

Using Statistics for Managerial Decision Making

Presented to: ASQ Local Section 701
Orange Empire

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Statistics: in higher education curriculum

Not commonly a required course!

6 Sigma

DMAIC

- Define
- Measure
- Analyze
- Improve
- Control



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Quality

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- Quality
 - What is Six Sigma?
 - Evolution Toward Quality
 - Achieving Quality for the Customer

What Is Six Sigma?

Globalization and instant access to information, products and services continue to change the way our customers conduct business.

Today's competitive environment leaves no room for error. We must delight our customers and relentlessly look for new ways to exceed their expectations. This is why Six Sigma Quality has become a part of our culture.

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What is Six Sigma?

A structured approach to improve an organization's effectiveness and efficiency.

Define

- Project Charter
- Identify and validate customer's needs and requirements
- Create a high-level picture of the process targeted for improvement

Measure

- Create a data collection plan
- Implement plan and return baseline performance measured in Six Sigma language

Analyze

- **Examine data**
- **Watch the process**
- Determine root causes

Improve

- **Generate solutions**
- Select solutions
- Implement solutions

Control

- Pick the right control method
- Document the response plan



Are these steps subjective?

Or are facts necessary?

Applications of Statistics

Founded in traditional manufacturing organizations for determining product quality levels.

Applications of Statistics

A challenge to service oriented industries!

A difficult concept to implement.

Service, Healthcare, and Government

Industries and institutions recognizing the
need for improvement and control.

Masters of Science in Quality Assurance at CSUDH

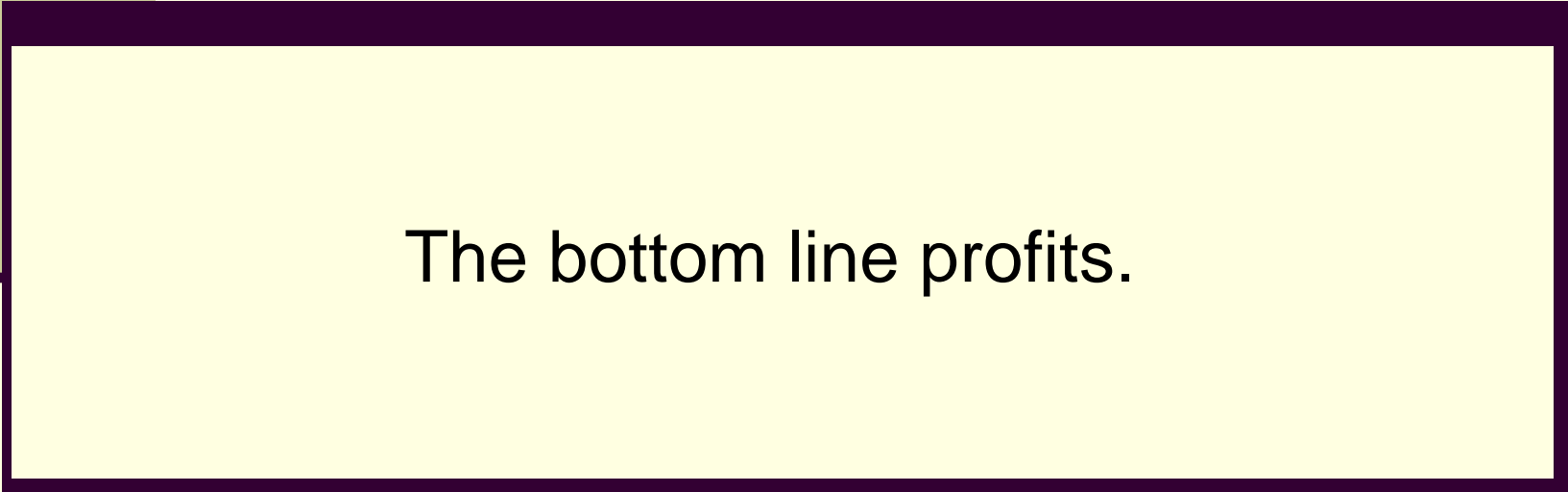
Added Service track with algebra based statistics to compliment traditional manufacturing calculus based statistics.

Other Universities:

Not including statistics in their Quality programs!



Management Focus



The bottom line profits.

Gap Analysis

Statisticians - ?????? - Management

Statistics:

Techniques by which information is collected, organized, analyzed and interpreted.

DOE

A powerful, but expensive and time consuming tool.

This perspective is changing.

DOE Updates

- SSBB BOK 2010 revision mentions simulation in support of DOE
- Using Simulation to Improve Quality Control, topic presented at ICQI by Dr. Gordon Clark
- The Significance of Simulation, article in June QP by T.M. Kubiak
- Simulation supports DOE

DOE

- Often overlooked in SSBB training
- Too time consuming
- Too expensive for practical applications

Digital DOE - Simulation

- Reliable technique
- Affordable
- Fast

Simulation

Has a practical application in the business world, but SPC must be understood for it to be effective!

Business Applications for Statistics:

Concerned with decision making.

Provides an orderly comparison of decision
alternatives.

Information Obtained

- Observation
- Experiment
- Survey
- Interview
- **Simulation**
- **Process modeling**

Descriptive Statistics

Includes techniques used to summarize and describe data.

Inferential Statistics

Includes techniques by which decisions about a statistical population can be made on sample data.

Do managers know and understand
the difference between these two
types of statistical analyses?



Do managers understand the value
of strategic statistical thinking?

Quality Managers are
becoming:

Managers of Organizational Excellence

IX. ANALYZE
EXPLORATORY DATA ANALYSIS/LINEAR CORRELATION & REGRESSION

Excel Results

Linest*	m_n	0.695495495	31.21171
	se_n	0.134221763	6.464976
	r^2	0.770444142	4.471821
	F	26.84990567	8
	ss_reg	536.9225225	159.9775

Table 9.20 Excel Linest Function Output

Correlation	Column 1	Column 1	Column 2	Column 2	
	Column 1	1			
	Column 2	0.877749476		1	
Regression Summary Output					
Regression Statistics					
Multiple R	0.877749476	Standard Error	4.471821182		
R Square	0.770444142	Observations	10		
Adj. R Square	0.74174966				
ANOVA	df	SS	MS	F	Significance F
Regression	1	536.9225225	536.9225	26.84991	0.000841014
Residual	8	159.9774775	19.99718		
Total	9	696.9			
	Coefficients	Standard Error	t Stat	p-value	
Intercept	31.21171171	6.464976221	4.827815	0.001308	
X Variable 1	0.695495495	0.134221763	5.181689	0.000841	
	Lower 95%	Upper 95%			
Intercept	16.30344982	46.119974			
X Variable 1	0.385979555	1.0050114			

Table 9.21 Excel Correlation and Regression Output

* Linest means line estimation. That is, the statistics for a "least squares" method to calculate a straight line to fit the data.


p - Value

A p-value is the probability of getting a value of the sample test statistic that is at least as extreme as the one found from the sample data (assuming that the hypothesized value is correct)

$p > 5\%$ Significant difference is not proven

$1\% < p < 5\%$ A statistically significant difference

$p \leq 1\%$ A highly significant statistical difference



Computer simulations can perform
multiple DOE functions quickly
and inexpensively



Garbage – in

Garbage - out

Quality Tools and Methodologies
can fill the void between
statisticians and managers.



We must drive out fear!

One of Dr. Deming's 14 points.



Thank you for your
attention?



Are there any questions about this
presentation?