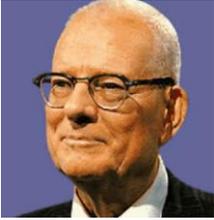
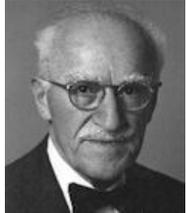
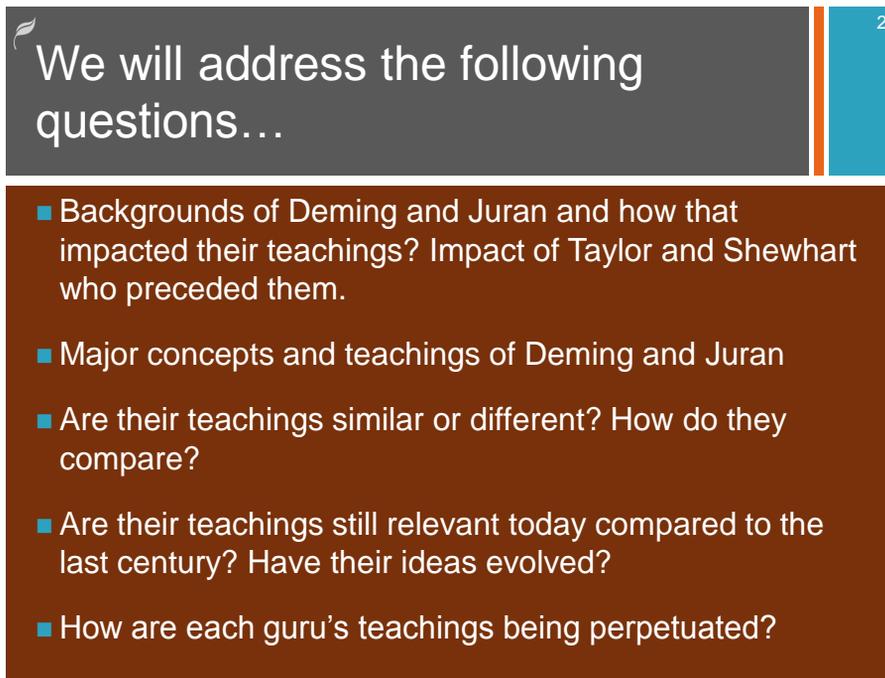


**Deming and Juran:  
Teachings and  
Enduring Impact**

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

Dr. Phillip R. Rosenkrantz  
Professor Emeritus, Cal Poly Pomona



**We will address the following questions...**

- Backgrounds of Deming and Juran and how that impacted their teachings? Impact of Taylor and Shewhart who preceded them.
- Major concepts and teachings of Deming and Juran
- Are their teachings similar or different? How do they compare?
- Are their teachings still relevant today compared to the last century? Have their ideas evolved?
- How are each guru's teachings being perpetuated?

## Unintended Results of Preparing this Presentation

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- Much deeper appreciation of Juran's Trilogy
- Realized the strong connection between Juran's teachings and how they were used by Motorola to develop Six Sigma Quality.
- Understanding behind the development of Pareto charts by Juran and strong use by Motorola.
- Belief that understanding and communicating modern quality to management is enhanced by studying the vantage points of both gurus.

## Longevity – Life Span of Quality Gurus

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Dr. W. Edwards Deming - 93

Dr. Joseph Juran - 103

Dr. Walter Shewhart - 75

Dr. Armand Feigenbaum – 92

Dr. Genichi Taguchi - 88

Dorian Shainin – 85

**Mean = 89.33 years**

**Median = 90 years**



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## Background: Early 1900's - Frederick Taylor

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- Father of *Scientific Management*
- Searched for the “*one best way*” to do any operation
- Developed time and motion study
- Believed management and labor should cooperate, people should be treated fairly, and work should be balanced among all workers
- Did not believe workers had the ability to understand scientific management or contribute
- Taylor and his ideas are still widely respected

## Taylor's Work with Henry Ford and the River Rouge Plant

6

- Vertically integrated automobile production from steelmaking to final assembly
- Operated with a fixed cycle time producing one car per cycle.
- No options or accessories so all jobs were repetitive and could be optimized without concern for variation
- Very early example of Lean Manufacturing using Scientific Management

## Studying the River Rouge Plant Led in Two Directions

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- First source of variation is product variation. Based on the success of Ford, American and Japanese companies went in two significantly different directions when faced with variation in customer orders:
  - **American companies** – Felt that the **key was to make operations repetitive**. Take common operations off line to economize in manufacturing. Move away from full integration. Worked as long as all competitors did the same (until early 70s). Evolved over decades into huge non-value-added systems filled with waste.
  - **Japanese Companies** – Mr. Toyoda saw that the **key was to keep operations fully integrated** but deal with product variation by balancing workloads and maintaining cycle time. Evolved into Lean Manufacturing (TPS).

## Traditional American Quality Control

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- Started with the inception of mass production and continues today.
- Lack of system focus. Overriding assumption is that poor quality is the result of people not doing their job
- Quality Strategy:
  - Inspection & repair
  - Punish offenders
  - Reduce inspection error
  - Train and monitor
- Attitude is that improving quality will increase costs (more inspection costs money)
- Acceptance that quality problems will always exist.

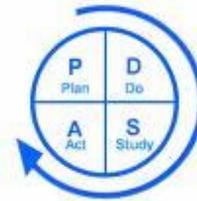
## Common Roots: 1920s - Shewhart developed Statistical Process Control

Walter Shewhart (1891-1967) 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.

## 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.**

## Major Concept #1: Process Control

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Process Control refers to how stable and consistent the process is:

- "In-control" – stable and only experiencing systematic or *common cause* variation.
- "Not in-control" – Process is not stable. Mean and variation are changing due to identifiable or *special causes* (usually controllable by those running the operation, also called *assignable causes*).
- Special cause variation represents <10% of the problems

## Major Concept #2: Process Capability (common cause variation)

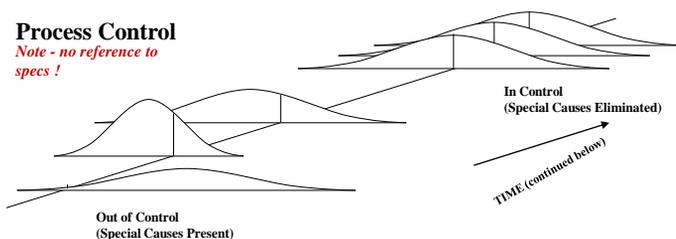
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- The ability of a process to produce within specification limits:
  - Able to produce within specifications – process is “capable”
  - Not able to produce within specifications – “not capable”
- Often quantified with process capability indices:
  - $C_p$  – Ability to stay within specs if centered
  - $C_{pk}$  – Ability based on current process center

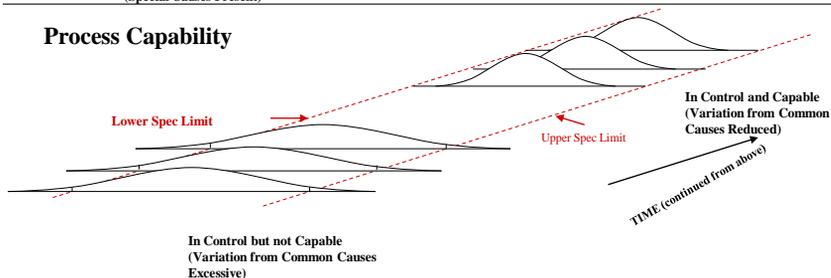
### Process Capability

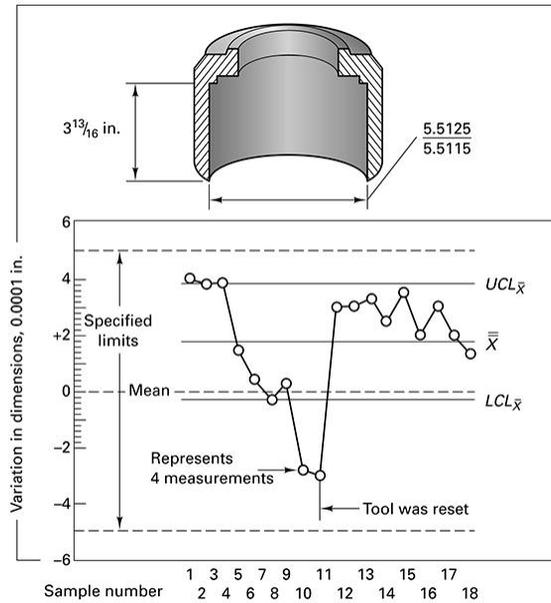
#### Process Control

*Note - no reference to specs !*



#### Process Capability





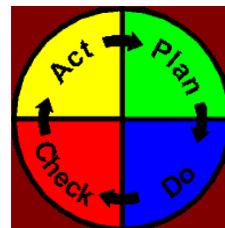
## PDCA Cycle

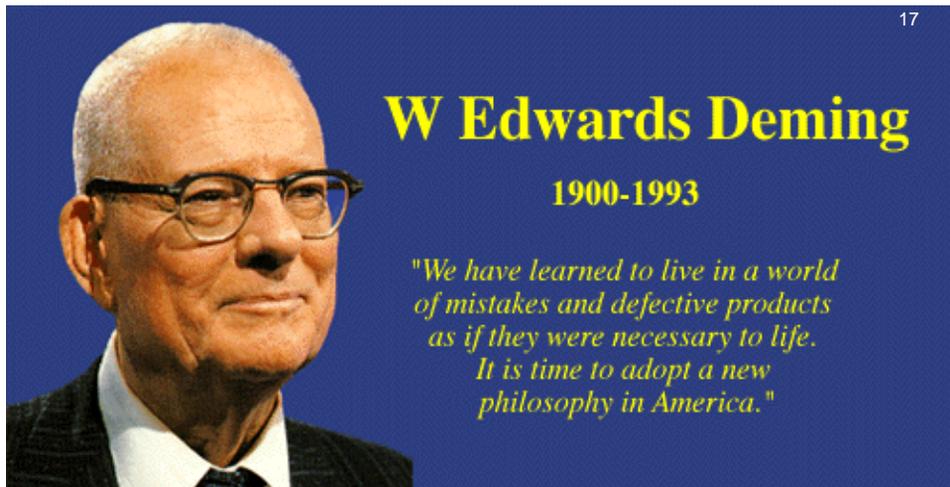
Shewhart Cycle was especially useful in solving quality problems. The PDCA Cycle denotes continuous improvement by repeating the basic cycle of:

- Plan -- Analyze the problem
- Do It -- Get the data
- Check -- Measure and study the change
- Act -- Modify as needed



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Dr. W. Edwards Deming is known as the Father of the Japanese Post-war Industrial revival and was regarded by many as the leading quality guru in the United States.

## Dr. W. Edwards Deming Milestones

- Born October 14, 1900 – Sioux City, Iowa
- Died December 20, 1993 (aged 93) Washington, D.C.
- Alma maters:
  - University of Wyoming, BS Electrical Engineering (1921)
  - University of Colorado, MS Statistics (1925)
  - Yale University PhD Statistics & Statistical Physics (1928)

## Dr. W. Edwards Deming Milestones

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- In addition to his other education, Dr. Deming studied under Walter Shewhart.
- Dr. Deming worked with census data for the U.S. Government.
- During WWII he was asked to implement SPC and Acceptance Sampling for the defense industry.
- After WWII American management went back to their former inspection-based methods.

## Reviving Japan

Deming was invited to Japan around 1950 by Japanese industrial leaders and engineers.

He guided them on how to implement quality control.

Awarded Second Order of the Sacred Treasure

Japanese scientists and engineers named the famed Deming Prize after him.

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## Out of the Crisis

21

- Four-day seminar for managers:
  - Red Bead Experiment – Demonstrated management folly in controlling common cause variation
  - Funnel Experiment – Demonstrated Tampering
- Deming's first book : *The New Economics (1984, 2000)*
- Deming published an explanation of his philosophies and concepts for managers in 1986 in his book: *Out of the Crisis*

## Deming's 14 points

22

- The 14 points are the basis for transformation of American industry.
- Not simply a matter of solving problems
- Management is responsible for creating the culture and improving the systems they operate with.
- The 14 points apply anywhere, to small organizations as well as to large ones, to service industries as well as to manufacturing.

## Deming's 14 Points for Management

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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

## Deming's Seven Deadly Diseases of Management

24

- 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

## Deming's System of Profound Knowledge

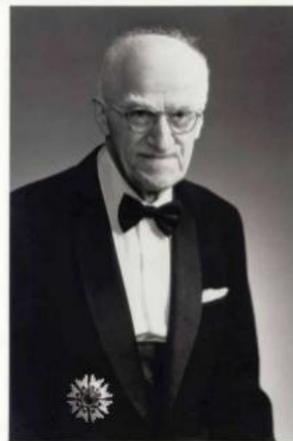
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- Deming advocated that all managers need to have what he called a *System of Profound Knowledge*, consisting of four parts:
  - **Appreciation of a system:** understanding the overall processes involving suppliers, producers, and customers (or recipients) 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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## Dr. Joseph M. Juran (1904-2008)

- Joseph Moses Juran was a Romanian-born American engineer and management consultant. He is principally remembered as an evangelist for quality and quality management having written several influential books on those subjects.
- Juran believed quality is associated with customer satisfaction and dissatisfaction with the product, and emphasised the necessity for ongoing quality improvement through a succession of small improvement projects carried out throughout the organisation



## Joseph M. Juran Milestones

27

- **1904:** Born December 24, in Romania
- **1920:** Graduated from Minneapolis South High School
- **1924:** Degree in electrical engineering from the University of Minnesota
- **1935:** Master's degree in Law (LL.M.)
- **1937:** Head of Industrial Engineering at Western Electric

## Joseph M. Juran Milestones

28

- **1937:** Dr. Juran creates the "Pareto Principle," also known as the 80-20 principle, to help separate the "vital few" from the "useful many" in their activities.
- **1945:** Dr. Juran is invited by General MacArthur to train Japanese leaders following World War II.
- **1951:** Publishes the first standard reference work on quality management, the Quality Control Handbook.
- **1954:** Dr. Juran visits Japan and introduces the managerial aspect of quality to the country's top executives.

## Joseph M. Juran Milestones (cont'd)

29

- **1964:** Publishes *Managerial Breakthrough* – One of the foundations for Lean and Six Sigma today.
- **1970:** Dr. Juran gains guru status as his expertise is used to combat quality crisis issues in the private sector.
- **1979:** Dr. Juran founds Juran Institute
- **1986:** The Juran Trilogy® is published and accepted worldwide as the basis for quality management.
- **2008:** Dr. Juran passes away at age 103 after laying the foundation for modern quality control.

## Books by Joseph M. Juran

30

- *Quality Control Handbook, McGraw-Hill, 1951*
- Eventually published in six editions. *Managerial Breakthrough, McGraw-Hill, 1964*
- *Management of Quality Control. 1967*
- *Quality Planning and Analysis, McGraw-Hill, 1970*
- *Upper Management and Quality, 1980*
- *Juran on Planning for Quality, The Free Press, 1988*

## Juran's Definition of Quality

31

- Quality means those features of products which meet customer needs and thereby provide customer satisfaction (Fitness for Use)
- Quality means freedom from deficiencies—freedom from errors that require doing work over again (rework) or that result in field failures, customer dissatisfaction, customer claims, and so on. In this sense, the meaning of quality is oriented to costs, and higher quality usually costs less

## How To Manage For Quality: The Juran Trilogy

32

- 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.

## Quality Planning

33

- Establish quality goals
- Identify who the customers are
- Determine the needs of the customers
- Develop product features that respond to customer's needs
- Develop processes able to produce the product features
- Establish process controls; transfer the plans to the operating forces

## Quality Control

34

- Evaluate actual performance
- Compare actual performance with quality goals
- Act on the difference

## Quality Improvement

35

- Prove the need and establish the infrastructure
- Identify the improvement projects
- Establish project teams
- Provide the teams with resources, training, and motivation to:
  - Diagnose the causes Stimulate remedies
  - Establish controls to hold the gains

## Breakthrough & Control

36

- Two diverse but interrelated things managers need to understand.
  - **Control** is performance to a standard, holding gains, eliminating flare ups, fire-fighting, holding-the-line, and getting back on target.
  - **Breakthrough** refers to drives, campaigns, programs and breakouts designed to take a process to a whole new level of performance.
- The organization goes through alternating phases of breakthrough and control to achieve long term results.

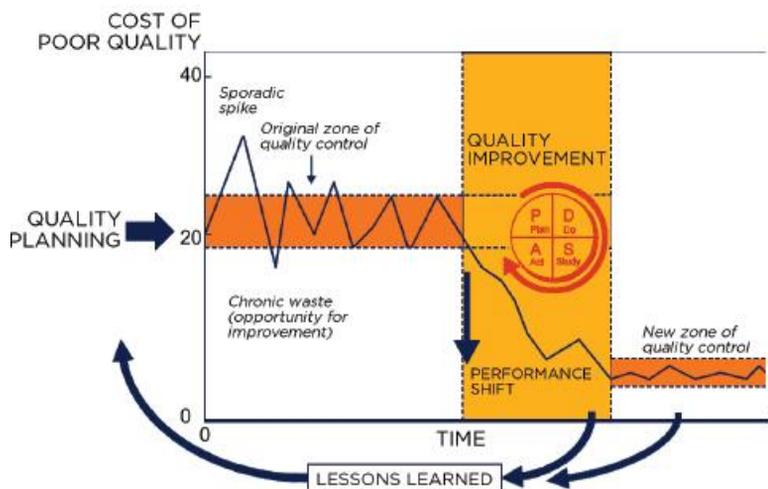
## Breakthrough

37

- Breakthrough in Attitude
- Pareto Analysis
- Organization of Steering and Diagnostic Arms
- Breakthrough in Knowledge - Diagnosis
- Breakthrough in Cultural Patterns
- Breakthrough in Results

## The Juran Trilogy

38



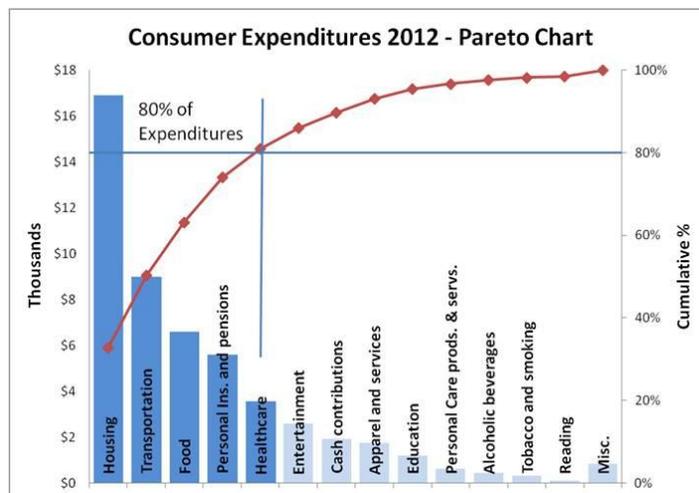
## Diagnostic Arms

39

- Breakthrough needed:
  - New markets
  - New processes
  - Manufacturing Cost
  - Improvement in product quality
  - New Products
- Diagnostic arm:
  - Market Research
  - Process Research
  - Industrial Engineering
  - Quality Control Engineering
  - Product R&D

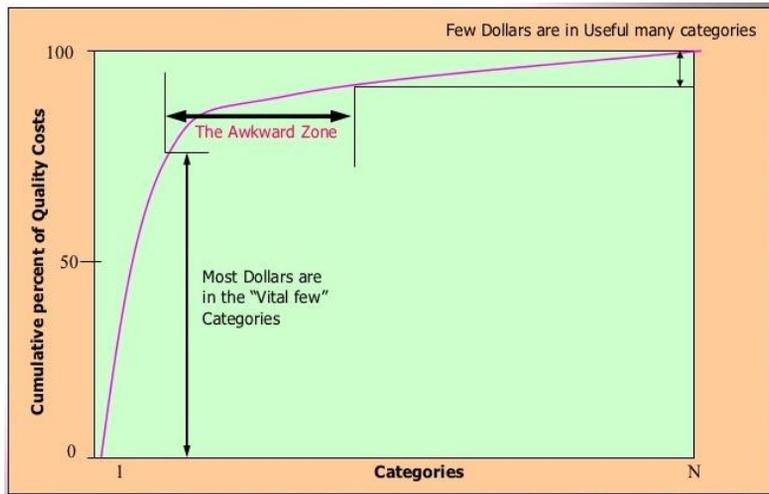
## Pareto Analysis

40



## Pareto Analysis

41



## Strength of Juran's Trilogy

42

- The methodology searches for continuous improvement of quality in every aspect of the organization.
- The methodology illustrates the use different quality tools to cover the steps of Juran's Trilogy. It creates a better understanding of the relationships of every stage of the company
- The methodology is well structured and allows the companies that implement it, an easy understanding and application.

## Comparison of Deming & Juran Teachings (Dr. Arnold Goodman)

43

Deming	Comparison	Juran
Be constant in purpose	D: Transformed quality control into improvement & strategy J: Transformed quality control into management & design	Define goals
Understand customers (implied)	D: Quality is satisfaction of customer requirements J: Quality is among the most productive of competitive weapons	Identify customers
Accept new challenges	D: What could be revolutionary if done? J: Quality is "fitness for use"	Determine requirements
Go quality over price	D: Quality journals help to define and solve quality problems J: "Customer progress spirals" facilitate customer improvement	Develop features

## Comparison of Deming & Juran Teachings (Dr. Arnold Goodman)

44

Deming	Comparison	Juran
Be better always	D: Become and stay competitive to create and keep customers and jobs J: Quality measures and improves services as well as products	Generate processes
Don't depend on inspection	D: Replace inspection with teamwork to construct quality in J: Quality processes are designed & managed	Establish controls
Lead... don't boss	D: Eliminate special causes, minimize process variation & then foolproof J: Generalized the 80-20 rule and named it after Pareto	Focus upon the Vital Few
Cooperate over the organization	D: Avoid short term thinking and managing J: Control prevents bad change and breakthrough creates good change	Breakthrough new attitudes

## Comparison of Deming & Juran Teachings (Dr. Arnold Goodman)

45

Deming	Comparison	Juran
Eradicate quotas	D: Unrealistic tasks & schedules frequently produce misleading results J: Quality implements the vision of the organization	Mobilize for improvement
Eliminate slogans	D: Reduce impediments from artificial sayings and arbitrary objectives J: Quality generates income in addition to cost	Diagnose for improvement
Promote all pride	D: Reward the quality of work in addition to the quantity of work J: "Criticality analysis" aids quality improvement	Steer toward improvement
Train on the job	D: Plan--Do--Study--Act J: Motivating people to change behavior will lead them to change attitude	Breakthrough knowledge

## Comparison of Deming & Juran Teachings (Dr. Arnold Goodman)

46

Deming	Comparison	Juran
Erase fears	D: Translate fear in the workplace into a joy of doing and calmness in being J: Quality need to manage the politics of desired cultural change	Overcome any resistance
Improve oneself	D: Statisticians have a broader role in quality than statistical analysis J: Anticipation and preparation are the parents of timing	Breakthrough performance
Transform everybody	D: Profound knowledge J: Quality will be in the 21 <sup>st</sup> century what productivity was to the 20 <sup>th</sup> century	Transition to new levels

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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