Total Quality Management

Contributions of Quality Gurus

Quality Gurus…

- *W. Edwards Deming*
  - Developed courses during World War II to teach statistical quality-control techniques to engineers and executives of companies that were military suppliers
  - After the war, began teaching statistical quality control to Japanese companies
- *Joseph M. Juran*
  - Followed Deming to Japan in 1954
  - Focused on strategic quality planning

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…Quality Gurus…

- *Philip Crosby*
  - In 1979, emphasized that costs of poor quality far outweigh the cost of preventing poor quality
  - In 1984, defined absolutes of quality management—conformance to requirements, prevention, and "zero defects"
- *Armand V. Feigenbaum*
  - In 1951, introduced concepts of total quality control and continuous quality improvement
- *Kaoru Ishikawa*
  - Promoted use of quality circles
  - Developed "fishbone" diagram
  - Emphasized importance of internal customer

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…Quality Gurus

- *Genichi Taguchi*
  - Emphasized variation reduction, Taguchi loss function
- *Shigeo Shingo*
  - Developed “Poka-Yoke” and Source inspection systems
- Taiichi Ohno
  - Father of Toyota Production System
  - Influenced areas like JIT and Lean manufacturing
- *Walter Shewart*
  - In 1920s, developed control charts
  - Introduced the term “quality assurance”

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Deming’s Chain Reaction

Improve Quality

Cost decreases because of less rework, fewer mistakes, fewer delays, better use of machine time and materials

Productivity improves

Capture the market with better quality and lower price

Stay in business

Provide jobs and more jobs

The Deming Cycle or PDCA Cycle

PLAN

Plan a change to the process. Predict the effect this change will have and plan how the effects will be measured

DO

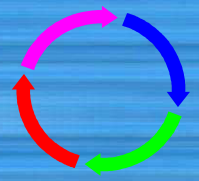
Implement the change on a small scale and measure the effects

CHECK

Study the results to learn what effect the change had, if any

ACT

Adopt the change as a permanent modification to the process, or abandon it



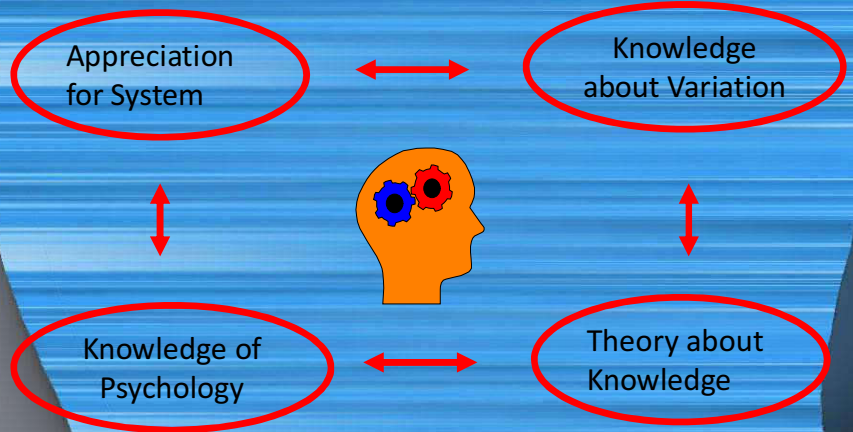
Deming's 14 Principles

1. Create a vision and show commitment
2. Learn the new philosophy
3. Understand inspection
4. Stop decision making solely on cost
5. Improve constantly
6. Institute training
7. Institute leadership
8. Drive out fear
9. Optimize team efforts
10. Eliminate exhortations to workers
11. Eliminate numerical quotas
12. Remove barriers to workmanship pride
13. Encourage self-improvement
14. Take action

Deming's Deadly Diseases

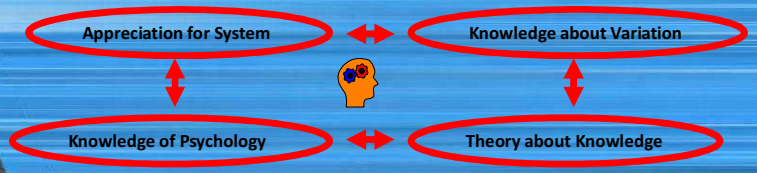
1. Lack of constancy of purpose
2. Emphasis on short-term profits
3. Performance Appraisal
4. Mobility of Management
5. Running a company on visible numbers only

Deming's System of Profound Knowledge



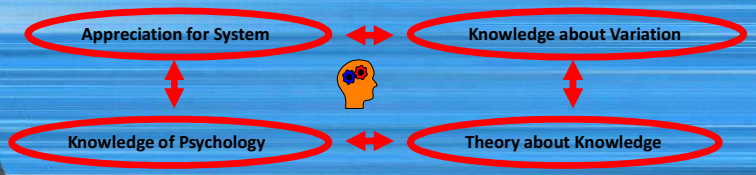
Appreciation for System

- Most organizational processes are cross-functional
- Parts of a system must work together
- Every system must have a purpose
- Management must optimize the system as a whole



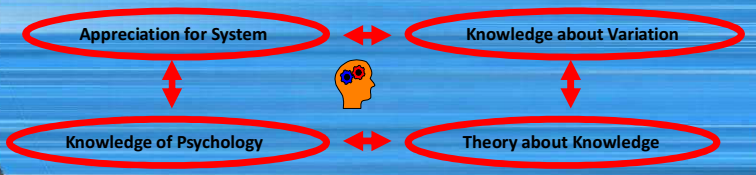
Knowledge about Variation

- Many sources of uncontrollable variation exist in any process
- Excessive variation results in product failures, unhappy customers, and unnecessary costs
- Statistical methods can be used to identify and quantify variation to help understand it and lead to improvements



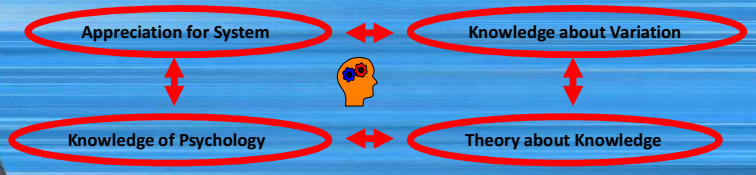
Theory of Knowledge

- Knowledge is not possible without theory
- Experience alone does not establish a theory, it only describes
- Theory shows cause-and-effect relationships that can be used for prediction



Knowledge of Psychology

- People are motivated intrinsically and extrinsically
- Fear is demotivating
- Managers should develop pride and joy in work



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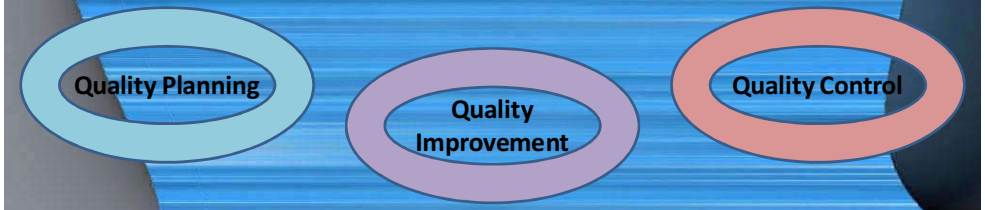
Juran's Quality Trilogy…

Quality Planning

- Identify who are the customers
- Determine the needs of those customers
- Develop a product that can respond to those needs
- Optimize the product features so as to meet our needs and customer needs



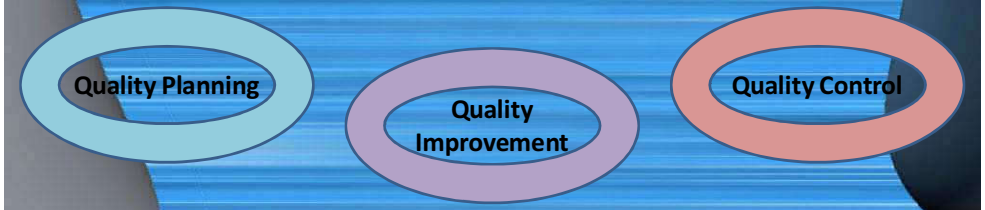
…Juran's Quality Trilogy

Quality Improvement

- Develop a process which is able to produce the product
- Optimize the process

Quality Control

- Prove that the process can produce the product under operating conditions with minimal inspection
- Transfer the process to Operations



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Crosby's Absolutes for Quality Management

First Absolute

- Definition of quality is conformance to requirements, not goodness

Second Absolute

- System of quality is prevention

Third Absolute

- Performance standard is zero defects

Fourth Absolute

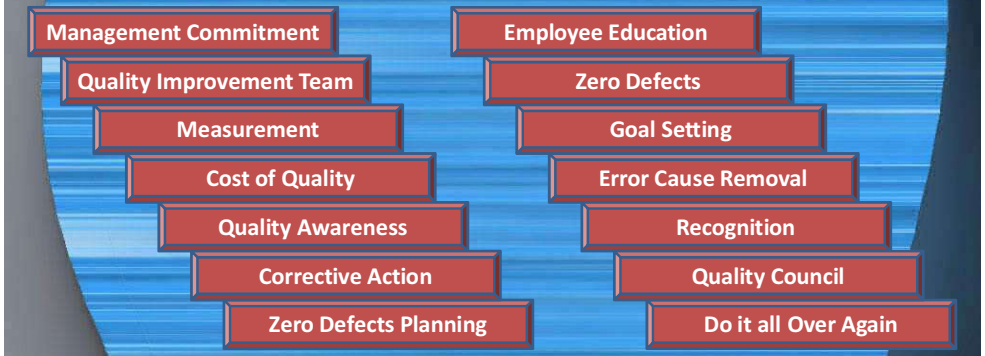
- Measurement of quality is the price of non-conformance

Crosby's Zero Defects

Zero Defects philosophy believes in total perfection or 'to do the job right the first time'

- Errors or defects are caused by two factors:
  - Lack of knowledge
  - Lack of attention

Crosby's Fourteen Steps for Quality Improvement



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Feigenbaum's Total Quality

'Total quality control is an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organization so as to enable production and service at the most economical levels which allow full customer satisfaction'

The two fundamental concepts:

1. "Quality is everybody's job"
2. "Because quality is everybody's job in a business, it may become nobody's job"

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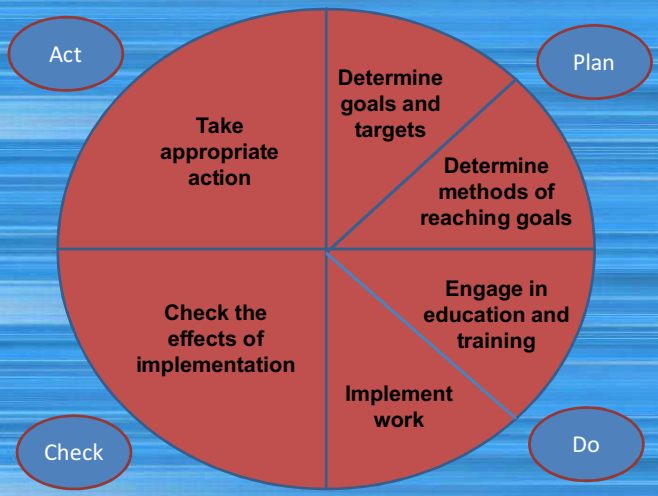
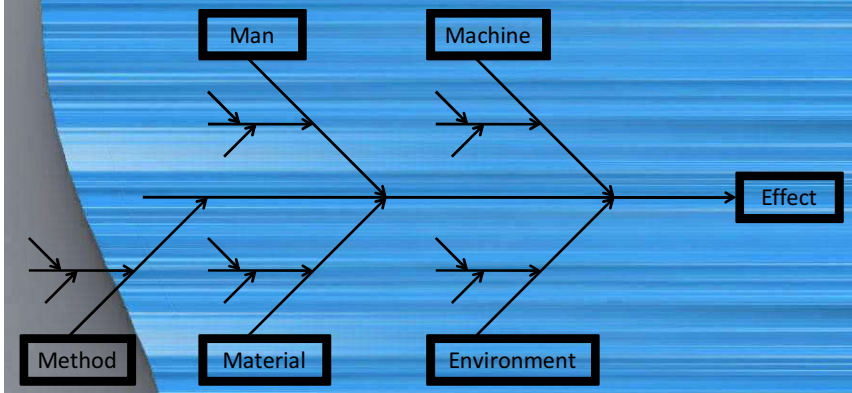
Ishikawa's expansion of Deming Cycle



Ishikawa Diagram

Also known as

- "Cause and Effect Diagram" or C&E Diagram
- Fishbone Diagram



5 Whys and the Fishbone Diagram

Problem Statement: You are on your way home from work and your car stops in the middle of the road

1. Why did your car stop?
   - Because it ran out of gas
2. Why did it run out of gas?
   - Because I didn't buy any gas on my way to work
3. Why didn't you buy any gas this morning?
   - Because I didn't have any money
4. Why didn't you have any money?
   - Because I lost it all last night in a poker game
5. Why did you lose your money in last night's poker game?
   - Because I'm not very good at "bluffing" when I don't have a good hand

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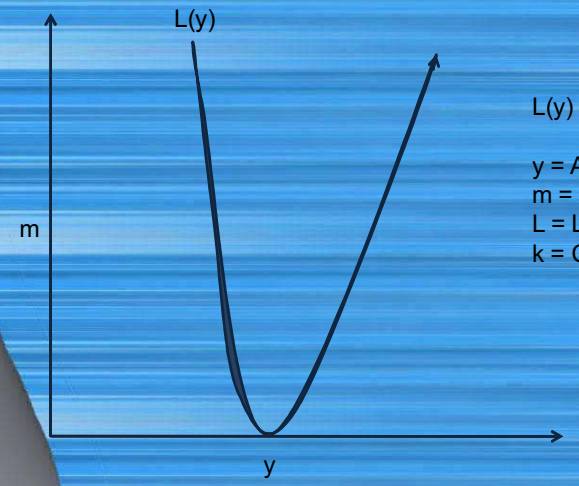
Taguchi Loss Function

Way to show how each non-perfect part produced, results in a loss for the company



$L(y) = k (y - m)^2$

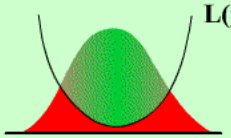
y = Actual measurement
m = Target value
L = Loss, a function of y
k = Constant

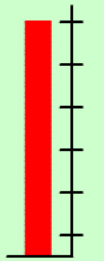
TAGUCHI LOSS FUNCTION

play
stop
step
rew

$L(y) = k(y-m)^2$

The loss due to performance variation is proportonial to the square of the deviation of the performance characteristic from its nominal value.





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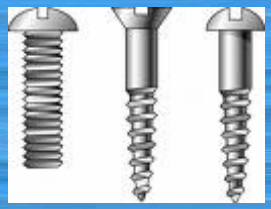
Shingo's Poka-Yoke

"Mistake Proofing"

An approach for mistake-proofing processes using automatic devices or methods to avoid simple human or machine error, such as

- Forgetfulness
- Misunderstanding
- Errors in identification
- Lack of experience
- Absentmindedness
- Delays, or
- Malfunctions



Recap

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