TQM 15.760

TOTAL QUALITY MANAGEMENT

THEMES

FOUR LEVELS OF QUALITY

FOUR THOUGHT REVOLUTIONS
   Customers first
   Continuous Improvement
   Total Participation
   Societal Learning

ORGANIZATIONAL MANAGEMENT
   Information & Measurement Systems
   Education
   Incentive Systems
   Organizational Change

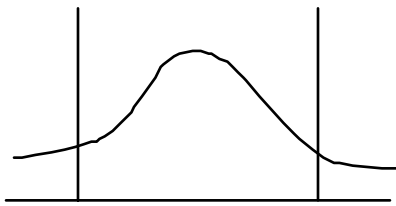# Four Levels of Quality

1. **FITNESS FOR STANDARD**
   -inspection oriented
   -no consciousness to customer/mkt

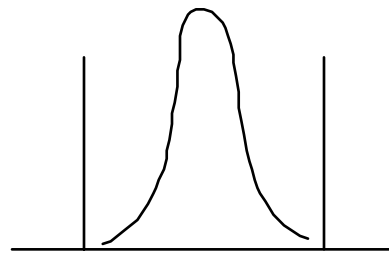2. **FITNESS FOR USE**
   -Must satisfy customer need for use
   -Hotel shampoo & body oil

3. **FITNESS FOR MARKET**
   -Must achieve low cost as well as
       1 & 2

high cost   low cost
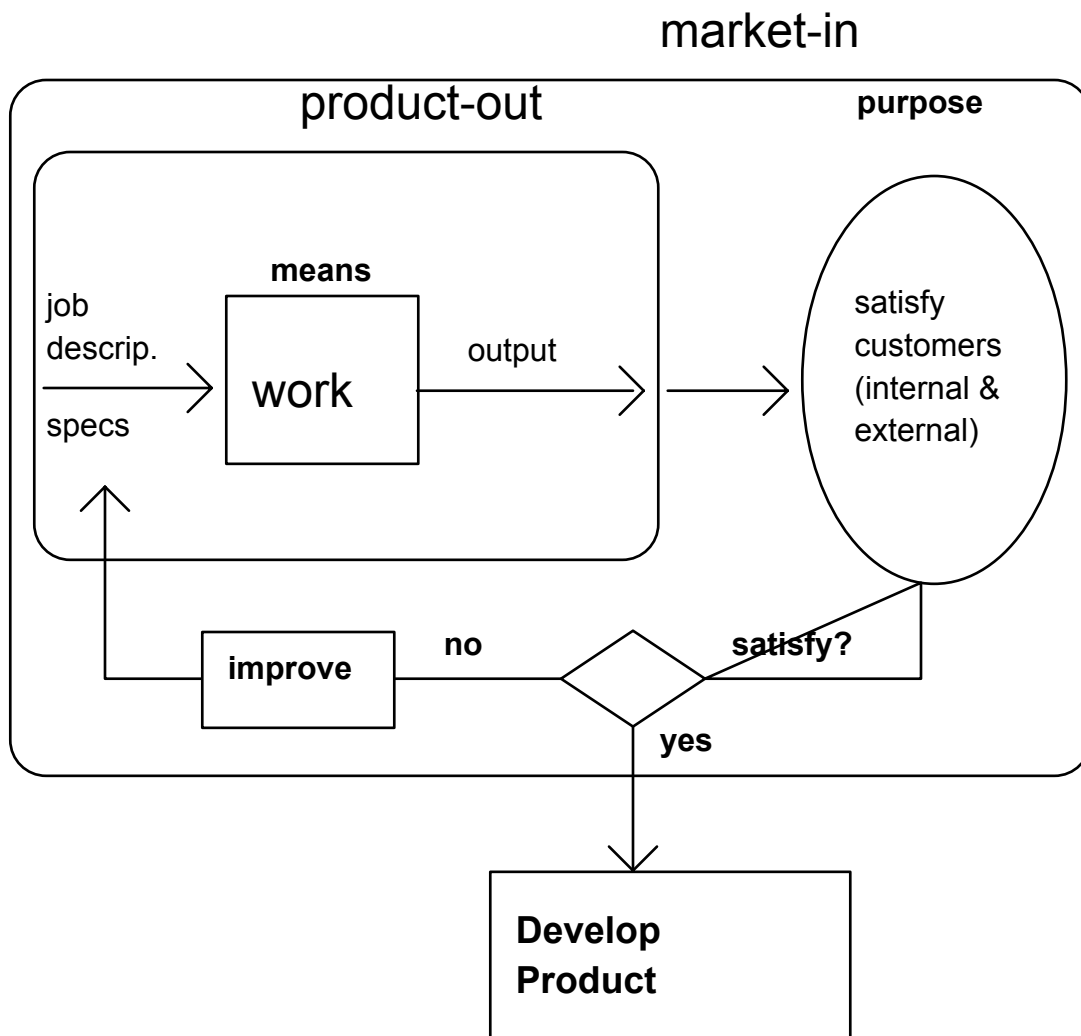
4. **FITNESS FOR LATENT REQ'TS**
   -Listening to the voice of the customer
   -V-8 engine, Swatch
   -Uncovering latent req't adds value

==> need continuous innovation

TQM: Four Thought Revolutions

1. Customer-First Revolution

(From "Product-out to "Market-in")

market-in

product-out

purpose

means

job descrip.
specs

work

output

satisfy customers (internal & external)

improve

no

satisfy?

yes

Develop Product

2. Continuous Improvement Revolution

Fundamental Concept: PDCA
   (Observe, Assess, Design, Intervene)

Quality Control:
   Manage known sources of variation
      -process control charts
      -management by exception
      -ROI control

Reactive Quality Management:
   Problem solving
   -application of SQC tools
      (Pareto anlysis, proeess flow chart,
         fishbone diagrams, histograms)

Proactive Quality Management:
   Finding hidden opportunities

   MANAGEMENT BY FACT:
"IN GOD WE TRUST;

ALL OTHERS BRING DATA"

3. Total Participation Revolution

-Total Involvement of CEO
(Leadership)

-Quality Specialist ----> All Employees

-Build Infrastructure: goals, training,
promotion, feedback, diagnosis, etc.

4. Societal Learning Revolution

Success stories need wide diffusion
(Baldridge, Deming Awards)

In Japan: progression through
    -Process industries
    -Mass Production
    -Small Volume Manufacturing
    -Construction
    -Services

Role of outside change agents
    -Deming, Juran, Shiba

Role of University/Industry Consortia
    -MIT: Center for Quality Management
          Leaders for Manufacturing

PRINCIPLES OF LEADERSHIP

1. LEADERS LEAD BY EXAMPLE
   -LEADERS MUST BE ROLE MODELS
   -LIVE YOUR LIFE AS A LEADER

2. LEADERS LEAD BY THEIR COMMITMENT
   -STATE CLEARLY YOUR COMMITMENTS
   -DEMONSTRATE YOUR COMMITMENT
   -HONOR YOUR COMMITMENTS

3. SET STANDARDS FOR
   -DISCIPLINE
   -ETHICS
   -ENTHUSIASM

4. MAKE EACH EMPLOYEE FEEL THAT
   HE/SHE MATTERS

5. CELEBRATE/RECOGNIZE ACHIEVEMENTS

6. BE A GOOD LISTENER

7. BE CONSISTENT AND PREDICTABLE

TQM GOAL:

HABITUAL, CONTINUOUS IMPROVEMENT IN PURSUIT OF

PERFECT PRODUCTION

- Zero Defects
- Zero Inventories
- Zero Lead Times & Cycle Times
- Zero Injuries
- Zero Machine Downtime
- Zero Customer Returns
- Zero Warranty Costs
- Zero Absenteeism
- Process Capability > 2 and incr.
- Rapid Product Introduction
- Rapid Learning
- Teamwork
- High Morale

-Pride

QUALITY INFORMATION SYSTEMS

OBJECTIVE: RAPID FEEDBACK

From Customers:
    -Field personnel reports
    -Customer interviews & surveys

From Competitors/External Studies:
    -Benchmarking

In the Production/Delivery System:
Rapid Feedback Systems: Detailed,
    Comprehensive, Fast
        -Who are customers/suppliers?
        -Faster flow times==>less tracking
        -Tight Feedback Loops
        -CIM oriented--much integration

Provide Data on:

-Defects, Downtime, Warranties, Returns
-Inventories, Lead Times, Cycle Times
-Injuries, Absenteeism, Turnover
-Process Capability, Learning Rates
-Vendor Quality

-Quality Costs

QUALITY DECISION TOOLS AND DATA ANALYSIS

DEMING: SIX SQC TOOLS THAT <u>EVERYONE</u> SHOULD KNOW AND USE

1. **Pareto Analysis**

2. **Process Flow Chart**

3. **Fishbone (Cause & Effect) Diagrams**

4. **Histograms**

5. **Control Charts**

6. **Scatter Plots**

WE HAVE TOOLS FOR TWO TYPES OF DATA:

1. NUMERICAL DATA

-*HISTOGRAMS*
-*PARETO DIAGRAMS*
-*CONTROL CHARTS*
-*SCATTER PLOTS*
-*PROCESS CAPABILITY*

2. LANGUAGE DATA

-*CAUSE & EFFECT DIAGRAMS*
-*KJ (or "LP" PROCESS*
(AFFINITY DIAGRAMS)

MANY OF THE LANGUAGE DATA TOOLS ARE NOT WIDELY TAUGHT IN THE WEST.

Quality Economics

-Macro: International Competitiveness
-Micro: Quality/Productivity Relation
    (Economics of DIRTFT)
-Cost of Quality:
    Careful Analysis and Accounting
        -Failure Costs
        -Appraisal Costs
        -Prevention Investments
        -Revenue effects of quality

Contributions of Taguchi

-Quality Loss Function
-Two-step process for parameter optimization (control variance and mean)

-Orthogonal Arrays for experimental design

PRODUCT DEVELOPMENT LEVERAGE
APPROXIMATELY 75% OF LIFE CYCLE (DESIGN AND MANUFACTURING) COSTS ARE DETERMINED DURING THE PRODUCT DEVELOPMENT PROCESS

Concurrent Design of Products and Processes
Whitney & Nevins, et al
McGraw-Hill 1989

PRODUCT DEVELOPMENT IN THE JAPANESE AUTOMOBILE INDUSTRY (COMPARED WITH U.S.):

--25% FASTER
--50% FEWER ENGINEERING HOURS

(EUROPEANS ARE FARTHER BEHIND)
Product Development Performance
Clark & Fujimoto
HBS Press 1991

ACTIVE PARTICIPATION OF ALL PLAYERS IS CRITICAL

Customer-driven Requirements

Suppliers (Vendor Management)

Company-wide Involvement

    -Manufacturing

    -Marketing

    -Engineering (Design of Products,
           Processes, Systems)

    -Purchasing

    -Quality Assurance

    -Workforce Participation

    -Distribution and Field Service

-Personnel

CONTINUOUS TRAINING AND EDUCATION

-General Quality Concepts
-Statistical Quality Control
-Cost of Quality
-Problem Solving
-Decision Making
-Teamwork
-Experimental Design
-Parameter Optimization
-Customer/Supplier Analysis
-Design for Manufacturability

WHO GETS WHAT TRAINING?

WHO DOES THE TRAINING?

WHO DESIGNS THE CURRICULUM?

MOTIVATION FOR LEARNING

SUPPLY CHAIN MANAGEMENT

Schonberger on Supplier Development

    -RELY ON FEWER, BETTER SUPPLIERS
    -"TREAT THEM LIKE FAMILY"
    -EMPHASIZE PARTNERSHIP WITH
       ORGANIZATIONAL INTERACTION
    ON ALL LEVELS

SINGLE SOURCE   MULTIPLE SOURCES

Get to know each supplier better	**less risk to supplier strikes/shutdowns**
QC is easier	**lower spot prices**
DFM is easier	**less scrutiny of each**
Short supply lines	

SUPPLY CHAIN MANAGEMENT:

DEMONSTRATE TO CUSTOMERS:

Quality at the Source
Process Capability
Declining Nonconformities
Declining WIP, LT, Space, Flow Dists
Operators
-cross-trained, doing Prev Maint
-presenting on SPC, Setup Reduction
-charting probs, processes/methods
-trained in JIT/TQC
Concurrent Design
Competitive Analysis
Flexibility of labor and equipment
Dedicated Capacity
Exact counts in standard containers

COMMITMENT TO World Class STATUS

EMPLOYEE INVOLVEMENT

"IF A FIRM THAT UTILIZES THE MINDS OF ONLY 50% OF ITS EMPLOYEES COMPETES WITH A FIRM THAT UTILIZES THE MINDS OF 100% OF ITS EMPLOYEES, WHICH DO YOU THINK WILL PREVAIL?"

EI OBJECTIVES:

EMPLOYEE INITIATIVE
            OWNERSHIP
            ENTHUSIASM
            LOYALTY

EI METHODS:

STRONG LEADERSHIP
TEAMWORK PROGRAMS
RECOGNITION AND REWARDS
INDIVIDUAL RESPONSIBILITY
TRAINING AND TOOLS

INCENTIVES

IMPLEMENTATION OF TQM

-Major Cultural Transition
        (Trust as the lubricant)

-Education and Training are Critical

-Tailor the process to the specific firm

-Quality Improvement Teams
        (Harnessing the Collective Genius)

Top Management Leadership:
    -Importance of Quality
    -Goals and Objectives
    -Commitment to these Goals
    -Responsibility for these Goals

Dr. W. Edwards Deming's Fourteen Points

1. Create constancy of purpose for impr. of product and service.

2. Adopt the new philosophy -- poor quality cannot be tolerated.

3. Cease dependence on inspection to achieve quality.

4. End the practice of awarding contracts on the price tag alone; work with a single supplier.

5. Improve constantly and forever every process for planning, production, and service.

6. Institute training on the job.

7. Adopt and institute leadership.

8. Drive out fear.

9. Break down barriers among staff areas.

10. Eliminate slogans, exhortations, and targets for workers.

11. Eliminate numerical quotas for the workforce and numerical goals for management.

12. Remove barriers that rob people of their pride of workmanship. Eliminate the annual rating or merit system.

13. Institute a vigorous program of education and self-improvement for everyone.

14. Put everybody in the company to work to accomplish the transformation.

Some Words from Dr. W. Edwards Deming

"The prevailing system of management has destroyed our people. People are born with intrinsic motivation, self-esteem, dignity, curiousity to learn, joy in learning. The forces of destruction begin with toddlers--a prize for the best Halloween costume, grades in school, gold stars--and on up through the university. On the job, people, teams, divisions are ranked--reward for the one at the top, punishment for the one at the bottom."

-Top Management Leadership

    -Habitual Continuous Improvement

    -Rapid Feedback Systems
    (Who are customers/suppliers?)

    -Data-Driven Decision Support Tools
      (Statistical Quality Control,
       Cost of Quality, Taguchi Methods)

    -Continuous training and education

    -Company-wide participation

    -Supply-Chain Management

    -TQM Implementation

    -Employee Involvement

Measuring Quality

Customer Satisfaction
Defect Rates
Cost of Poor Quality
Inventory
Productivity
Innovativeness
Complexity
Order Lead Times
Manufacturing Cycle Times
Product Development Cycle Times
Injuries
Machine Downtime
Absenteeism and Turnover
Changeover time improvements
Rate of Product Introduction
Rates of Learning and Process Imp.
Workforce Training and Education
Workforce Suggestions

Teamwork, Morale, Pride
Vendor Cooperation

Baldridge Quality Award Criticisms

1. requires large expenditures

2. fails to predict financial performance

3. not focused on superior product
      or service quality

Judging

1. Deployment - horizontal and vertical

2. Integration   - alignment, communication
                        - speed

Legacy

Spirit of Cooperation

Baldridge Quality Award Categories for Scoring

1. Leadership--symbolism & involvement

2. Info systems/analysis--internal, benchmk

3. Strategic Quality Planning
   Plans and Goals that are
   concrete, focused, integrated, aggressive

4. Human Resource Utilization
   -empowerment, teamwork, skills

5. Quality Assurance of Pdts & Services
   -process quality drives product quality

6. Quality Results
   -data on quality and defects, etc.

7. Customer Satisfaction
   -systems and results

Award's Merits	_Award's Demerits_
stimulate debate	ignores finan. perf.
raise consciousness	downplays product qua.
decathalon: composite	self-nominating
	no definition of quality
	examiners also consult
	aims too low
	thermometer
	-not instructive
	philosophically agnostic
	not focused on
	world-class
	too process oriented
	bureaucratic

Donald Berwick

"Controlling Variation in Health Care"

Subject: Control & Reduction of Variation

**TQM =   customer satisfaction +
organ. culture (empowerment) +
continuous improvement**

**Concept of variation categorized by
-special causes
-common causes**

Identify disconnected alarm systems

Beware: local excellence, systemic garbage

Tells what (articulately) but not how

Peter Senge

"Building Learning Organizations: The Real Message of the Quality Movement"

First Wave of Quality:
- champion continuous improvement
- remove impediments that disempower people
- support new practices

Second Wave of Quality:
Improve Management Processes
The industrial engineering of managment work

Third Wave of Quality
- institutionalize learning w/5 disciplines:
    Shared Vision
    Personal Mastery
    Mental Models
    Team Learning
    Systems Modeling

Intrinsic vs. Extrinsic motivation

Schaffer and Thompson

Successful Change Programs Begin with Results

The Activity-Centered Fallacy:

1. Not keyed to specific results

2. Too large-scale and diffused

3. Results is a four-letter word
       (avoid appearance of short-termism)

4. Delusional Measurements

5. Staff and Consultant Driven

6. Bias to orthodoxy, not empiricism

THE TIMELESS SECRETS OF INDUSTRIAL SUCCESS

(R. H. HAYES, HARVARD UNIVERSITY)

1. BEWARE OF COMPLACENCY

2. CONTINUALLY ENLIST THE HELP OF EMPLOYEES TO IMPROVE PRODUCT AND PROCESS

3. DENY EVERY INCH TO COMPETITORS AND POTENTIAL COMPETITORS

4. STUDY COMPETITORS' SOURCES OF SUCCESS

5. DON'T BE TOO RATIONAL

6. YOU ARE NEVER DONE

Results Driven

1. Introduce Managerial and Process innovations only as needed

2. Empirical testing reveals what works

3. Frequent reinforcement energizes

4. Use lessons of each phase to design next phase (i.e., continuous process)

How to get started

1. Create the context and Identify the crucial business challenges

2. Ask each unit for a few ambitious short-term goals

3. Monitor progress, capture the essential learning, reformulate strategy

4. Institutionalize only what works
FALSE STARTS & FAILURE MODES IN TQM PROGRAMS

1. TRAINING CAPACITY

2. RESISTANCE TO CHANGE

3. FEAR OF FIRING

4. CAPITAL CRUNCH

5. WORK OVERLOAD

6. SATISFIED CUSTOMERS

7. COST OF QUALITY

8. LOVED TO DEATH (institutionalized)