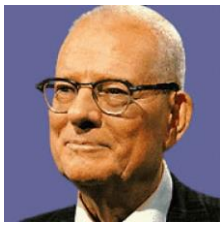
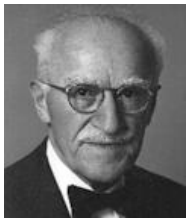
Deming and Juran: Teachings and Enduring Impact





ASQ Orange Empire
Dinner Presentations
April 10 & May 8, 2018

Dr. Phillip R Rosenkrantz
Professor Emeritus, Cal Poly Pomona

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Part II - May 8

More about Deming and Juran's quality structures

How are Deming and Juran's teachings relevant and applied today in Six Sigma and Transformation?

Have their ideas evolved and how are they being perpetuated?

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Outline

3

- Brief Review of Part I
  - Common Roots – Walter Shewhart & Types of Variation
  - Deming and Juran major contributions/works
- Deming & Juran Quality Structures
- Motorola's Six Sigma – Roots in Deming & Juran
  - Motorola approach to management involvement
  - Pareto Analysis
- Transformational & Emotional Leadership

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Common Roots: 1920s - Shewhart developed Statistical Process Control

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Walter Shewhart (1981-1967) developed the concepts and tools of Statistical Process Control (SPC) based on statistical theory and sampling.

An essential concept of SPC is recognizing that there are different sources of variation that contribute to overall process variation.

Each type of variation requires different management action.

Deming and Juran both studied under Shewhart and were very active in promoting SPC and management understanding of the basic concepts.

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Types of Variation

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- Shewhart taught that there are several types of variation. (Note that Six Sigma quality focuses on reducing variation):
  - **Common cause variation** - Built-in random variation in the system. Difficult to reduce without changing the system or process.
  - **Assignable or Special cause variation** - Variation caused by identifiable events usually under control of the work group.
  - **Tampering** - Over adjusting of the process resulting in increased variation.

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Foundational Concept - Common Cause vs. Assignable Cause Variation

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- **Variation Caused by the System** - According to Dr. Deming's research, more than 85% of problems are the result of "common cause" variation. Management is responsible for the system and is responsible for reducing this type of variation. Later research puts the estimate at over 94%.
- **Variation Controlled by the Work Group** - The work group is responsible for preventing and reducing "assignable cause" variation.
- Management needs to understand these concepts.

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Deming's *14 Points for Management (vision, culture, strategy)*

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1. Create constancy of purpose
2. Adopt philosophy of prevention
3. Cease mass inspection
4. Select a few suppliers based on quality
5. Constantly improve system and workers
6. Institute worker training
7. Instill leadership among supervisors
8. Eliminate fear among employees
9. Eliminate barriers between departments
10. Eliminate slogans
11. Remove numerical quotas
12. Enhance worker pride
13. Institute vigorous training
14. Take action

- Eight of the 14 points are people related. How to lead, inspire, and treat them.

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Deming's *Seven Deadly Diseases of Management (bad strategies)*

8

- Lack of constancy of purpose
- Emphasis on short-term profits
- Evaluation by performance, merit rating, or annual review of performance
- Mobility of management
- Running a company on visible figures alone
- Excessive medical costs
- Excessive costs of warranty, fueled by lawyers who work for contingency fees

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Deming's System of Profound Knowledge (transformation)

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- Deming advocated that all managers need to have what he called a *System of Profound Knowledge*, consisting of four parts:
  - ***Appreciation of a system***: understanding the overall processes involving suppliers, producers, and customers (or recipients) of goods and services.
  - ***Knowledge of variation***: the range and causes of variation in quality, and use of statistical sampling in measurements.
  - ***Theory of knowledge***: the concepts explaining knowledge and the limits of what can be known.
  - ***Knowledge of psychology***: concepts of human nature.

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Deming Quality Structure

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- Customer-oriented statistician who made quality control into continuous-improvement. Management focus. Not as prescriptive as Juran.
  - Be constant in purpose – What is the aim? Get everyone on board and working together.
  - Understand customers
  - Accept new challenges
  - Go quality over price
  - Be better always
  - Don't depend on inspection

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Deming Quality Structure

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- From "work" to "teamwork"
  - Lead…don't boss
  - Cooperation over competition within organizations
- From teamwork to proper treatment at the individual level
  - Eradicate quotas
  - Eliminate slogans
  - Promote pride
  - Train on the job
  - Erase fears

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Deming Quality Structure

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- From treatment to transformation
  - Improve oneself
  - Transform everybody
- Several books illustrate or validate Deming's ideas about transformation:
  - *The Fifth Discipline* by Dr. Peter Senge
  - *Good to Great* by James Collins
  - *Profit Beyond Measure* by H. Thomas Johnson and Anders Bröms

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The Juran Trilogy

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- To attain quality begin by establishing the "vision" for the organization, along with policies and goals
- Makes extensive use of three managerial processes:
  - Quality Planning
  - Quality Control
  - Quality Improvement
- Juran's Trilogy shows how an organization can improve every aspect and business results by better understanding of the relationship between processes that plan, control and improve quality.

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Juran Quality Structure

14

- Management-oriented engineer who made quality control into management. Practitioner focus. More structured.
  - Define goals
  - Identify customers
  - Determine requirements
  - Develop features
- From planning to developing
  - Generate processes
  - Establish controls

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Juran Quality Structure

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- From developing to evaluating and control
  - Focus on the Vital Few
  - Breakthrough new attitudes about continuous improvement
- From evaluating to organizing for improvement
  - Mobilize for improvement
  - Diagnose for improvement
  - Steer toward improvement

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Juran Quality Structure

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- From organizing to performing
  - Breakthrough knowledge
  - Overcome any resistance
  - Breakthrough performance
  - Transition to new levels

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Juran

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- "It is most important that top management be quality-minded. In the absence of sincere manifestation of interest at the top, little will happen below."
  — Joseph M. Juran

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Motorola's Six Sigma – Deeply rooted in Juran (& Deming)

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- Motorola needed a quality system that would work. They instituted management training and accountability. They developed their "Six Sigma" quality program.
  - All employees were trained on quality. "Quality training matched to target populations."
  - Top management accountability was included which was missing from most previous quality movements and fads.
  - Motorola won the first Malcolm Baldrige National Quality Award in 1988
  - Motorola's quality management system provided a simple approach that managers could use to insure genuine continuous improvement was going on.

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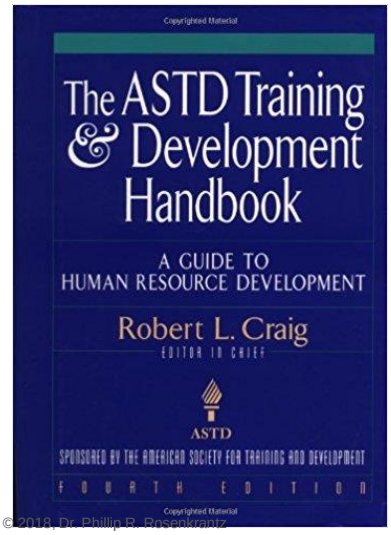
35. **Training in Quality** / Bruce J. Hayes, Director, *Motorola University Quality Center* 725



We will look at:

•Quality training at all levels

•Six Levels of quality system implementation

•Two quality tools:
- •Pareto Charts
- •SPC Charts

•Example from GM – Cause and Correction of Excess Battery Discharging

•How Motorola implemented quality in a simple but effective way

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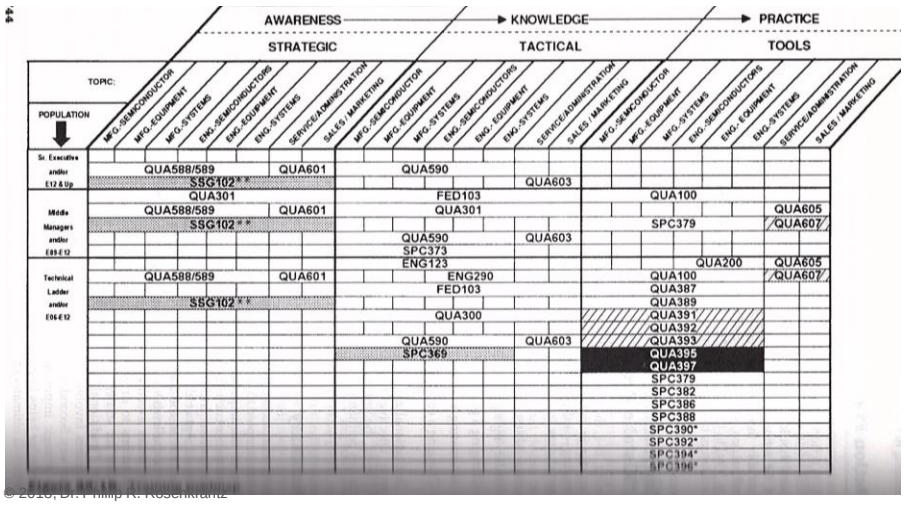
Motorola Training Strategy – Courses matched to populations



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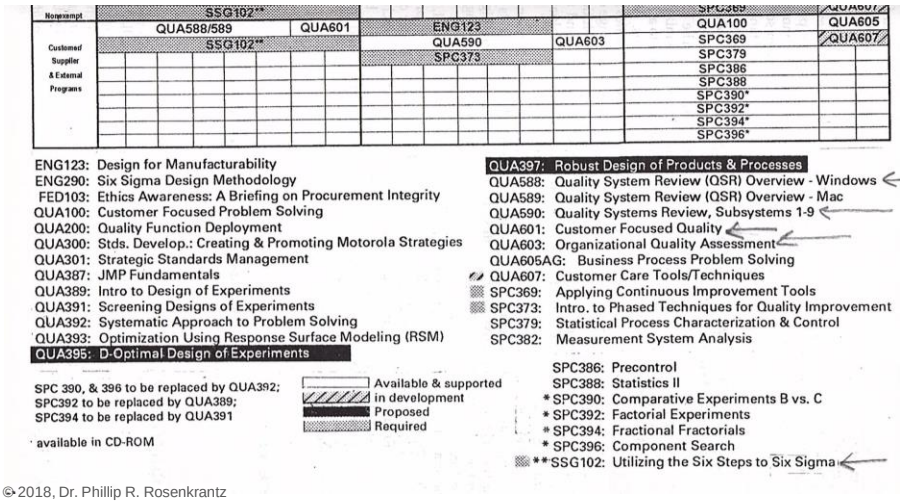
Courses for Awareness, Knowledge and Practice



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Level of Quality System Implementation (Brian J. Hayes, Director, Motorola University)

1	No quality system
2	Realization of the need to change
3	In the process of developing a top down policy/strategy
4	Quality system in place to react to customer needs
5	Proactive quality system in place to prevent quality problems
6	Fully integrated customer-focused quality system

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Senge's Mental Models of Quality (From: *The Fifth Discipline*)

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1	**None**	Status quo – "We hire good people and have competitive products."
2	**Realization**	
3	**Strategy**	Quality control – "We 100% inspect and only send good products to our customers."
4	**Customer**	Customer Service – "We have an 800 number and correct problems right away."
5	**Proactive**	Process Improvement – "We use SPC and teams to constantly improve how we operate"
6	**Integrated**	Total Quality – "We operate a seamless, value-adding system which incorporates quality control, customer service, process improvement and design, and supplier relationships."

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Survey (2002) of Executives in the American Automobile Industry About Knowledge and Use of Quality Tools and Statistical Methodologies

24

- **Demographic Items**
  - Executive level
  - Area of responsibility
  - Background
  - Highest degree
  - How knowledge was acquired
  - Level of *Quality System Implementation (Hayes)*
  - Size of company
  - No. of subordinates
  - Level of involvement
- **Quality Measure Items**
  - Quality
  - Customer Satisfaction
  - Value of quality tools and statistical methodologies
- **Preferred learning methods**
- **306 surveys mailed**
- **93 usable responses**

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QS-9000 Requirements Used for the Study of Awareness and Corporate Use (modified)

(Very Low = 1, Low = 2, Medium = 3, High = 4, Very High = 5)

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Quality Tools	Statistical Methodologies
Benchmarking	Descriptive statistics
Cause and effect diagrams	Sampling
Pareto charts	Statistical Process Control (SPC)
Critical path method (CPM)	Design of Experiments (DOE)
Mistake proofing	Capability analysis
Process flow charting	Gage Repeatability and Reproducibility
Quality Function Deployment (QFD)	Regression analysis
Failure Modes and Effects Analysis (FMEA)	Response Surface Methodology
	Taguchi Methods

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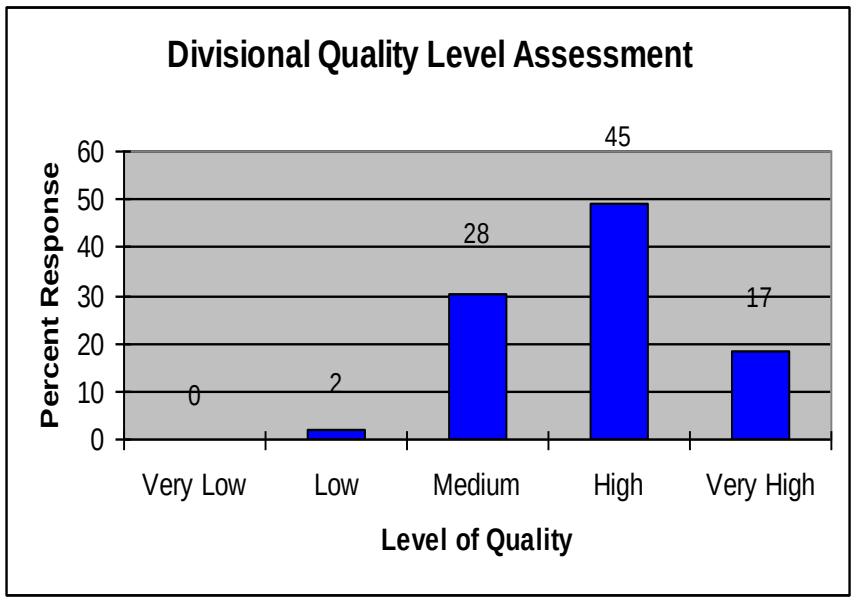

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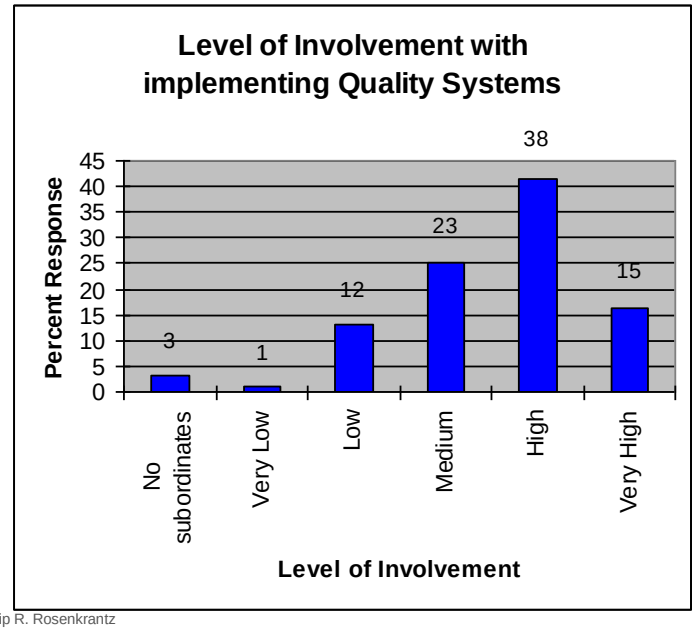

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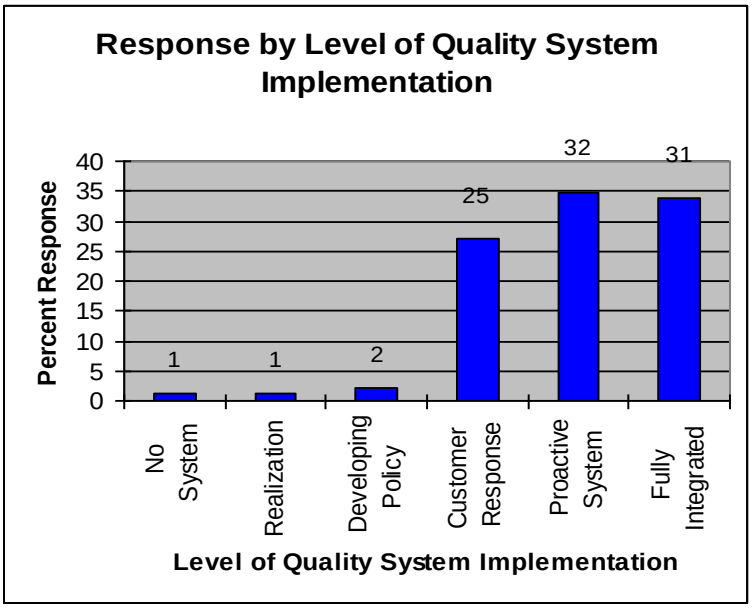

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Quality System Implementation

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- Level 6 - *Very High* use of Benchmarking and Cause and Effect Diagrams
- Top two levels - *Very High* use of Mistake Proofing, Flow charts, and Gage R&R studies
- Factor Analysis for top two levels combined
  - Factor 1 - Data driven design and robust design (35.6%)
  - Factor 2 - Process control (21.7%)
  - Factor 3 - Variation reduction and prevention (20.1%)
  - Factor 4 - Problem diagnosis and process improvement (19.8%)

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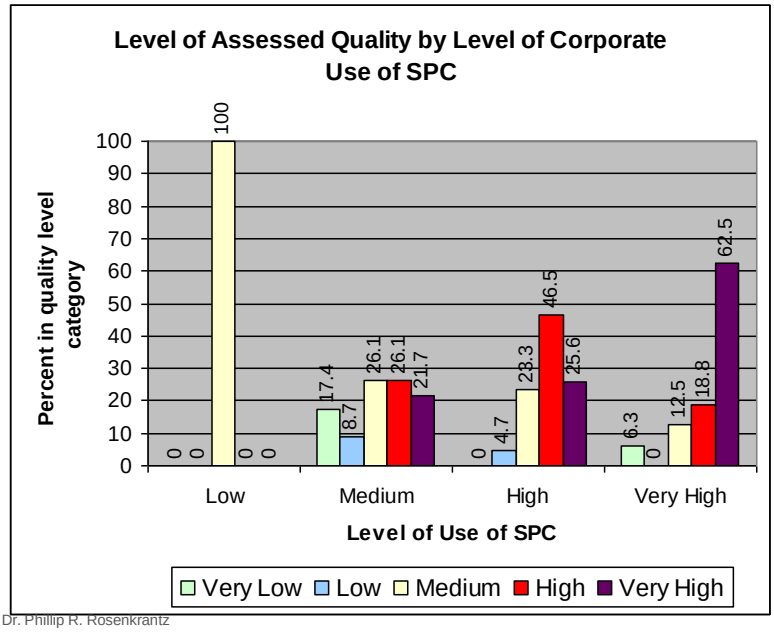

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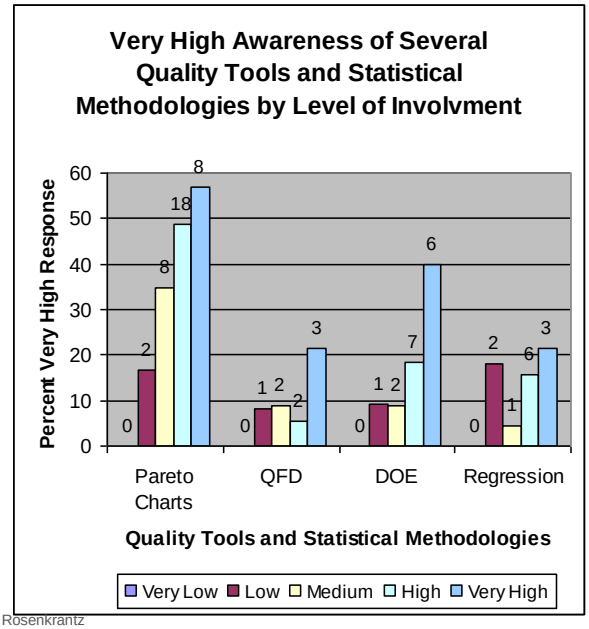

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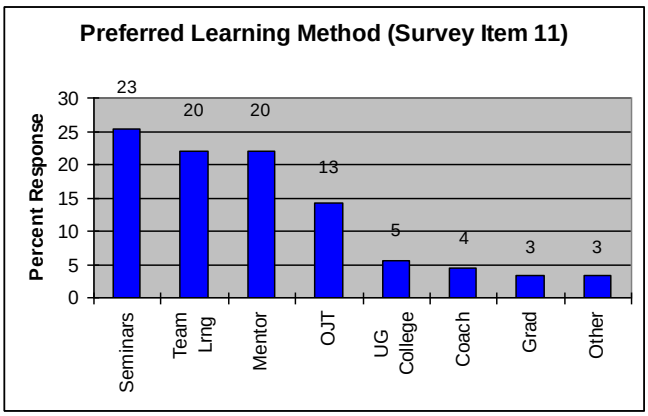
What teaching/learning strategies and methods are preferred by executives for learning about statistical methodologies?



1. Execs like to learn with other execs. 2. Execs like to work on real problems

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Pareto Analysis (a.k.a. 80-20 Rule)

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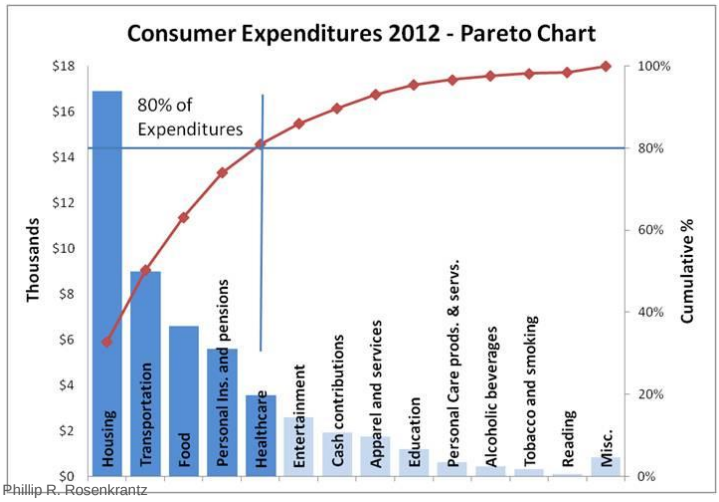

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Pareto Analysis

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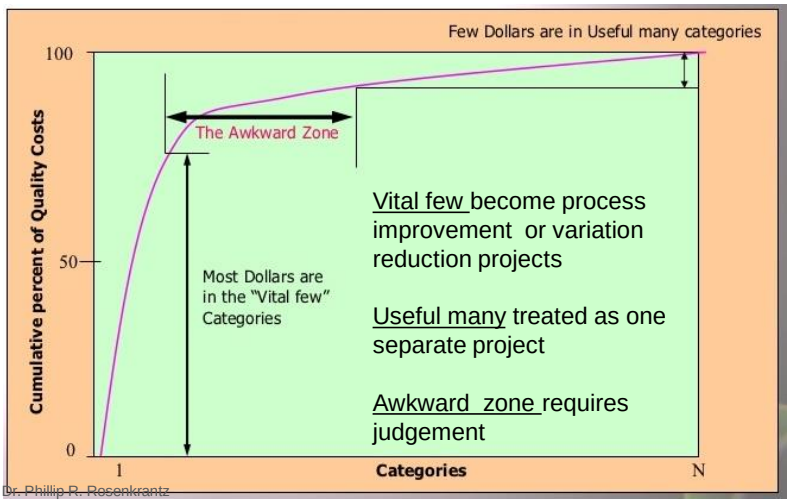

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Pareto Chart Metrics – Y axis alternatives

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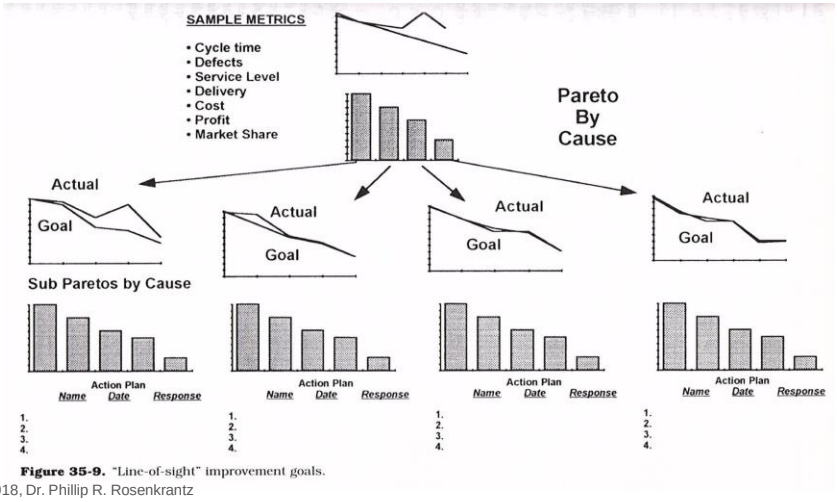

Figure 35-9. "Line-of-sight" improvement goals.

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Sources of Data for Pareto Charts

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- Check sheets
- Data analysis
- Inspection records
- Downtime reports
- Scrap reports
- Customer feedback (calls/claims)
- Control charts

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Track & total "out-of-control" conditions from control charts

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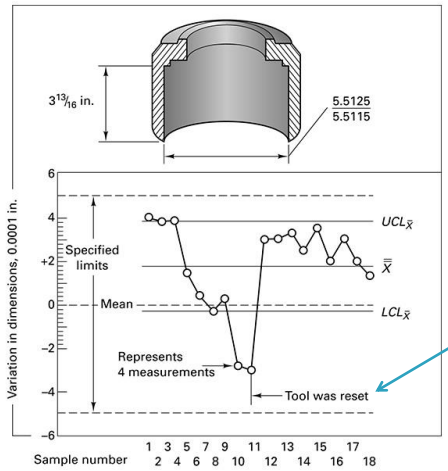

Assignable Cause

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GM Example: Corporation-wide problem – Low and dead batteries on cars

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- Dead or low batteries in cars caused problems throughout the production and delivery system costing millions of dollars and unhappy customers.
- Dead batteries at the gate slowed down the shipping process.
- Low charges allow batteries to freeze, crack, and drip battery acid and ruin the paint on rail cars below.
- Cars wouldn't start on trucks and rail cars upon delivery. Batteries replaced or jumped to unload the car.

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Project: Cause & Correction of Excess Battery Discharging

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- Potential Causes:
  - Defective batteries from supplier
  - Received with low charge from battery plant
  - FIFO not used in battery storage
  - Misleading markings on battery racks
  - Switches left on after production & inspection
  - Doors open or lights on during downtime (lunch, between shifts, weekends)
  - Excessive drainage during repair and/or engine start
  - Test devices calibrated incorrectly

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Summary of Downtime Battery Drainage Charts

	Final Line	Line 1	Line 1 Hole	East Yard	Line 3 Bank	Line 3	Line 4	Line 5	Line 7	Total Items
Glovebox Light						33	24	6	1	64
Decklid Light	46	6	1			2	2		1	58
Dome Light	6	4	6	1	3	12	15	8		55
Ignition	2	3	1			20	3	1		30
Courtesy Light	5	2	2		2	7	4	5		27
Map Light	4	3	1	4	5	6	1			24
Radio		2	1			3		1		7
Stoplight	4	2								6
Key Buzzer	2		1	2		1				6
Underhood Lamp	3									3
Tail Lights	1	1								2
A/C Blower	1					1				2
Emergency Flasher	1									1
Totals: Items	75	22	14	5	10	85	50	22	2	285
Cars	55	17	8	4	8	64	42	16	2	216

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Pareto Chart of Downtime Battery Drainage Sources by Type

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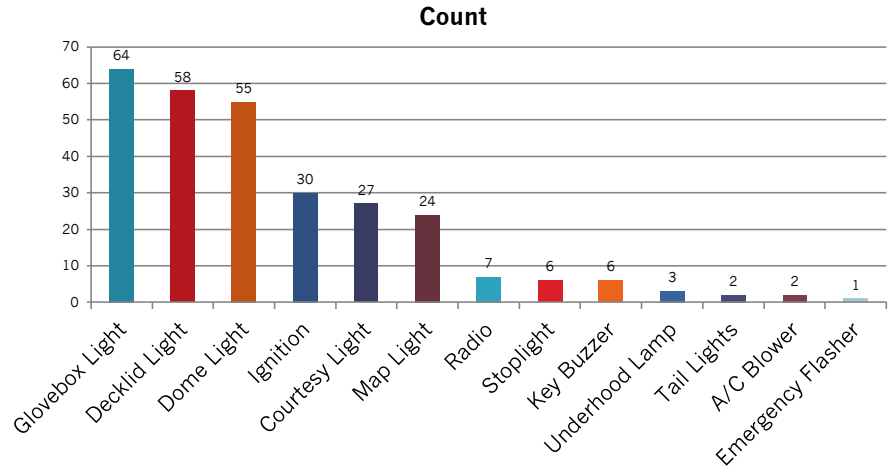

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Pareto Chart of Downtime Battery Drainage Sources by Location

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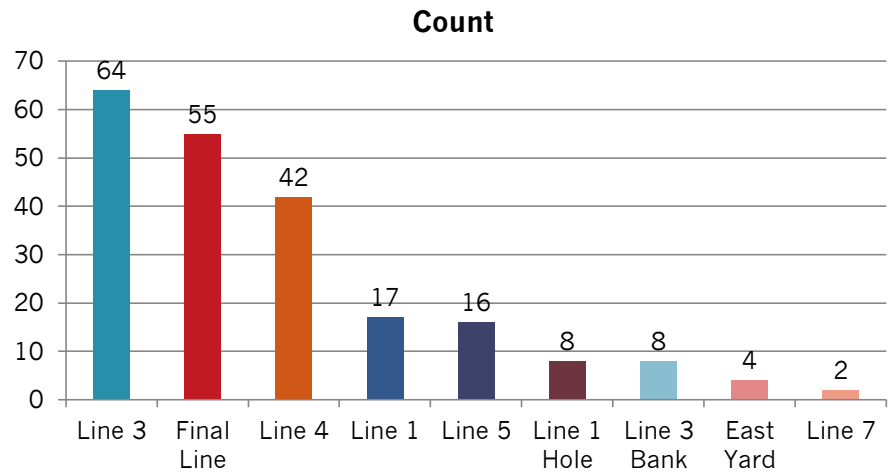

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Motorola's Approach to Quality Management – Roots of Six Sigma

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- Divisional Directors were taught to understand and use two major improvement tools. Underlying premise was first-hand knowledge and accountability that was more than just smoke and mirrors:
  - Pareto charts – "Show me your Pareto charts and tell me what projects you are working on?"
  - Statistical Process Control charts – "Show me your control charts for your projects and what you are doing to bring the process in-control."
- At Director's meetings each director was required to share what projects they were working on.

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Transformation – It is a process also.

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- Implementing a quality program like Six Sigma requires more than just training and tools.
- Transformation to a quality-minded, system-oriented, continuous improvement culture is required.
- Deming and Juran were all about transformation. Each had their own approach.
  - Deming's Fourteen Points for Management & System of Profound Knowledge
  - Juran's Trilogy/Breakthrough

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Leadership and the Levels of Quality System Implementation

1	**None**	**Transactional Leadership** (Frederick Taylor) – Hierarchical management with focus on individual performance, how work is done, and problem solving. Incremental improvements in work methods and productivity. Non-threatening.
2	**Realization**	
3	**Strategy**	
4	**Customer**	**Transformational Leadership** (Deming, Juran, Senge, and others)– Emphasis on empowerment and how people think about work. System thinking, team learning, and major culture change. Policy Deployment.
5	**Proactive**	
6	**Integrated**	

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The Essence of Transformational Leadership

- Transformational Leadership is about changing the focus from work and firefighting, to focusing on the aim of the organization and helping others…helping the system
- Job of leaders and teachers is to help others learn and grow. If they learn and grow they will understand. Then they will find better ways serve their co-workers, customers, and society and stay in business while contributing to society.
- The transformational change process requires leadership that understands how to move the organization from one stage to the next

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Transformation Roadmap

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1	**None**	**Realization Phase** – Leadership transformation. Training on values, communications. Basic tools. "Low hanging fruit". Build Trust. Shift emphasis away from targets.
2	**Realization**	
3	**Strategy**	**Transition Phase** – Strategic planning & systems thinking. Department level teams. Quality tools. Internal/External customer focus.
4	**Customer**	
5	**Proactive**	**Performance Phase** – Alignment. Empowerment. Process improvement. High performance teams. Variation reduction tools. Redesign.
6	**Integrated**	

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Emotional Leadership – Daniel Goleman

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- Refers to a leader that has "emotional intelligence" (EI), Goleman's ideas center around these qualities:
  - **Self-awareness** — self-assessment, self-confidence, the ability to read one's emotions
  - **Self-management** — self-control · involves controlling one's emotions and impulses and adapting to changing circumstances.
  - **Social awareness** — empathy, organizational awareness, the ability to sense, understand, and react to others' emotions while comprehending social networks.
  - **Relationship management** · the ability to inspire, influence, and develop others while managing conflict.

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A Closer Look at Level 6?

- Can get through Level 5 by fixing and improving existing systems.
- Level 6 may require major redesign & reorganization
- Level 6 is Juran's Breakthrough
- Illustrated in the book *Good to Great* by Jim Collins

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The W. Edwards Deming Institute deming.org

- Founded in1993, in Washington, D.C., where the Deming Collection at the U.S. Library of Congress includes an extensive audiotape and videotape archive.
- The aim of the Institute is to "Enrich society through the Deming philosophy."
- Vision is for the System of Profound Knowledge® to be the standard lens people use to understand and improve the world.
- **2018 ANNUAL CONFERENCE: WHY DEMING, WHY NOW,** October 5 - 6, 2018, Manhattan Beach, CA

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Juran
juran.com

- In 1979, Juran founded The Juran Institute, whose mission is to "Create a global community of practice to empower organizations and people to push beyond their limits."
- Top management involvement, the Pareto principle, the need for widespread training in quality, the definition of quality as fitness for use, the project-by-project approach to quality improvement. These are the ideas for which Juran was best known, and they are still widely used today.
- **Corporate Headquarters, Southington CT**

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References and Appendices

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Appendix: Comparison of Deming & Juran Teachings (revised)

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14 Points	Deming	Juran
1. Be constant in purpose	Transformed quality control into improvement & strategy	Define goals. Transformed quality control into management & design
2. Adopt a philosophy of prevention	We are in a new economic age. Western management must awaken to the challenge, and take on leadership for change.	Central to Quality Planning, Quality Control, and Quality Improvement. Breakthrough.
3. Don't depend on inspection	Replace inspection with teamwork to construct quality in	Quality processes are designed & managed. Establish controls
5. Be better always	Become and stay competitive to create and keep customers and jobs	Quality measures and improves services as well as products. Generate processes
6. Train on the job	Plan--Do--Study--Act	Breakthrough knowledge. Motivating people to change behavior will lead them to change attitude

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Comparison of Deming & Juran Teachings

14 Points	Deming	Juran
7. Lead… don't boss	Eliminate special causes, miminize process variation & then foolproof	Generalized the 80-20 rule and named it after Pareto. Focus upon the Vital Few
8. Erase fears	Translate fear in the workplace into a joy of doing and calmness in being	Overcome any resistance. Quality needs to manage the politics of desired cultural change.
9. Cooperate over the organization	Avoid short term thinking and managing	Breakthrough new attitudes. Control prevents bad change and breakthrough creates good change
10. Eliminate slogans	Reduce impediments from artificial sayings and arbitrary objectives	Diagnose for improvement. Quality generates income in addition to cost

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Comparison of Deming & Juran Teachings

Deming	Comparison	Juran
11. Eradicate quotas	Unrealistic tasks & schedules frequently produce misleading results	Mobilize for improvement. Quality implements the vision of the organization
12. Promote all pride	Reward the quality of work in addition to the quantity of work	Steer toward improvement. "Criticality analysis" aids quality improvement.
13. Vigorous Training	Transform everybody. Profound knowledge	Transition to new levels. Quality will be in the 21st century what productivity was to the 20th century
14. Take Action. Accept new challenges.	What could be revolutionary if done?	Determine requirements. Quality is "fitness for use"

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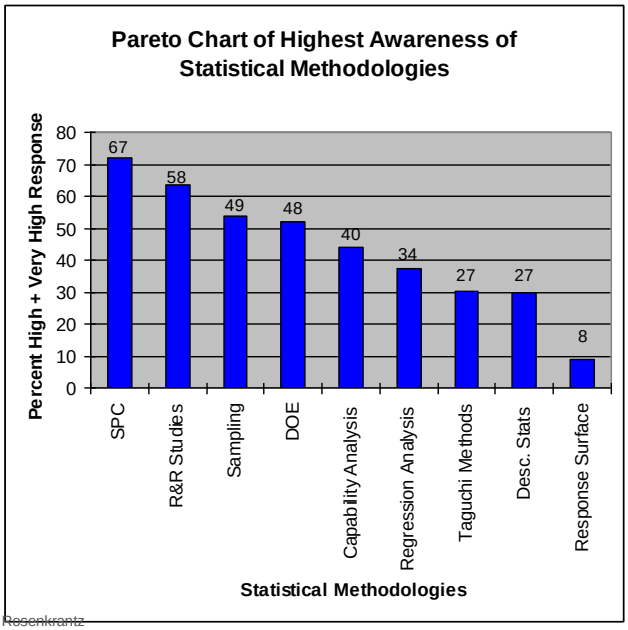

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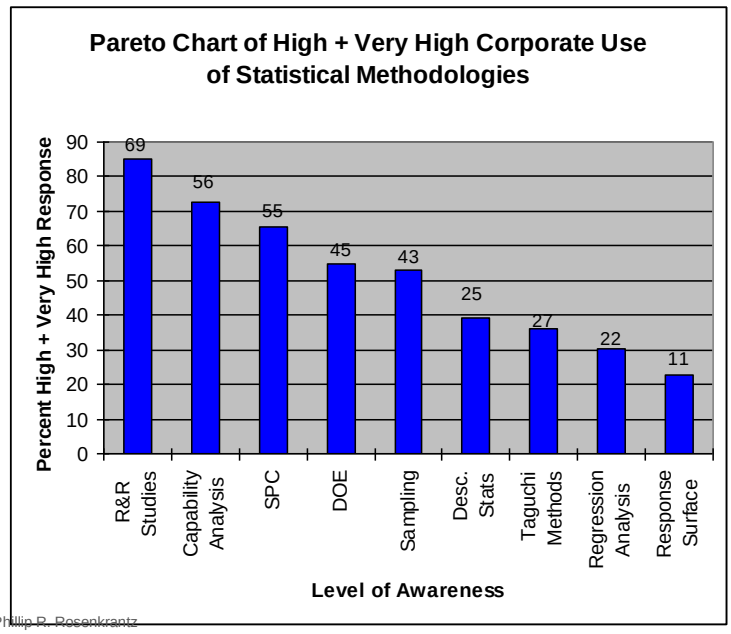

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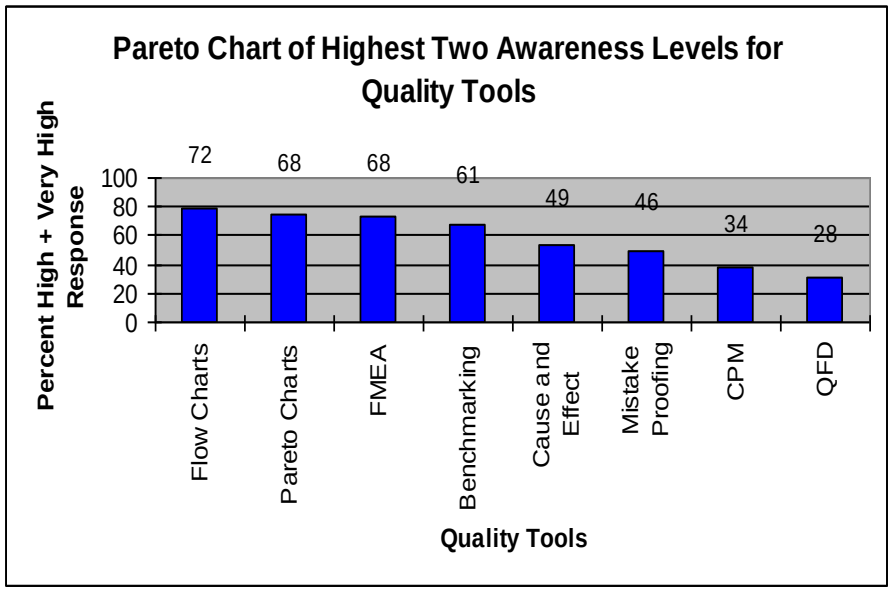

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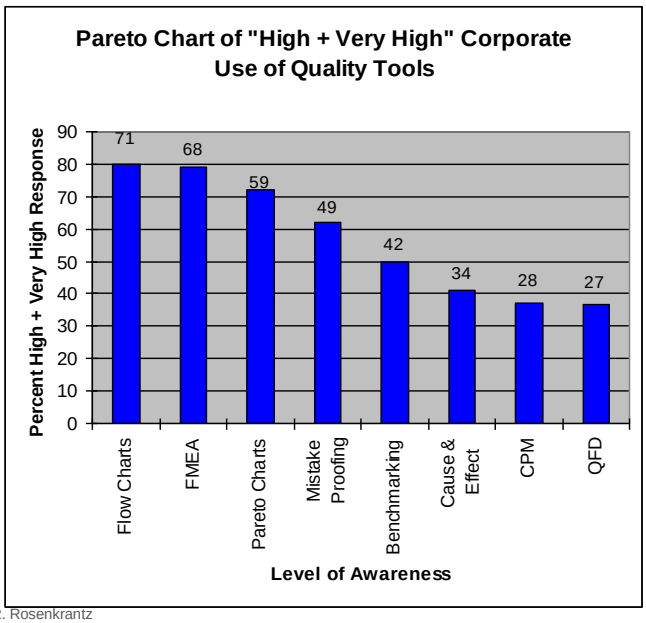

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