Transforming the Engineering Organization with Systems Engineering and Quality Management

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Join 2\textsuperscript{nd} Quality Revolution

Quality Management Working Group

- Engineering Leadership Training
- Systems Thinking / Tools Workshops
- Case Studies / Research Projects
- Networking and Collaboration
Join 2nd Quality Revolution

QUALITY MANAGEMENT INSTITUTE®
A Virtual University for Training in Management and Leadership

QUALITY MANAGEMENT WORKING GROUP
Dr. Barclay Brown and Dr. Larry Kennedy invite you to join in the development of the INCOSE Quality Management Working Group.

We are in the process of creating a charter and our goal is to have our first official meeting at the INCOSE IW on January 28-31, 2017. Our objectives include creating awareness of the essential nature of Quality Management in today’s workplace and to encourage and ignite a “Second Quality Revolution.”

This will be an active working group with free educational programs and research projects available to all QMWG members. Actions being considered include:

- Specialized QM workshops and curriculum for systems engineers;
- Outreach to all engineering disciplines re: QM and systems thinking;
- Cross-training collaborations with leaders from other professions;
- Research projects to quantify the program-specific influence of QM.

We will emphasize QM as a cornerstone of professional development for systems engineering and that it adds value to the engineering disciplines by:

- Defining systems engineering as a leadership discipline with the skills to manage process quality and increase profitability;
- Considering the organization as a system, fully integrating the process, the person and the job description;
- Managing the human factors related to output reliability, safety and the promises we make to our customers;
- Raising the level of professionalism, corporate and technical influence, job satisfaction and the career path.

(Please email us at: INCOSE@QMNation.com for details about our next steps.)

INCOSE Webinar 91
August 17, 2016
Engineering Leadership: The Call for a Second Quality Revolution
Speaker: Dr. Larry Kennedy
Presentation: 42 mins.
Questions/Answers: 17 mins.

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QualityManagementInstitute.com/INCOSE
Apollo Program
The Challenge for Leadership

➢ Keeping the Promise to Our Customers
  ▪ Quality Products and Services
  ▪ Reliable Customer Service Responses

➢ Hiring and Training Reliable People
Quality Management

➢ An Educational Technology with:
  ▪ Systems
  ▪ Methods
  ▪ Language

➢ To Reach Your Business Goals
QM, in its orthodoxy, provides values-based and facts-driven solutions to a variety of issues affecting the design and production processes.

Engineering managers must now be capable of functioning as effectively in team-building and values-based discussions as they are in task delegation and production management.

"Human factors integration" is no longer limited to solving the problems of people interacting with machines. It has become the "code word" for the vulnerabilities of a workforce with deficits in education, experience and work-ethic.
Join 2\textsuperscript{nd} Quality Revolution

➢ Restore the Skills and Values That Supported the Quality Revolution

W. Edwards Deming
Philip Crosby
Joseph Juran
2QR Complete QM: Engineer, Manager and Leader

- Empowers the traditional goals of improving products and services, and reducing expense and waste.
- Provides the tools to evaluate and solve the people problems that threaten the success of our work and vision.
Quality Marketed
Definition of Quality

➢ Conformance to Requirements: What the Customer Needs, Wants or Expects in a Product or Service

➢ Promises That Are Specifically Stated or Implied in Advertising
Managing Quality Requires

➢ QM Methods
➢ QM Values
➢ Reasonable Discussions
System of Quality

➢ Prevention:
   Prevent Errors
   From Occurring
   and/or Reaching
   the Customer

➢ An Ounce of Prevention is Worth a Pound of Cure

  Benjamin Franklin
QM Prevention Methods

➢ Quality Control: Taking Bad Things Out of Processes
➢ Quality Assurance: Putting Good Things Into Processes
QC - Taking Bad Things Out

Eliminates the **Defects**

- Editing
- Inspecting
- Testing
- Monitoring
- Auditing

**QC:** After Errors Occur
Quality Control (QC)

- Quality Control Has Its Limitations
- Too Expensive to Inspect Every Single Product or Service

Capsule Zipper Repairs Classroom
Statistical Methods

➢ Sampling
➢ Testing for Reliability
Testing for Reliability

➢ Testing Them Until They Fail
➢ Carefully Counting Repetitions
➢ Calculating the Failure Rate
Testing for Reliability

➢ Certified for Intended Purpose
➢ Routed to Reasonable Use
➢ Reliability = Quality Assurance
QM Prevention Methods

➢ Quality Control: Taking Bad Things Out of Processes
➢ Quality Assurance: Putting Good Things Into Processes
QA - Putting Good Things In

Eliminates the Causes

➢ Reliable Human Resources
➢ Policies and Procedures
➢ Equipment and Training
Quality Assurance (QA)

➢ QA – Reliability Engineering
➢ Calculate the Statistical Probability of Failure
➢ From Systems to Units to Components and Materials
Standard of Quality

➢ Zero Defects: Not Satisfied With Any Defects Reaching Our Customers
Zero Defects Attitude

➢ Pride of Workmanship
➢ Not Expecting Perfection
➢ Always Keeping the Promise
Good Experience Gone Bad

➢ Unsatisfied Hunger

➢ Lost Moment of Comfort
A Simple Question

➢ How Many Worms Are Too Many?
A Simple Answer

➢ How Many Worms Are Too Many?

ONE!
Acceptable Quality Level

➢ AQL’s Are Designed to Give Relief From Work Pressure
➢ Avoid the Perceived Threat of a Standard of Perfection
The Problems With AQL’s

➢ How Many Are Too Many?
➢ Humans Make Mistakes
➢ Incremental – Continuous
The Problems With AQL’s

➢ Processes Have Multiple Steps or Actions
The Problems With AQL’s

➢ Four Step Process: 90% AQL
➢ Right: 90 Times Per Hundred
Calculating AQL Defects

A Four Step Process With 90% AQL

➢ Step 1: 100 Actions × 90% = 90 Defect Free Products or Services

➢ Step 2: 90 Defect Free × 90% = 81 Defect Free Products or Services

➢ Step 3: 81 Defect Free × 90% = 73 Defect Free Products or Services

➢ Step 4: 73 Defect Free × 90% = 66 Defect Free Products or Services
How About A 98% AQL?

A Four Step Process With 98% AQL

➢ Step 1: 100 Actions X 98% = 98 Defect Free Products or Services

➢ Step 2: 98 Defect Free X 98% = 96 Defect Free Products or Services

➢ Step 3: 96 Defect Free X 98% = 94 Defect Free Products or Services

➢ Step 4: 94 Defect Free X 98% = 92 Defect Free Products or Services
Measurement of Quality

➢ Price of Non-Conformance: What It Costs When We Do Things Wrong

➢ Dollars and Human Values
The Cost of Quality

➢ **Cost of Doing Things Wrong**
  Warranties, Rework, Repairs, Replacement, Customer Loss

➢ **Cost of Doing Things Right**
  Inspections, Audits, Checking Human Resources, Procedures, Equipment, Training, etc.
The Cost of Quality

➢ $ Wrong - $ Right = COQ

➢ To Eliminate the Costs of Errors and People Problems
The Cost of Quality

➢ $ Wrong - $ Right = COQ

➢ To Eliminate the Costs of Errors and People Problems

➢ QUALITY IS FREE

Philip Crosby
A general rule of thumb is that the costs of poor quality in a thriving company will be about 10 to 15 percent of operations. Effective quality improvement programs can reduce this substantially, thus making a direct contribution to profits.

Philip Crosby said that companies lose as much as 20% of their operating budget through errors, rework, customer service problems, etc. but often “choose to continue to pay for poor quality.”

American Society for Quality

Quality Digest (February 2001)
Everyone Has A Story . . .

. . . about supposedly reliable people and companies who have failed to keep their promise.

➢ Have you tried to update your cell phone or cable service lately; and had to sift through the confusing and often misleading facts?
Lost Time, Money and Opportunities = Lost Profits

Avg. Schedule Overruns
- 70%

Avg. Budget Overruns
- 59%

Features in Final Product
- 31% Out
- 69% In

➢ One in Six IT Projects Have a Budget Overrun of 200%

Harvard Business Review
Lost Time, Money and Opportunities = Lost Profits

All Projects Avg. Success = 29%
Success = On-Schedule, On-Budget and Fully-Featured

The Standish Group Chaos Manifesto
Lost Time, Money and Opportunities = Lost Profits

The Data Indicates Culture and Process are the Root Causes of Lost Profits NOT the Development Method

<table>
<thead>
<tr>
<th>DEVELOPMENT METHOD</th>
<th>PROJECT SIZE</th>
<th>SUCCESS RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agile</td>
<td>All Sizes</td>
<td>39%</td>
</tr>
<tr>
<td>Waterfall</td>
<td>All Sizes</td>
<td>11%</td>
</tr>
<tr>
<td>Agile</td>
<td>Large</td>
<td>18%</td>
</tr>
<tr>
<td>Waterfall</td>
<td>Large</td>
<td>3%</td>
</tr>
<tr>
<td>Agile</td>
<td>Small</td>
<td>58%</td>
</tr>
<tr>
<td>Waterfall</td>
<td>Small</td>
<td>44%</td>
</tr>
</tbody>
</table>

The Standish Group Chaos Manifesto

Lost Time, Money and Opportunities = Lost Profits

"The Data Indicates Culture and Process are the Root Causes of Lost Profits NOT the Development Method"
Lost Time, Money and Opportunities = Lost Profits

Failure to Document - Take Action

Expenses increase because of the effort to find defects and costs of rework.
Everyone Has A Story . . .

. . . about supposedly reliable people and companies who have failed to keep their promise.

WHY?
Most workers hate their jobs or have 'checked out,' Gallup says

70% Disengaged or Actively Disengaged HATE THEIR JOBS
Disengaged employees shift the load to the engaged employees - frustrate high-performers.

Organizations with high employee engagement.

- 21% Higher Productivity
- 22% Higher Profitability
- 25%-65% Lower Turnover; 37% Less Absents
- 28% Lower Shrinkage; 48% Less Accidents

Inc.com – The Cost of Unhappy Employees
Four-Year College Graduates

50% Lack Math Skills and Proficient Literacy

Two-Year College Graduates

75% Can’t Summarize A Newspaper Article

American Institutes for Research
An approach to problem solving, that considers and evaluates "facts and events" as parts of an overall system.

- Avoids the failures created by reacting to specific parts, outcomes or events in isolation.
- Considers specific strategies and tactics to overcome known limitations.
2QR® is the Scientific Method

Empowered by
Due Diligence

Facts-Driven Tool of Systems Thinking
2QR® is the Scientific Method

An Application of Systems Thinking That Discovers Best Practices
2QR® is the Standard for Deploying Standards

Regulatory Compliance - Corporate Governance Planning - Budgeting - Development
2QR® Complete QM is People, Processes and Tools

**Work Culture**
Team of Engaged, Well-Trained High-Performers

**Policy / Procedure**
Artfully Designed and Deployed Work Standards

**Technology**
Fully-Utilized Tools and Efficiencies
2QR® Complete QM Culture

People • Tools • Processes
Integrated Values and Skills Development

Skills that are Supported by Values

Reliable Culture

People
- Unified Focused Productive
- Organizational Values
- Personal Values
- Professional Values
- Keeping the Promise Work Culture
- Personal Authenticity Ethical Dependability
- Zero Defects Attitude
- Engaged Individuals

Processes
- On-Time On-Budget Predictable
- Administrative Skills
- Project Management Skills
- QM Leadership Skills
- People, Time, Information and Budget
- Work Process Analysis Rigor - Due Diligence Agile and Lean
- QM Fundamentals Scientific Method Systems Thinking

Connected Products
- Subject Matter Expertise
- ZDA Customer-Focused

Competent Culture
Values that are Expressed through Skills
## 2QR® Complete QM Culture

The Definitions and Measures of the 8 Attributes/Values of a Quality Manager

<table>
<thead>
<tr>
<th>Attribute/Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vocational Certainty</td>
<td>A measure of our faithfulness to our career agenda. QM’s are disciplined about developing their skills and talents and acquiring earned confidence.</td>
</tr>
<tr>
<td>2. Zero Defects Attitude</td>
<td>A measure of our commitment to keep our promises and to initiate systems with the reliability goal of preventing even one defect from reaching our customers.</td>
</tr>
<tr>
<td>3. Process Quality</td>
<td>A measure of our mastery of planning and budgeting disciplines and how effectively we apply them to create viable work processes.</td>
</tr>
<tr>
<td>4. Admin. Consistency</td>
<td>A measure of our attention to details. QM’s carefully listen to their customer's to identify and conform to their requirements and assure customer satisfaction.</td>
</tr>
<tr>
<td>5. Executive Credibility</td>
<td>A measure of our sincerity and skill with people. Sincerity comes naturally from the heart but skills can be sharpened and improved to gain reliable influence.</td>
</tr>
<tr>
<td>6. Personal Authenticity</td>
<td>A measure of our resolve to be consistent with our customers and co-workers. Authentic leaders work diligently to make exceptional service feel normal.</td>
</tr>
<tr>
<td>7. Ethical Dependability</td>
<td>A measure of our trustworthiness in practical matters. QM’s are the people we turn to when we want things to work right, run on time and be there when needed.</td>
</tr>
<tr>
<td>8. Create a KTP culture</td>
<td>A measure of the mutual respect, accountability and professionalism in a work culture. These are the practiced values of effective leaders.</td>
</tr>
<tr>
<td>Project Complexity</td>
<td>Low</td>
</tr>
<tr>
<td>--------------------</td>
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</tr>
<tr>
<td>QM Fundamentals</td>
<td>Built-in quality and managing defect rates</td>
</tr>
<tr>
<td>Scientific Method</td>
<td>Discover and apply best practices</td>
</tr>
<tr>
<td>Systems Thinking</td>
<td>Systematically/systemically plan and test</td>
</tr>
<tr>
<td>Work Process Analysis</td>
<td>Systems thinking applied to agile and lean</td>
</tr>
<tr>
<td>Rigor and Due Diligence</td>
<td>Manage risk and gain opportunities</td>
</tr>
<tr>
<td>Process Documentation</td>
<td>Defect root cause search and repair</td>
</tr>
<tr>
<td>Time/Resource Mgmt.</td>
<td>Conform to schedules and budgets</td>
</tr>
<tr>
<td>People/Process Mgmt.</td>
<td>Employee engagement/resolving conflicts</td>
</tr>
<tr>
<td>Challenges to Effectiveness and Efficiency</td>
<td>Low</td>
</tr>
</tbody>
</table>
2QR® Complete QM Culture
Values, Skills and Organizational Impact

Organizational Maturity

- Engaged High-Performers
- Agile and Lean Projects
- On-Schedule and Budget
- Less Defects and Rework
- Lean Human Resources
- Effective Communications
- Self-Correcting Culture
- Delighted Customers
- Stable Workplace

Profitability and ROI
2QR® People are Engaged

➢ **Learn the Facts**
  and Take Action to Create Reliable Solutions

➢ **Within** the Scope of their Responsibility

➢ **Within** Available Resources
2QR® People are Productive

➢ Fully Utilize the Right Processes and Tools
➢ Create Reliable and Predictable Projects
➢ Produce Outcomes On-Time, On-Budget and Free from Chaos
A 2QR® Complete QM Culture is

➢ An Engaged Team Performing with Excellence
➢ It's Agile, Lean, Predictable and Profitable
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INCOSE Qualification Institute
INCOSE@QMNation.com for details about our next steps.