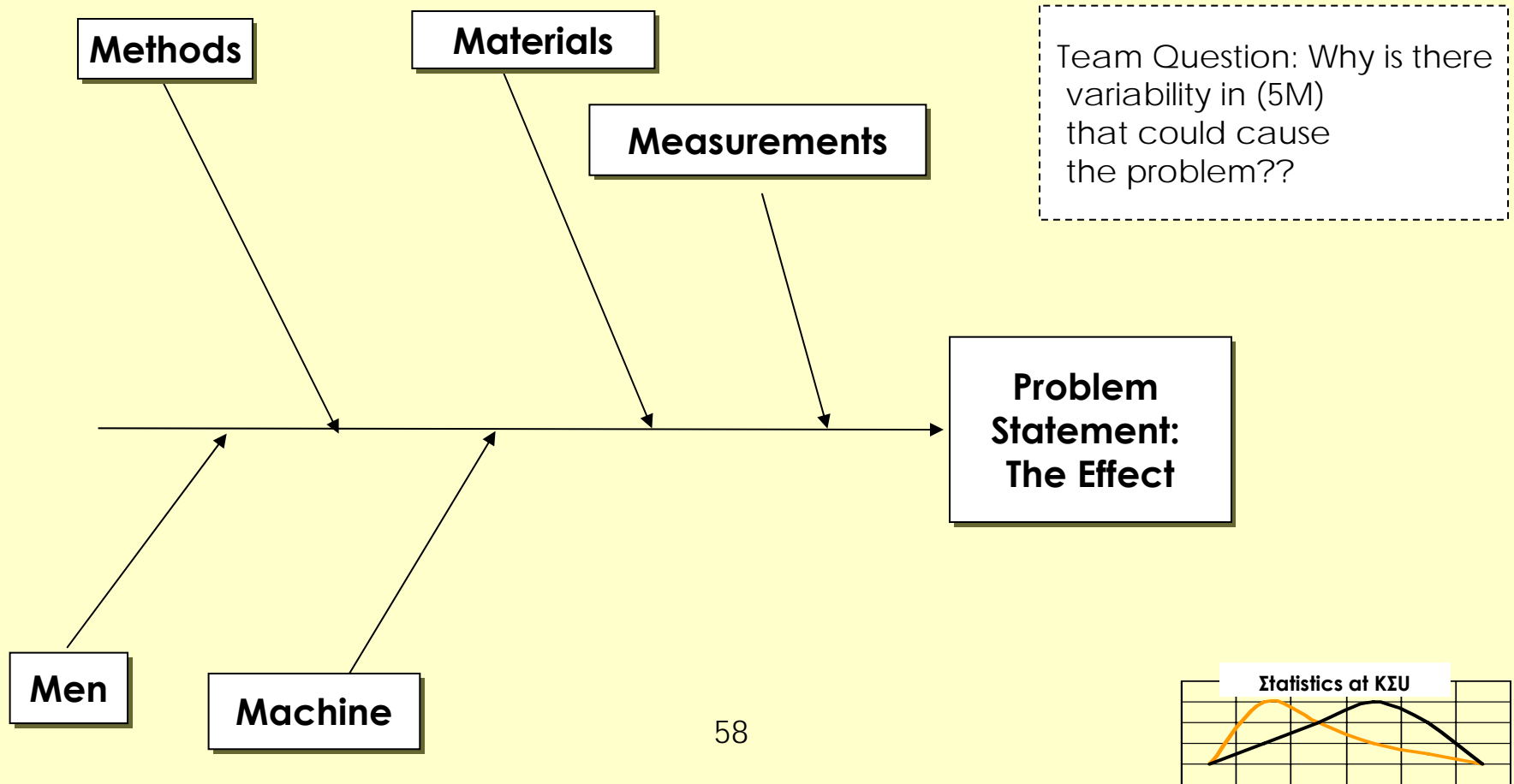
ANALYZE –

- ✓ Determine X variables that may influence Y (Metric to be improved) using C&E Diagrams or FMEA's
- ✓ Use statistical summaries of data (X and Y) to look for patterns
- ✓ Use statistical methods to find which X's impact Y (e.g. regression)



Six Sigma – DMAIC Improvement Process

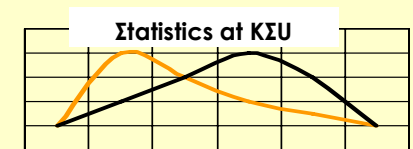
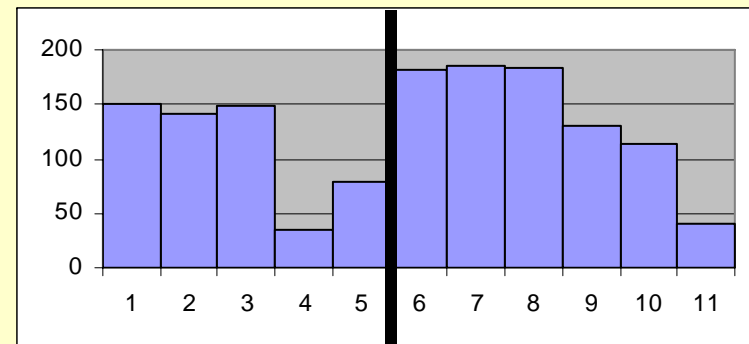
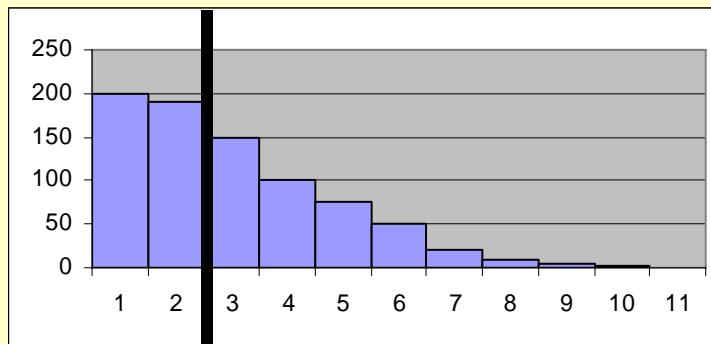
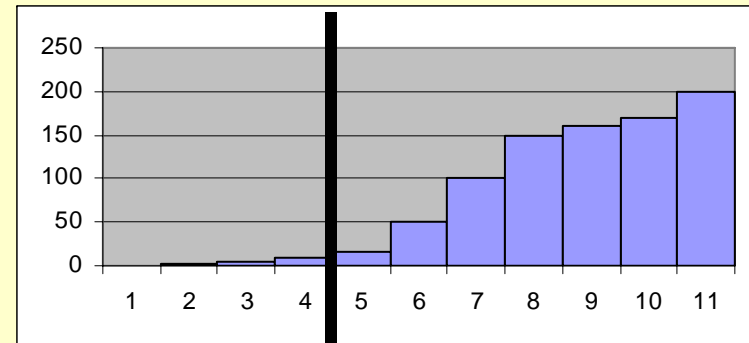
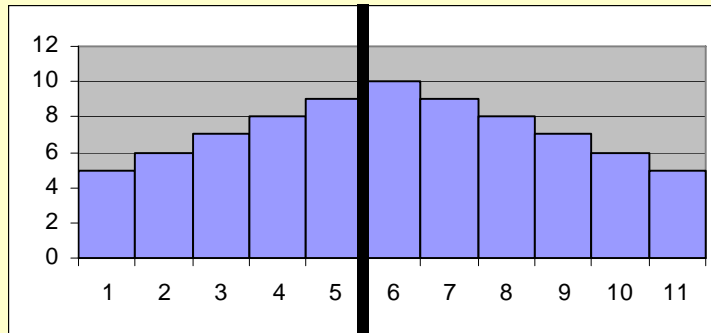
ANALYZE: Cause and Effect Diagram



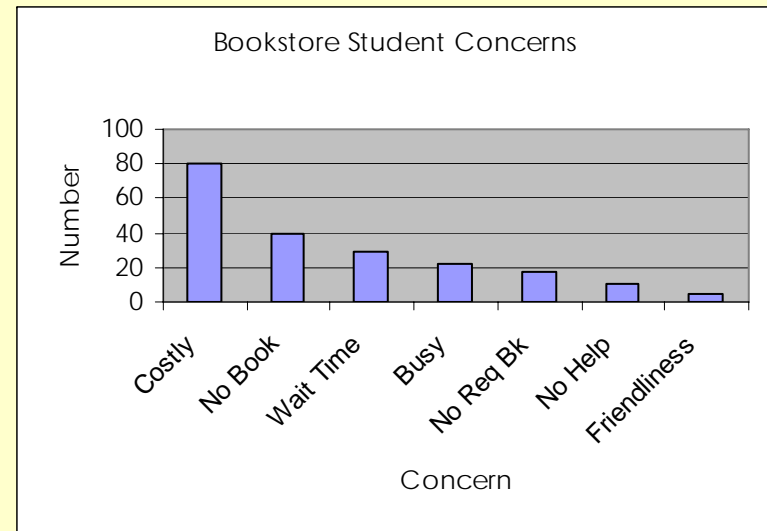
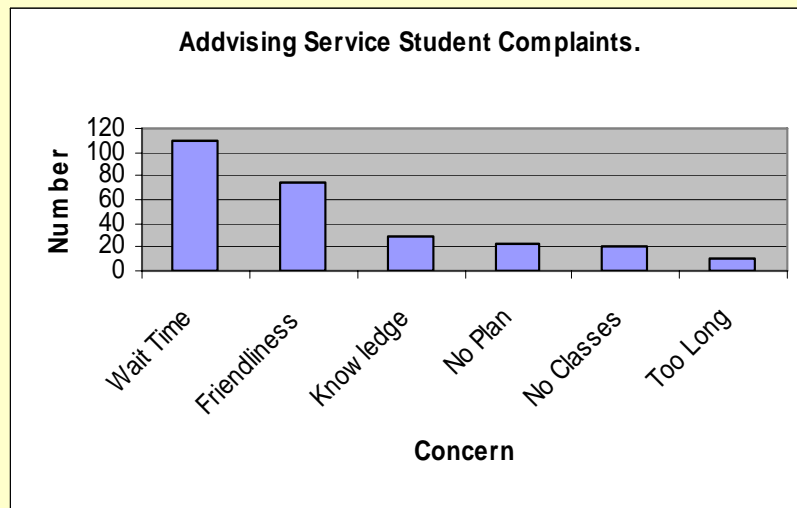
Six Sigma – DMAIC Improvement Process

ANALYZE: Examine Histograms for Service Wait Times

What do each of the Histograms below communicate?

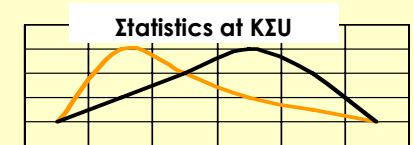


Six Sigma – DMAIC Improvement Process



Pareto Principle – 80% of a problem can be explained by 20% of the potential causes (80/20 Rule).

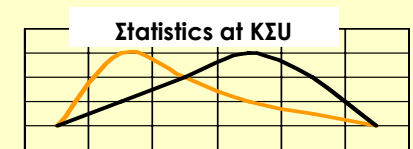
Separate the “Vital Few” from the “Trivial Many.”



Six Sigma – DMAIC Improvement Process

IMPROVE– Look at many alternatives

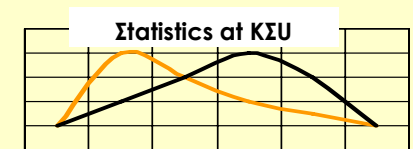
- ✓ Often redesign of the process steps in the flowchart can produce improvement. Eliminate complexity.
- ✓ Identify “Experiments” where process parameters (X’s) are changed to improve Y (metric being improved).
- ✓ Find X’s that correlate with Y and then adjust X’s to improve Y
- ✓ Error Proof Process to make output more consistent
- ✓ Incorporate technology (e.g. bar codes, light beams etc) where appropriate.
- ✓ Develop on-going process metrics to monitor performance. Set standards for performance.



Six Sigma – DMAIC Improvement Process

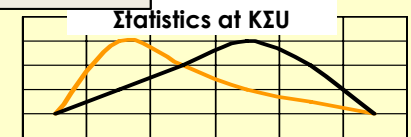
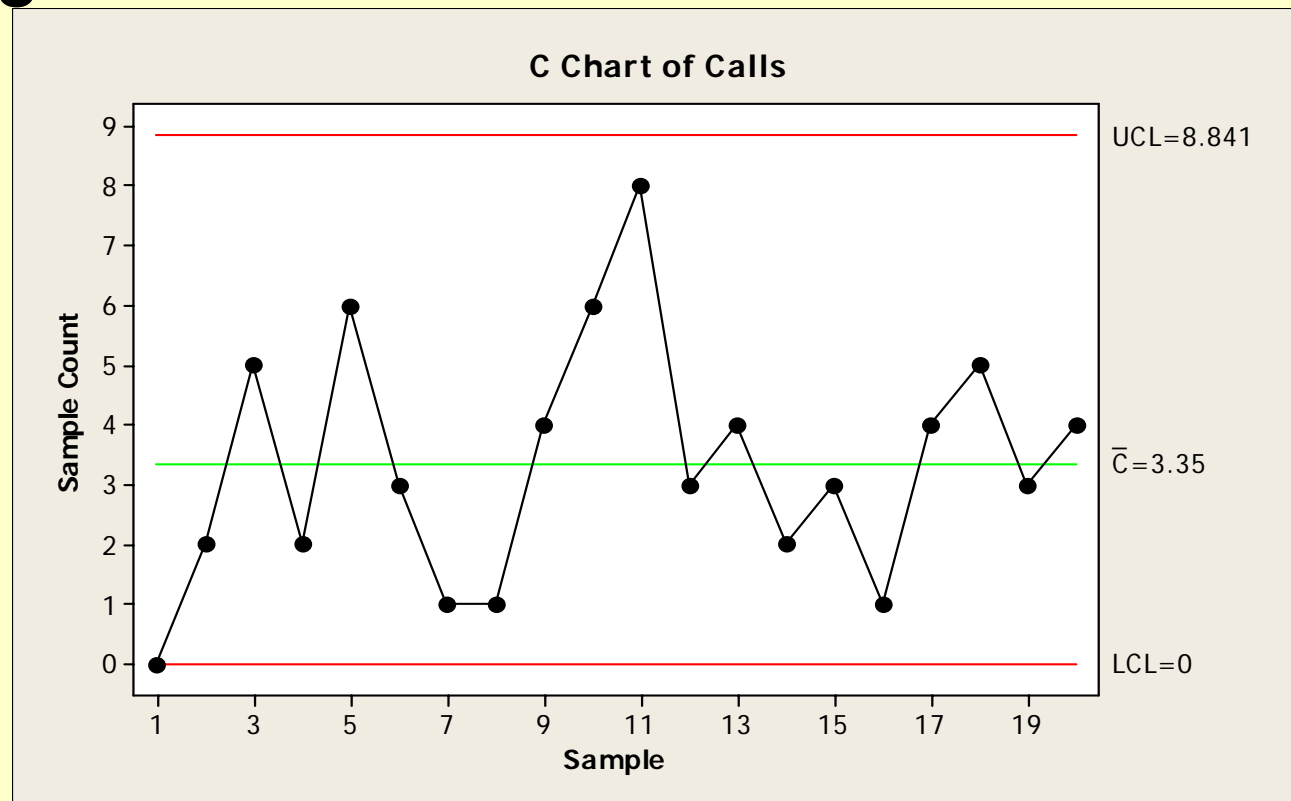
CONTROL – Hold the gains!

- ✓ Use monitoring methods for critical X's to ensure control of Y's
- ✓ Error Proof process inputs
- ✓ Establish in-process control system
- ✓ Use statistical tools such as control charts to monitor process *and* customer measures



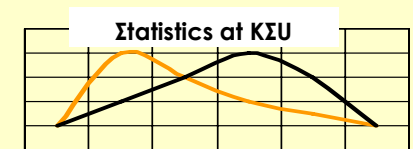
Six Sigma – DMAIC Improvement Process

Monitoring Complaint Calls Received per Day. React when more than 9 calls received – Something Changed!



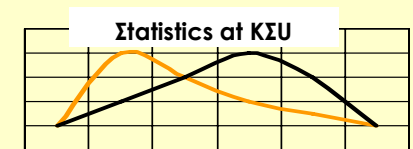
Workshop Topics

1. Workshop Learning Objectives.
2. The Governor's Customer Service Improvement Initiative – What does it mean for us?
3. Are there any good examples of what others have done?
4. What is Six Sigma and How will it help?
- 5. Review and Table Exercise**



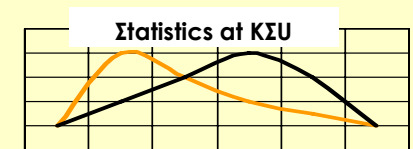
Review: General

1. Define your unit's process – develop a flowchart, identify the CTQs;
2. Measure – what drives customer satisfaction? what is important? Capture time, accuracy of processes;
3. Analyze – how is satisfaction related to importance? How is the process data shaped? Are there significant differences between (among) groups? Are there significant differences pre-post a change?
4. Improve – where are the opportunities for improvement?
5. Control – monitor your improvements.
6. Call the Department of Mathematics and Statistics – 770-423-6327 ☺



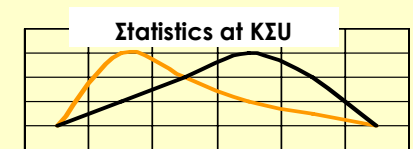
Review: Organizational Level

- Establish a focus on Internal & External Customer Satisfaction (CS)
- Establish Objectives for Units to Improve CS.
- Units form teams in critical-to customer service or product areas.
- Train teams and leadership in Process Improvement Methods
- Leadership work with teams to establish goals and define projects.
- Unit leadership conduct periodic reviews with teams.
- Organization leadership conduct unit reviews of progress.
- Celebrate and Share Successes!!

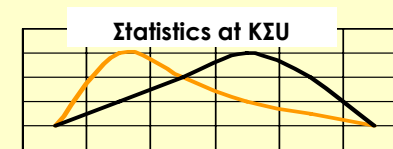


Review: Team Level

- Agree on “Who is the Customer?”
- Identify customer-perceived value-added service or product.
- Flowchart value-added activity process.
- Identify customer Critical To Quality (CTQ) metrics.
- Develop Sampling Plan and collect data to establish baseline performance.
- Analyze Data, identify opportunities for improvement.
- Benchmark metrics, establish goals for metrics.
- Develop improved process suggestions , review with leadership.
- Implement Improvements.
- Verify Improved Results with Data.
- Establish Controls in Process.
- Celebrate improvements!!

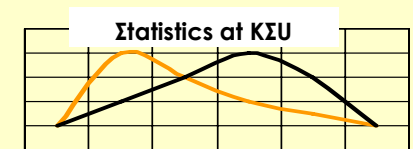


Fun Guided Table Exercise



References

- Damelio, R. (1996) The Basics of Process Mapping, Productivity Press, N.Y., N.Y.
- George, M., Rowlands, D., Kastle, B. ((2004) What is Lean Six Sigma?, McGraw-Hill, N.Y., N.Y.
- Gygi, C, DeCarlo, N., Williams, B. (2005) Six Sigma for Dummies, Wiley Publishing, Indianapolis, Indiana.
- Kane, V.E. (1989) Defect Prevention, Marcel Dekker, N.Y., N.Y.
- Stamatis, D. (2004) Six Sigma Fundamentals, Productivity Press, N.Y., N.Y.



Complete Workshop Questionnaire

- Check box "After Workshop"
- Thank You!!!!

