Quality Philosophies & Foundations

Below are the **Learning Objectives for The Quality Philosophies & Foundations** from the ASQ CQE Body of Knowledge**:**

- Explain how modern quality has evolved from quality control through statistical process control (SPC), to total quality management (TQM) and leadership principles (Deming's 14 points).
- Explain how quality concept has helped form various continuous improvement tools including lean, six sigma and the theory of constraints (TOC).

Quality History & Evolution

Quality Inspection Era

Quality did not begin in the 20th century. Quality existed for many hundreds of years and was championed by the specialized & experienced **Craftsman** who built the product. Quality was further maintained by the **Guilds** to which those craftsmen belonged.

Quality made its first pivot away from the craftsmen with the introduction of **Interchangeable parts**, which was first introduced in the early 1800's as part of the **Industrial Revolution**. With the introduction of jigs & fixtures to support the mass production of interchangeable parts, inspection & gauging was introduced to ensure quality.

Quality made another small pivot in the early 1900's when *Frederick Taylor* introduced the theory of **Scientific Management** which specified that Gauging was a defined responsible for one of the eight foreman required for effective shop management.

The definition of Quality in this Era could be defined as: *Quality through Inspection.*

Quality Control (Statistical Control) Era (1924 - 1949)

A major Quality breakthrough occurred in 1924 when **Walter Shewhart** & others (**Deming**) at Bell Laboratories introduced the concept of the Control Chart, launching Quality into the Statistical Control Era. Also during this time period, the statistical concepts behind the modern day Sampling Plan were introduced by the likes of Dodge & Romig where they pioneered the concept that only a portion of an entire lot would need to be checked in order estimate the overall level of quality (AQL) in the entire lot.

Wartime demands during World War II turned these new, best practices of Control Charts & Acceptance Samplings into widespread & mandatory requirements as part of the war effort. Is it during this time period that the U.S. War Department (Now the Department of Defense) published their Quality Standards for Acceptance Sampling. These Quality Standards later became the basis for modern day Acceptance Sampling Guidelines.

The definition of Quality in this Era could be defined as: *Quality through Process Control*

Quality Assurance Era (1950 - 1980)

This Quality Era is characterized by the introduction of new prevention techniques (Poke-yoke) and new concepts like Total Quality Management (**Feigenbaum**) & the Cost of Quality (**Cosby, Juran & Taguchi**). This era also saw an expansion of the understanding and utilization of Statistics in Quality in what would become known as Statistical Process Control.

Through the teachings of Quality Guru's like Deming, Crosby, Feigenbaum, Ishikawa & Juran, this era saw an increased emphasis of **Top Managements responsibility for Quality**.

This era can also be characterized by the growth and emphasis of Quality in Japan with contribution by Quality Guru's like **Deming, Juran, Taguchi and Ishikawa**

The definition of Quality in this Era could be defined as: *Quality through Management*

Strategic Quality Management Era (1980 - 2000's)

This Era in Quality has seen experienced an expansion on the concepts developed in previous Era's (SPC, Quality Cost, Top Management Responsibility) and has also seen many new the Quality Techniques and concepts that have formed the basis of today's Continuous Improvement tools.

These new practices include **Six Sigma methodologies, Lean Thinking & Theory of Constraints, Kaizen, the Kaizen Blitz, 5S & Value Stream Mapping.** These topics are discussed in detail in the Continuous Improvement portion of this primer.

The definition of Quality in this Era could be defined as: *Quality through Continuous Improvement*

Quality Philosophies

Below is a list of the major Quality Guru's in the last century and their philosophies and contributions to Quality.

W. Edwards Deming

- PDSA (Plan – Do – Study – Act)
- Focused on System Improvement
- **14 Obligations of Top Management**

Deming's 14 Obligations of Top Management

1.	Create Consistency of Purpose
2.	Adopt a New Philosophy
3.	Cease Dependence on Inspection
4.	Stop Awarding Business based on $$ Alone.
5.	Continuous Improvement of Production Processes
6.	Modernize On The Job Training
7.	Institute Leadership
8.	Drive out Fear
9.	Break Down Department Barriers (Silos)
10.	Eliminate Slogans that do not provide a Method
11.	Eliminate Quotas & Work Standards
12.	Remove Barriers that rob Pride from the Individual
13.	Institute Programs for Education & Training
14.	Structure Management to focus on 1 - 13

Walter A. Shewhart

- Control Charts – Differentiate Assignable v. Chance Cause
- PDCA (Plan – Do – Check – Act)
- Statistical Process Control & Statistical Improvement

Genichi Taguchi

- Loss Function Concepts – Quality Cost
- Signal to Noise Ratio & Design Robustness
- Experimental Design (DOE)

Kaoru Ishikawa

- Fishbone/Cause & Effect Diagram (Ishikawa Diagram)
- Promoted Company Wide Quality Control (CWQC) & Quality Circles
- Stressed Next Operation as a Customer
- Employee Empowerment –Training of Workers

Philip B. Crosby

- Quality is Conformance to Requirements
- Stressed Senior Management Involvement & Continuous Improvement
- Contributed to the Cost of Quality Concept (Quality is Free)
- 4 Absolutes of Quality Management

Joseph M. Juran

- Stressed Senior Management Involvement & Continuous Improvement
- Quality as Fitness for Use
- Contributed to Cost of Quality
- Introduced the Pareto Principle (80/20 Rule)
- Juran's Quality Trilogy
    - Quality Planning - A continuous method whereby Top Management is strategically planning for improved Quality.
    - Quality Control - A on-going monitoring process to detect & correct any Quality issues.
    - Quality Improvement - A drive for breakthrough results to resolve chronic issues.

The Quality Management System (QMS)

The Quality Management System is a disciplined and structured approach to the management of Quality, and is generally modeled here by the ISO 9000 standard.

Below are the **Learning Objectives for The QMS Section** as defined by the ASQ CQE Body of Knowledge**:**

1. Identify and define top management's responsibility for the quality management system (QMS), including establishing **policies** and **objectives**, setting **organization-wide goals**, and supporting **quality initiatives**.

2. Define, describe, and use various deployment tools in support of the QMS: **benchmarking, stakeholder identification** and analysis, and **performance measurement tools** & **project management tools** such as **SWOT analysis, PERT chart, Gantt charts, critical path method (CPM),** and **resource allocation**.

3. Identify and define the basic elements of a quality information system (QIS), including who will contribute data, the kind of data to be managed, who will have access to the data, the level of flexibility for future information needs, and data analysis.

The first learning objective focuses on the full development cycle of a Quality Management System by top management with the creation of policies & objectives and the tools required to support those initial activities (Benchmarking, Stakeholder Analysis, SWOT).

Second is the implementation and on-going support and improvement of the QMS by top management and the organization. The Tools associated with these activities include the project management tools (PERT, Gantt, CPM) to implement a QMS and the performance measurement tools to measure and monitor the final product.

Third is the Quality Information System to support the QMS. Throughout the entire QMS cycle which includes the planning, development, implementation, execution, maintenance & improvement of the QMS, you will need all kinds of data. The Quality Information System is the backbone and source for the data that will support the entire QMS cycle.

Below is a description of each QMS Cycle along with the deployment tools that should be utilized in each of those phases.

Top Management Responsibility

Top Management is fully responsible for the **planning, development, implementation, execution, monitoring & improvement** phases of the Quality Management System. Below we will discuss each of those phases in detail along with the tools associated with each.

Strategic Planning of the QMS - Process & Tools

The strategic planning portion of the QMS refers to the up-front analysis that management must perform to develop their vision for the organization along with Quality Management System required to implement that vision. This analysis includes the usage of 3 primary tools including **Stakeholder Analysis, SWOT Analysis and Benchmarking**.

Stakeholder Identification is normally one of the 1st tool that should be utilized in the Strategic Planning phase. Before you can develop an adequate QMS or Quality Plan, you must ensure that you've fully identified all the key stakeholders in your organization. This would include the customers, employees, distributors, suppliers, shareholders/owners & society at large.

These Stakeholders should also represent the critical functional areas within your organization: Sales/Marketing, R&D, Operations, Engineering, Quality, Finance, HR, etc. To ensure that your strategic plan will be effective in driving business results, the Key Stakeholders must be identified and included in the strategic planning phase.

SWOT Analysis is normally the second tool that is utilized in the Strategic Planning phase. SWOT stands for Strengths, Weaknesses, Opportunities & Threats and your strategic plan for Quality should address all of these things.

You must leverage the core strengths of your business to drive growth while improving on your weaknesses to ensure that you're fully taking advantage of your opportunities and addressing any potential threats to the business. This SWOT analysis should lay the foundation for you're the development of your QMS.

Benchmarking is the 3rd and final major tool that can be used during the Strategic Planning process. Benchmarking is the process where an organization compares their processes & performance against themselves or their competition in order to uncover and implement best practices. In this way, organizations can create organizations goals that are aligned with best in class performance.

Benchmarking can also reveal potential improvements or new methods to improve their effectiveness. Benchmarking can be performed against both internal or external processes.

Your Strategic Planning should not be limited to just product quality. It should address & consider all areas of the business including finance, sales, human resources, supply chain, customer service, IT, etc. When discussing and developing your Strategic Plan, you must always remain customer focused and data driven. This is not a time for opinion or subjectivity.

Once completed, the Strategic plan should represent top managements vision of the future of the organization.

Development of the QMS - Process & Tools

When the strategic planning is complete, Top Management must begin converting the vision into an actionable plan. This starts by developing a **Quality Policy** which summarizes organizations intentions & views with respect to the importance of quality as it relates to the organizations customers, employees and the business objectives. This policy should guide and direct all future decisions and be aligned with the vision.

The Quality Policy should be a principle based statement that defines the "Why" (Success in the Market Place, Happy/Healthy Customers,) and the "What", but not necessarily the detailed "How". In this way, the Quality Policy will align with the company's core competency (what they do best).

The Quality Policy will then be used as the basis for the creation of **quality objectives**. Quality Objectives take the vague Quality Policy and begin morphing it into an actionable target.

One of the primary tools that should be used in the implementation phase is the development of **Performance/Quality Metrics**. An action plan cannot be formed without specific performance targets that are to be achieved.
Performance and Quality Metrics can be strategic or tactical.

These metrics should be created in a way that they directly align with your goals and objectives which then give you an objective measurement of your performance against the target (goal). The Performance Metrics that you create should also be SMART - Specific, Measurable, Achievable, Realistic, Time-based.

Implementation & Delivery of the QMS - Process & Tools

Organizational Goals & Objectives should then be *cascaded or deployed* to the appropriate functional area within the organization, this process is called Hoshin Kanri. The functional areas within the organization should be capable of translating the organizations objectives into functional objectives and action plans to accomplish the larger goals. This is how the vision becomes reality.

Below is an example of how an Organizational Vision becomes a goal, then an actionable plan.

Organizational Vision: Continually grow to become the number one resource for CQE Certification.

Organizational Goal: Achieve 10% market share in CQE Certification Study Material Sales.

Organizational Objective: Launch 1st product by 6.1.2015, and 2nd product by 12.31.15 with a month over month sales growth rate of 10%.

Functional Objective: The development team will spend one hour each day to complete the 1st product by 6.1.2015, then continue this work-load to achieve the 2nd objective of the completion of the 2nd product by 12.31.2015. The Marketing Team publish 1 piece of free content to online readers each week to drive brand awareness and grow trust.

Action Plan: For the 39 separate topics associated with the CQE Exam, a development plan has been developed where two topics from the same BOK Pillar will be completed each week for the next 18 weeks to achieve the 6.1.15 go-live date for the 1st product.

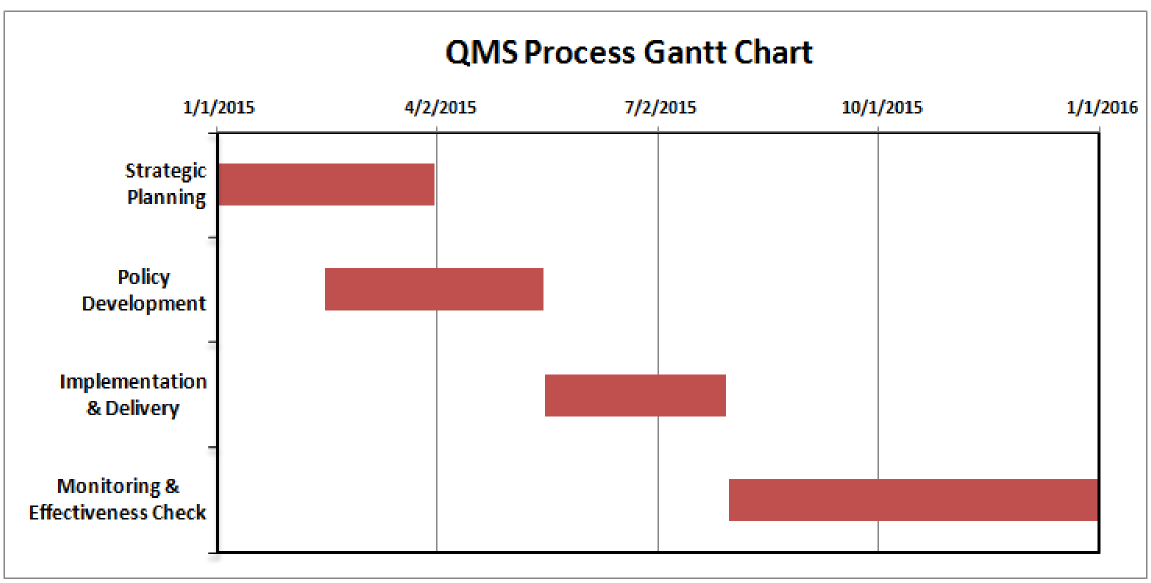
Quality Circles can then be formed from members of the functional teams in order to execute on the action plan. **Steering Committees**, which are primarily made up of top management, should be created in order to track, monitor & steer the progress of the Quality Circles.

That action plan that specifies the who, how and when of the plan to achieve the objective. The creation of the action plan, and it's execution is associated with the implementation and delivery of the QMS. It is important that during the implementation phase of the QMS cycle that the proper **resources are allocated & empowered** to execute the action plan.

Often times, large scale projects must be initiated in order to make the plan a reality. This is where you will need the following **Project Management Tools**:

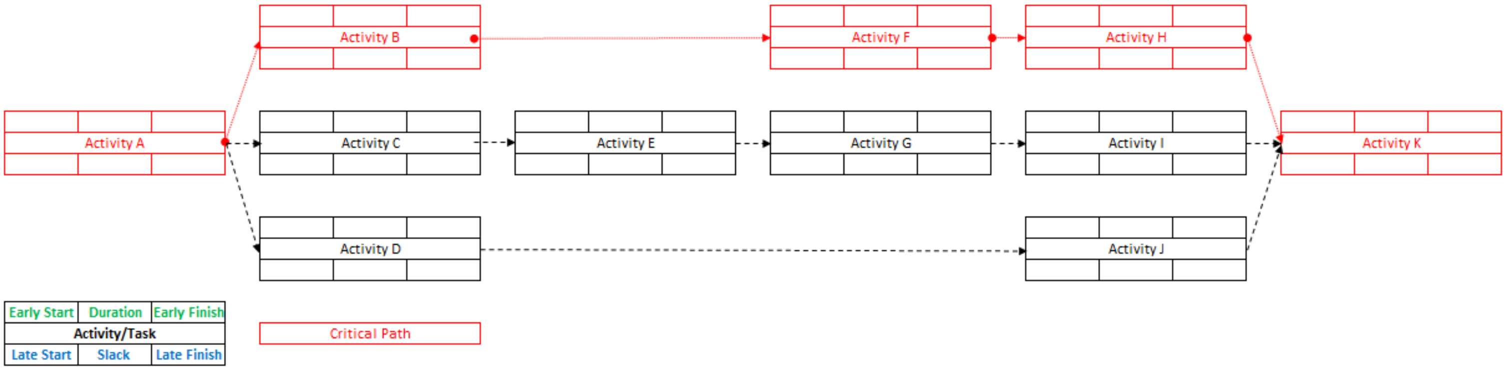
- **Gantt Chart**
- **PERT Chart**
- **CPM Chart**

The **Gantt Chart** is a horizontal bar chart that shows the steps required to complete a project, along with the time required to complete each step in the project.



The **PERT Chart** and **CPM Chart** are both variations of an **Activity Network Diagram** that are discussed further in the Continuous Improvement section for Quality Management & Planning Tools.

These tools represent a diagram that networks the activities associated with a project to assist the user in planning, analyzing, monitoring, reviewing & communicating a project plan. The critical path can be seen in red and each activity is populated with its earliest & latest start date, earliest and latest finish date, the estimated duration associated with the activity and any slack time associated with the activity.



The primary difference between PERT and CPM is that PERT is event oriented, while CPM is activity oriented. So the milestones on a PERT chart is the completion of an event while the CPM chart focuses on activities that take time.

Monitoring for Effectiveness of the QMS - Process & Tools

Performance according to the plan must be monitored. In this process, you will utilize the **Performance metrics** that you've develop to show progress towards your goal.

Quality Audits should also be routinely performed to assess if the QMS process and implementation has been effective in achieving its goal. Below are 8 questions you can ask yourself in order to assess the effectiveness of your Quality Management System.

1. Did the strategic planning team include Representatives from all key stakeholders identified?
2. Did the Quality Plan address all observations made in the SWOT Analysis?
3. Are the Goals & Objectives SMART (Specific, Measurable, Achievable, Realistic & Time Based)?
4. Were the Goals & Objectives effectively cascaded through the organization to the right owners?
5. Were resources allocated appropriately to the strategic goals & objectives?
6. Is the organization structured appropriately to execute the plan?
7. Is a data collection/analysis process in place to monitor progress against the plan?
8. Has the Quality Plan resulted in an increase in business results?

The results of this audit, and other effectiveness checks should be communicated back to the Quality Steering Committee. Top management should then use this information in the next phase of the QMS cycle which is the continuous improvement phase.

Continuous Improvement of the QMS - Process & Tools

If any observations are made during the monitoring/effectiveness phase of the QMS cycle, continuous improvement efforts can be applied in order to enhance the system. Your CAPA system is a primary tool that should be utilized for this effort.

Quality Information Systems

The Quality Information System is the collection of systems that an organization uses to generate, collect, store, analyze & report information(data) that is then utilized in the QMS decision making process. This data is required to support all phases in the QMS cycle.

For example the benchmarking process of the strategic planning phase may require that you collect your production yield data to compare against a competitor, or perhaps data is collected and analyzed during the monitoring phase of the QMS cycle to compare your current progress against your stated objective for a SMART Metric.

One of the most common forms of the Quality Information System is the ERP system. Many organizations utilize ERP systems to manage customer orders, production scheduling, raw material allocation, scrap tracking, distribution of finished product, etc. This is a key source of information as it relates to the QIS.

The Quality Information System is key because it is the backbone that supports the QMS process. The QMS process would be ineffective if the data that is utilized during the decision making process is faulty. This is why it's so important for a Quality Engineer to understand

ASQ Code of Ethics for Professional Conduct

Below is the Learning Objectives for the ASQ Code of Ethics as defined by the ASQ CQE Body of Knowledge:

4. Determine appropriate behavior in situations requiring ethical decisions. (Evaluate)

As a certified quality professional ASQ requires that you maintain the highest level of professional conduct. Quality is Integrity, not just in the products we make, but in the way we make them and the relationships we maintain.

ASQ represents their focus on this Code of Ethics in their Vision, below:

> "By making quality a global priority, an organizational imperative, and a ***personal ethic***, ASQ becomes the community for everyone who seeks quality concepts, technology, or tools to improve themselves and their world."

Global priority. Organizational imperative. ***Personal ethic***.

ASQ's Code of Conduct breaks down into the **Fundamental Principles & 3 Key Relationships**:

1. The relationship we have with our peers
2. The relationship we have with the public
3. Lastly the relationship we have with our customers, clients & employers.

Within those 3 relationships are 7 key articles that every CQE must be compliant with.

Relationship to the Public

- **Article 1** –Hold paramount the safety, health and welfare in the performance of the public in the performance of their professional duties.

Relationship with Employers, Customers & Clients

- **Article 2** – Perform services only in their areas of competence.
- **Article 3** – Continue their professional development throughout their careers and provide opportunities for the professional and ethical development of others. *This Article is my personal favorite as it calls for personal continuous improvement which is the goal of this website!*
- **Article 4** – Act in a professional manner in dealings with ASQ staff and each employer, customer or client.
- **Article 5** – Act as faithful agents or trustees and avoid conflict of interest and the appearance of conflicts of interest.

Relationship with Peers

- **Article 6** – Build their professional reputation on the merit of their services and not compete unfairly with others.
- **Article 7** – Assure that credit for the work of others is given to those to whom it is due.

Fundamental Principles

ASQ requires its members and certification holders to conduct themselves ethically by:

1. Being honest and impartial in serving the public, their employers, customers, and clients.
2. Striving to increase the competence and prestige of the quality profession, and
3. Using their knowledge and skill for the enhancement of human welfare.

Members and certification holders are required to observe the tenets set forth below:

Reference

The information above is taken directly from the ASQ Code of Ethics.

Leadership Principles and Techniques

Below is the **Learning Objective for The Leadership Principles & Techniques** from the ASQ CQE Body of Knowledge**:**

- Describe and apply the various principles and techniques for developing and organizing **teams** and **leading** quality initiatives. (Analyze)

Within this learning objective there are two key terms, **Teams** & **Leadership**, which this section will cover in detail.

Leadership

Leading Quality Initiatives

As you learned in the Quality Management System section, Strategic Planning is required to establish the organizations vision. Then action plans must be cascaded through the organization to the functional areas on order to execute the plan. Leaders are needed all throughout all levels this process.

Top Leaders are required to develop the organizations vision & strategic plan (the Why). Leaders in the middle of the organization must then take that strategic plan and convert it into the objectives & action plans (the How, When, Where, & Who) needed to make that vision a reality.

At the functional level, Quality Engineers are needed to take that action plan, which is also known as a Quality Initiative and drive it to completion. This requires leadership skills from the Quality Engineer.

In this method, leaders throughout the organization are aligned around one vision, and are executing plans in order to make that vision a reality.

Leadership the Right Way

So leaders drive change. Check. Change brings Results. Check. Results are good. But anyone can get results. However it takes an effective leader to get the best results *the right way*. As a leader you must be the role model for Quality.

To be a role model for quality, you must lead, and good leadership requires intentionality. You have to be intentional in the way you lead. You have to be intentional with the way you motivate. You have to be intentional with the way you train, communicate, encourage, support and empower your team.

As a leader you must be capable of resolving conflict and holding team member accountable for performance & proper behavior.

As a leader you must be intentional about the *culture* that you're building. You must build a healthy culture of trust, respect & communication. A healthy culture is like air, when its present you don't notice, when it's gone, it's all you can think about.

Leadership and Motivation

Motivation of team members is a top priority for a leader. Unfortunately Motivation is not a "One Size Fits All" thing.

What works for one employee may not work for someone else. Every person is motivated by something different.

Sometimes, team members are motivated when they feel respected & that their opinion is considered. Motivation can also occur when team members are challenged with a difficult or stretch assignment.

In general, humans are motivated by our needs & emotions. Our motivations drive us to action towards a goal or to fulfill a need.

There are 4 motivational theories that you can utilize when determining the best method to motivate your team, these include the **Hawthorne Experiments**, McGregor's **Theory X & Y**, **Maslow's Hierarchy of Needs** & Herzberg's **Motivation-Hygiene Theory**.

The Hawthorne Experiments

The **Hawthorne Experiments** studied the effects of changing working conditions on productivity and quality. These experiments uncovered some interesting truths about motivation and human behavior.

These experiments concluded that improved team performance is more correlated with social issues, like how much do the employees enjoy their co-workers and the employees sense of belonging on the team, then extrinsic motivators. The experiment found that extrinsic motivators(money, bonuses) are generally less correlated with employee productivity.

Happy employees are more productive than unhappy ones.

McGregor's Theory X & Y

Douglas McGregor, Professor at MIT, has observed that people generally hold one of two views of human nature; **Theory X** or **Theory Y**.

The first view, which is called **Theory X**, takes a negative view of human behavior. These people believe that employees are generally lazy and avoid responsibility. Theory X says that motivation should come through the threat of punishment or coercion.

Theory X also says that the only positive motivator is money, an extrinsic reward . Theory X says that workers have no interested in Quality and that Quality can only be achieved through inspection and threats against poor performance.

The second view, called **Theory Y**, takes the positive view of human behavior. Theory Y says that employees are generally motivated to work and seek out challenge and responsibility. Theory Y says that employees do not generally dislike work and are self-motivated. Theory Y says that employees are motivated by the intrinsic rewards like the feeling of accomplishment on a job well done.

Maslow's Hierarchy of Motivation

Psychologist Abraham Maslow's developed his hierarchy of needs which he believed drove human motivation. Maslow's five needs include **Physiological, Safety, Belongingness, Esteem & Self-Actualization**.

Maslow theorized that these needs existed in a hierarchy and that humans cannot pursue higher levels of needs (Esteem & Self-Actualization) if we have not fulfilled the lower level needs (Physiological, Safety, Belongingness).

Herzberg's Motivation-Hygiene Theory

Frederick Herzberg developed the Motivation-Hygiene Theory by conducting research & interview of working class people. His resulting theory focuses on two factors that he's named **Motivation** and **Hygiene**. These two factors both influence an employee's satisfaction level and productivity.

Hygiene Factors are those things that affect job dissatisfaction - things like working conditions, compensation, company policies, relationships with co-workers, etc. These things make up the environment that the employee works, and are able to product job dissatisfaction if they are poorly managed.

Correcting Hygiene Factors is like taking penicillin, it can only move you from a state of sickness to normalcy. Penicillin can never take you from feeling normal to a state of happiness or contentment.

Motivation Factors are those things that affect job satisfaction - examples of motivation factors include *opportunities for recognition, personal growth, development & responsibility*. These factors are similar to the Self-Actualization Need that Maslow discusses.

Motivation factors represent things a manager can use to take a neutral employee to a feeling of job satisfaction and higher productivity. Motivation factors produce intrinsic rewards that make an employee feel that their job has meaning.

These types of intrinsic rewards have been shown to be more motivating than extrinsic rewards (money, bonuses, etc).

Leadership & Performance Management

Performance Management is a concept and collection of tools that a leader can use to improve team performance.

Performance Management is characterized by two key characteristics - the leader providing **positive feedback** to reinforce good behavior on the team, and the leader providing **negative, constructive feedback** in an effort to eliminate or improve on a negative behavior.

Performance Management shows a leader how to set challenging goals & objectives for their team/employees.

Then the Performance Management tools also support the leader in measuring the team/employees performance against those goals & objectives.

Teams

Today's world is more complex then every before & companies must pursue BHAGs (Big Hairy Audacious Goals - thanks Jim Collins) in order to win in the marketplace.

To make these big goals a reality, teams of people are required. No individual contributor by themselves is able to achieve breakthrough success.

Teams are capable of tackling larger and more complex issues. Teams are capable of bringing more expertise, diversity and perspective to a discussion than any individual contributor might.

This makes teams much more efficient in accomplishing large goals.

Types of Teams

There are many types of teams. Below are the two most common teams that are utilized to implement a quality initiative.

Process Improvement Team (Six Sigma, Continuous Improvement, Waste Elimination, Quality Teams) -This type of team is generally a cross Functional teams which is focused on variation reduction (six sigma), waste elimination (lean) or other types of quality improvements utilizing the continuous improvement tools.

Natural Work Groups - This type of team consists of team members who work in a particular process area or job function and share a common goal.

The group supervisor is generally the leader of the natural work groups and their goal is to generally achieve whatever performance targets are set before them and to continuously improve the process that they execute.

Team Development (5 Stages)

Teams don't form up and automatically start producing results. Teams must develop and mature to achieve a high level of productivity. Below are the 5 stages of team development. While teams generally move linearly through these stages, there are circumstances or changes that can move a team backwards or forwards rapidly into different stages.

1. **Forming** - This is the earliest stage of team development where team members experience a mix of excitement and anxiety. In this stage a team is responsible for forming their mission statement, & goals/objectives. Teams will also spend time determining the roles and responsibilities for each member and setting boundaries for acceptable behavior.

2. **Storming** - Oftentimes, early in a team setting, team members may begin to feel overwhelmed by the teams new goals and may cling to their own opinions and try to steer the project in a selfish direction. This is characteristics of the second phase of team development, called storming.

   This phase often results in conflict and resistance to group tasks. This stage is often characterized by a lack of team cohesiveness and members may find that competition trumps collaboration. In order to overcome this unproductive phase, team members much break themselves of their selfish agendas and learn to trust their team members.

3. **Norming** - In this phase of development, team members begin to develop the norms of the group and focus on the team objective rather than their selfish objectives. Members become more open and willing to discuss and consider other members point of view.

   Group cohesion begins to emerge and the team develops norms for things like conflict resolution, decision making, assignment execution, etc. Constructive criticism & positive feedback begins to occur as teams begin accepting the team and its purpose and moving towards the goal. Productivity increases in this stage.

4. **Performing** - This is the most mature phase of team development that is characterized by high performance. In this stage, team members know each other well and are able to leverage each other's strengths and compensate for their weaknesses.

   Team members are also fully aligned with the teams goals and objectives in this stage. In this stage, teams have clearly defined relationships, structures and team purpose.

5. **Adjourning** - This is the development stage where the team disbands, normally after the accomplishment of their goal. In this stage, team member should document best practices and lessons learned. Any successes should be celebrated and failures corrected.

Team Management & Structure

To properly plan and execute a team-based initiative, you should follow **a process approach to team management**.

This process approach begins with the formation of a steering committee (upper management) & a project champion (upper manager).

The champion and steering committee are responsible for developing and communicating the vision and empowers teams throughout the organization to execute the action plan.

Then, a cross-functional teams is created. This team is made up of *members from the different stakeholders* within the organization. This *team should be given adequate support and resources to accomplish their task*.

Resources include time, talent, training, equipment, people, information, money, etc. Teams should also be given the authority to make key decisions that will impact the results of the project.

Once teams are given an objective and the resources to achieve that goal, then *the team should be held accountable for the result*. The team should meet regularly to discuss issues, follow up on action items and ensure progress towards their goal.

The steering committee should also follow up with the functional team to provide an update on progress and to ensure that the teams work remains aligned with the vision.

Team member should be active participants in the team & it's activities. Members should also participate in any group discussions to share perspective. *This perspective sharing will ensure that the final solution encompasses the needs of all key stakeholders.*

Team members should be held accountable to completing assignments between meetings. This will ensure that the team is effective in achieving their quality initiative or completing their project.

Leadership Conclusion

This section was dedicated to the various principles and techniques for developing and organizing teams and leading quality initiatives.

As you've learned **Leadership & Teams are both required to implement a quality initiative**, and quality initiatives move a company forward. Leaders are needed to develop the "why" (Vision) and the "How, when, where, who & when" (Goals, Objectives and Action Plan). *Then teams execute against the action plan to make the vision a reality*.

Leaders at all levels of the organization must continuously motivate their teams and manage performance. Also as a Quality Engineer you must be aware of the different types of team, each of which exist for different purposes. You must also be aware of how these teams develop through the five stages into productive groups that are capable of implementing a quality initiative.

Facilitation Principles and Techniques

Below is the **Learning Objectives for The Facilitation Principles & Techniques** from the ASQ CQE Body of Knowledge**:**

- Define & Describe the **Facilitators** *role and responsibilities* on a team. Define and apply **various tools** used with teams, including *brainstorming, nominal group technique, conflict resolution & force field analysis* (Analyze)

The Facilitator

Purpose & Focus

A Facilitators goal is to guide an team towards success. However, ultimately the facilitator is not responsible for the success of the team, the team is.

A Facilitator's focus should not be the end product. Their focus should be on the processes that the team utilizes to create the end product. These include the teams processes for idea creation, decision making, conflict management, skills training, communication, resource allocation, team meeting management, etc.

In a perfect world, there would be no need for facilitators. Projects and teams would work smoothly and efficiently together. However this is never the case. Teams always have gaps that can decrease the likelihood for success of the project. This is where a facilitator adds value. They work to fill those gaps in the team, to increase the likelihood for success.

Relationship between Facilitator & Leaders

Facilitation and leadership share many commonalities and require a lot of the same skills like communication, interpersonal skills, project management, etc. Therefore, the Facilitator is the leaders right hand man.

However the leader focuses on the teams product, while the facilitator focuses on the teams process. Unfortunately, in some situations, it is necessary that the leader and facilitator be the same person. In these cases, that person must be capable of fulfilling both roles, and knowing when to switch between them.

A Facilitator in Action

There are a number of skills required of a good Facilitator. This includes the soft skills like the ability to understand people, encourage change, communicate, motivate, moderate, mediate, question & guide. This also includes the technical skills like problem solving, idea creation, decision making, process analysis, statistical tools & process improvement tools.

What a Facilitator Does	What a Facilitator Does ***NOT*** Do
Identifies training needs of team members	Doesn't Ignore team member deficiencies
Provides feedback on effectiveness and decision making	Doesn't solve a groups problems for them
Understand team dynamics & models healthy behavior	Is unaware of the team dynamics
Brings a neutral perspective	Is not biased or judgmental
Clarifies & summarizes discussion points during communication	Doesn't Force team members to accept other members opinions
Keeps the team on track during meetings	Doesn't allow teams to get distracted or off topic
Coaches the leader & members when needed	Doesn't make demands or Instructions
Continuously assesses the decision making and change process	Doesn't focus on the final decision, only the decision making process
Encourages a thorough and data driven decision making process	Doesn't allow subjectivity or hastiness in decision making
Breaks down any cultural barriers	Doesn't allow cultural barriers negatively impact a team
Supports discussions of sensitive or volatile topics	Doesn't take sides or dominate a group discussion
Ensures team meetings have an agenda	Doesn't allow team members to work on non-value added activities
Holds a team accountable to follow their meeting agenda	Doesn't allow team members to get distracted or off-topic
Encourages team members to actively listen & discuss topics	Doesn't stifle team participation
Mediates & supports team members during conflict	Doesn't allow conflict to fester and reduce team performance

Facilitation Tools

In many project settings or during the execution of an action plan associated with a quality initiative, a Facilitator will need to assist the team in analyzing a problem, discussing potential solutions & then deciding on the best solution.

The facilitator must be aware of the tools available to support their team in these different activities.

First, a facilitator should be capable of leading their team through a Brainstorming session. These sessions can be used to generate a large list of potential solutions or ideas to solve a problem.

Additionally, the Facilitator can lead their team through a Force-Field Analysis to uncover any other hidden opportunities or potential solutions to the problem at hand.

Finally, the facilitator can walk the team through the Nominal Group Technique or Multivoting to help them narrow their list of potential ideas down to only the actionable or value added ideas.

The last tool that a facilitator must be aware off is Conflict Resolution. Throughout the above processes, or any other team meeting, the opportunity for conflict exists. A Facilitator must facilitate healthy conflict, and help to resolve unhealthy conflict.

Brainstorming

Many times, a team will need to discuss a topic in an effort to come up with solutions to a problem. In these instances, a facilitator can utilize the brainstorming tool which is designed to generate many ideas in a short period of time.

This tool is only as good as the facilitator who's using it because this tool requires that the facilitator create a positive, non-judgmental atmosphere. When used properly, this tool will allow for team members to be uninhibited and creative in their thinking.

During the brainstorming session, the facilitator should encourage team members to randomly shout out ideas or potential solutions that come to mind. All ideas should be recorded for future discussion.

At this point, none of the ideas are discussed or judged. Any judgment at this stage would stifle the creativity in the room. The facilitator should remember to encourage participation from all members to ensure that multiple perspectives are contributing to the final solution.

For teams that are dominated by one or two group members, a facilitator can use a more structured approach where members are directed to speak in turns, going around the room in order.

If the topic at hand is particularly sensitive, a facilitator can make the process anonymous by asking team members to write down their ideas on paper and then have the ideas summarize by the facilitator or trusted group member.

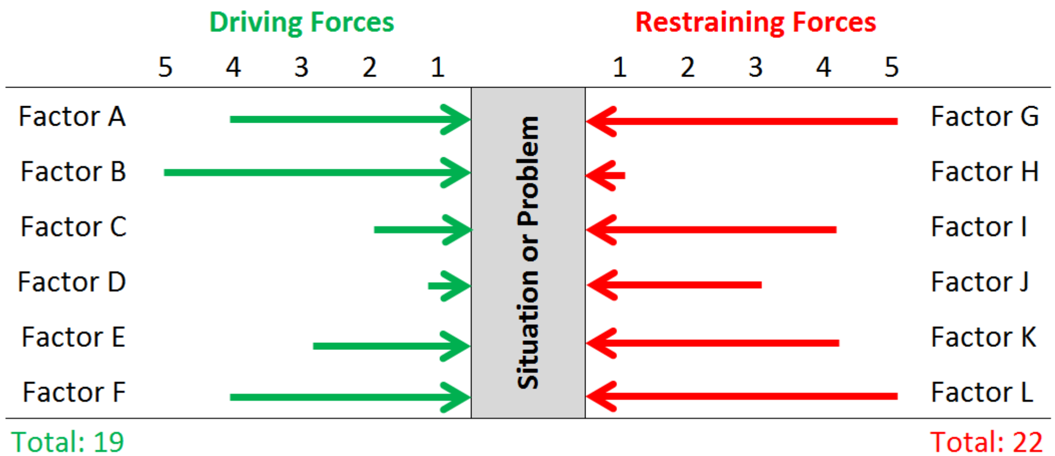
Once the idea generation step is complete and all ideas have been added to the list, the team should review and discuss the potential solutions that were just created.

The Facilitator should encourage team members to seek clarification, discuss and expand on the existing ideas. These ideas can be fed onto a fishbone diagram or affinity diagram for further analysis.

Force Field Analysis

This is another techniques that a facilitator can use in order to identify problems and generate potential solutions.

Oftentimes, in order to accomplish a goal, it is important for the team to understand the current forces that are acting in favor of the goal and against the goal. These two forces, called the Driving Forces and Restraining Forces both work to influence the goal, in opposite directions.



As a result of this analysis, you can develop a plan of action to enhance the driving forces, or introduce a new driving force. Similarly, your action plan can be focused on reducing or eliminating the restraining forces.

Nominal Group Technique (NGT)

Once a group has a list of potential solutions to a problem, it is often then necessary for the facilitator to assist the group in choosing the best solution.

Let's say that you've been able to narrow your list of potential solutions down to the final 6 best ideas. You've also got 5 team members, and you can't reach agreement as to which particular solution should be executed. A facilitator can use the Nominal Group Technique to gain team agreement.

The NGT process involves each member *ranking* each idea from 1 - 6, with #1 being the idea that is most popular. Then a final sum of all ranking is performed to find the idea that has received the lowest score. For example, Idea #2 below got the best overall score amongst the 6 possible ideas.

	Quality	Engineering	R&D	Marketing	Manufacturing	Total
Idea 1	1	4	5	4	1	**15**
Idea 2	2	1	2	1	6	**12**
Idea 3	3	3	4	3	3	**16**
Idea 4	4	6	6	5	4	**25**
Idea 5	5	2	1	6	5	**19**
Idea 6	6	5	3	2	2	**18**

Multivoting

Multivoting is a technique similar to NGT in that it helps groups narrow a large list of potential solutions down to only the critical few.

With NGT, each team member ranks each idea. With Multivoting, each team member gets to cast a limited number of votes on the ideas they like the best.

Multivoting is often an iterative process where there are multiple rounds of voting. Additionally, each member will often get multiple votes. This in essence allows them to pick their top 3 or top 4 most favorable ideas.

See the below example of Multivoting where 20 ideas are paired down to the top 3 using the iterative, Multivoting process. This example is similar to the one above where there are 5 group members.

Each member gets 4 votes in the first round. Then in each subsequent round of voting, the number of votes per person goes down by 1 until each person gets only 1 vote. After each round, the ideas with the fewest, or no votes get eliminated.

	Round 1 4 Votes per person	Round 2 3 Votes per person	Round 3 2 Votes per person	Round 4 1 Votes per person
Idea 1	~~0~~			
Idea 2	3	4	4	1
Idea 3	1	~~0~~		
Idea 4	2	2	~~0~~	
Idea 5	~~0~~			
Idea 6	2	~~0~~		
Idea 7	1	~~0~~		
Idea 8	~~0~~			
Idea 9	4	4	4	3
Idea 10	~~0~~			
Idea 11	2	3	2	1
Idea 12	1	~~0~~		
Idea 13	~~0~~			
Idea 14	1	2	~~0~~	
Idea 15	1	~~0~~		
Idea 16	~~0~~			
Idea 17	~~0~~			
Idea 18	1	~~0~~		
Idea 19	~~0~~			
Idea 20	1	~~0~~		
Total	20	15	10	5

In final, Idea 9 was voted at the winner, with Idea 2 & 11 splitting second place. Depending on the group dynamic, the facilitator may want to votes in silence so as to eliminate social or peer pressures.

Conflict Resolution

As you likely already know, conflict is unavoidable. Conflict will often occur as a team attempts to implement a quality initiative which normally requires much change.

Change can drive conflict. Conflict can also occurs when mutually exclusive views or opinions are being discussed. Below is a handful of work situations or causes where conflict can arise due to the existence of mutually exclusive opinions:

- Organizational Structure causing competing goals & priorities
- Actual or perceptual differences in values, ideals or objectives
- Personality clashes between team member or groups

Conflict is always amplified by emotions like fear, distrust, anger, frustration, or personal bias. This is why a facilitator must focus on making objective, data driven decisions. This will remove as much emotion from the decision as possible.

Most people are familiar with negative conflict and the damage it can do to a team resulting in hostility, hurt feelings, isolation or loss of productivity. However conflict is not always bad and oftentimes is considered a good thing and result in improved team performance or creativity. A facilitators job is to prevent and resolve negative conflict and promote healthy conflict.

Conflict is not a one-size-fits all event. It can come in all shapes and sizes. Therefore, A facilitator should understand the sources of conflict and possess the skills and techniques required to resolve that various situations where conflict may occur. As such, conflict resolution is not a singular tool that can be applied the same way each time, it's a technique.

Techniques to Resolve Conflict

Prevention is the best prescription for conflict resolution. Many conflicts can be avoided by proper facilitation of tough discussions.

A facilitator can avoid conflict by ensuring that the group is operating in a healthy culture which includes participants that are actively listening in an attempt to understand each other before jumping to conclusions or judgment.

A facilitator can also prevent conflict during tough discussions by clarifying or summarizing a team members position so that it is not miss-interpreted by another member.

Facilitators can also prevent conflicts by utilizing the NGT or Multivoting tools for decision making. This will ensure that all decisions are made as a group effort and that decisions are not dominated by a vocal minority of the team.

Once conflict has arisen, a facilitator can intervene and use their negotiating skills to resolving that conflict. A facilitator should use their judgment to determine the level of intervention. This intervention should vary depending on the severity and atmosphere of the conflict as well as the overall group norms for conflict resolution.

Time is also the facilitators ally. If a facilitator feels that a conversation or decision is gets heated, they can defer the conversation or decision to a later time. This will give the team members a chance to cool off and think about the topic in more depth. A facilitator can use this cooling off time to communicate with the conflicting team members individually in order to better understand their position and make the individual feel heard and considered.

Conclusion

As you read through this section, you've probably thought of a co-worker or leader in your organization who's also a good facilitator. You'll also probably agree that this person is effective at assisting teams achieve their goals, which is the primary focus for a facilitator.

Remember, a facilitator is not responsible for, or focused on, the final decision or outcome. A facilitator is focused on the process used to make the decision or create the outcome.

As a quality engineer, you must understand the roles and responsibilities of a facilitator on a team and be ready to fill that role when necessary. Additionally, you must be capable of applying the various tools available to a facilitator; these include *brainstorming, force field analysis & nominal group technique.*

These tools can be utilized to generate ideas during problem solving, analyze the factors contributing to an outcome and make team decisions on tough topics.

Conflict resolution should also be a primary focus for the facilitator. Encouraging healthy conflict to spark creativity and preventing unhealthy conflict that will limit the team for reaching their potential.

Communication Skills

Below is the *Learning Objective* for **The Communication Skills** portion of the ASQ CQE Body of Knowledge**:**

- Define & Distinguish between various **communication methods** for delivering information and messages in a *variety of situations* across all levels of the organization (Analyze).

The Importance of Communication

As a Quality Engineer, there are very few things that can reduce your effectiveness more than poor communication. Why?

Because communication is we human's primary tool to *connect* with each other. This connection is meant to create a common understanding of a topic, idea or emotion.

Communication is the mortar between the bricks of knowledge that ultimately keep your house upright. Without communication, all your skills and talent go to waste.

This makes sense when you consider that communication is the primary skill required for persuasion, collaboration, influence, negotiation, motivation, inspiration & informing.

This is why your communication skills can often be the difference between success and failure.

Further, the importance your communication skills shares an exponential relationship with leadership & complexity. As your level of leadership increased or level of complexity of your project increases the importance of communication increase at an exponential rate.

Communication Methods

When people think of the methods of communication, they normally think of the two primary methods of delivering information: Oral & Written communication.

However effective communication requires two additional and more important skills: **listening** and **non-verbal communication**.

Active Listening

Listening plays a very important part in leadership and effectiveness as Stephen Covey pointed out in *The 7 Habits of Highly Effective People* with the now famous "Seek First Understand, Then To Be Understood" habit.

Now you need to know that there is only one way to listen - actively. *Passive* listening is an oxymoron. **It is impossible to listen passively**.

Active listening or listening actively is an *intentional* & *focused* effort in order to understand the speaker. Active listening requires concentration, discipline and an open-minded.

Active listening has two major benefits. First, it assures that you're hearing, understanding & empathizing with what is being said. Second, it communicates back to the speaker that they are important and that you care about what they have to say, building trust and respect.

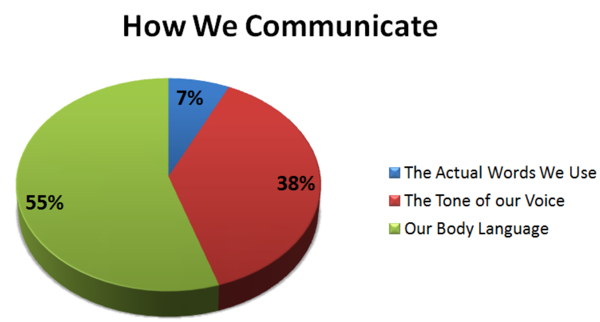
Active listening is not easy. Here are a few techniques you can use to improve your active listening skills. The first skill is the proper usage of body language. This includes making eye contact with the speaker and using your poster to show that you're engaged and interested. More on that topic below.

The next key tool you can use to actively listen is **summarization**. When a speaker has indicated that they are done speaking, you can attempt to summarize their message back to them to verify with the speaker that you understood them correctly. This is an opportunity for the speaker to clarify any points and ensure that you're both on the same page.

Obstacle to Active Listening
There are a handful of negative habits that can *prevent you from listening actively* which can reduce your effectiveness as a leader/facilitator or individual contributor.

These negative habits include interrupting the speaker, being easily distracted, assuming you know what the speaker is going to say next or mentally planning your next statement. All of these habits will disrupt your ability to listen actively which will ultimately reduce your effectiveness as a Quality Engineer.

Non-Verbal Communication
Research has shown that only 7% of our communication is made up of the actual words we use. The other *93% of our communication is made up of non-verbal type communication* which includes your **tone** and **body language**.



Therefore, to be an effective communicator you must be aware of and have control over your tone and body language.

Tone
It's not what you say, it's how you say it. Your tone means everything. Your tone can be used to communicate so many different things.

Your tone can be a reflection of your mood or emotional state, your level of respect for the speaker, your interest in or your attitude about the topic being discussed, or so many other things.

You're tone is so powerful that it will trump the actual words you use. You can say "Thank You" in a tone that says the exact opposite.

Body Language
Similar to tone, your body language speaks volumes!

Your body language is a complex combination of your eye contact, posture, hand gestures & placement, facial expression, head movement, leg position, touch and the use of space.

Basically everything you do with your body sends a message.

This message, similar to tone, is a direct reflection of your mood, energy level, emotional state, level of interest or inner attitude towards a topic or person.

You're body language can communicate many different messages, including:

- Openness versus Defensiveness
- Confidence versus Insecurity
- Engagements versus Boredom
- Energetic versus lethargic
- Enthusiastic versus frustrated

The bottom line here is that to be effective as a quality engineer, you need to be conscious of your body language & tone to encourage effective communication. *Be intentional with the way you use your body language & tone.*

Speaking
Effective speaking is been a long discussed and studied topic. Aristotle developed the concept of Rhetoric which identifies three key dimensions which must be blended together for effective communication:

- **Ethos** - Commonly known as the *credibility* of you, the speaker. This is a reflection of how much you are respected & trusted. Your Ethos includes your perceived level of competence, sociability and composure.
- **Pathos** - Denotes the *emotional* connection that you make as the speaker. Emotions are powerful and can drive others to action. As such, to be an effective speaker you must use emotions to create a connection between your message & your audience.
- **Logos** - Also known as the *logic* of your message. To be an effective speakers you must be capable of using facts, data, evidence and reason in order to pursued and communicate a message.

These 3 dimensions of speaking should be intertwined in order to increase your persuasion power and influence**.**

Using Questions Effectively
Questions are extremely powerful and one of my favorite tools as an Quality Engineer. Thoughtful questions force others to consider a situation from a different perspective and can spark creativity in a discussion.

Questions can also be used as an effective form of persuasion. Oftentimes in a conversation you might see the proper solution before the rest of the team does. So to effectively "sell" your idea to the team, you can ask strategic questions that steer the thought process of the responder in an attempt to get them to come up with the same idea themselves.

This is effective because once a person feels like they came up with the idea, they will own it and be much more willing to implement it. You've now performed the act of Inception.

The Auditor Hat
Another effective usage of questions is what I call the "Auditor Hat" technique. This is where you put on your "Auditor Hat" and challenge a proposed solution or idea by asking the types of questions you would expect in an audit. This will ensure the final solution is well thought out.

Open Ended v. Close Ended Questions
Effective questions can also be used to dig into the root cause of a situation. This is the common technique of asking "Why" multiple times, until you've gotten to the root cause of a problem.

This type of question is known as an open-ended question and require the responder to give context, perspective & details. Open ended questions can be useful in starting a discussion or gathers information about a topic.

You can also ask closed-ended questions which can only be answered by a simple yes or no. This type of question will not allow the responder an opportunity to explain or expound on their response but can help you hone in on a topic or check for understanding.

An effective communicator generally starts with open ended questions in order to gather as much detail about a situation as possible. Then they use close ended questions to narrow the discussion down to the key topics or issues.

Be careful when utilizing questions as you may be distracted by your own thoughts in preparing your next question. Be sure to stop and focus on the responder to ensure you fully understand their response.

Feedback as a Communication Tool

Another communication tool that effective leaders utilize is that of Feedback.

Feedback can be either positive or negative & is meant to encourage positive behavior or to correct negative behavior. This feedback, if done properly, can have a large impact on the performance of the team or an individual.

Thus you should be aware of the techniques to giving feedback effectively and the pitfalls to avoid.

The Feedback Bank

Before you start giving feedback it's important that you understand how the feedback bank works. With every positive piece of feedback you give someone, you're making a deposit into their bank account, and with every negative piece of feedback, you're always making a withdrawal from their feedback bank account.

The point of this perspective is to make sure you're never *overdrawn* on your feedback bank account someone. Or else you face resentment and defensiveness.

So before you start giving someone negative feedback, you must make a few deposits first. You also must understand that every piece of negative feedback is a larger withdrawal than the equivalent deposit of positive feedback.

Therefore you must always be giving more positive feedback than negative. In fact researchers have shown that 3:1 is the appropriate ratio of positive to negative feedback.

Effective Feedback is Specific & Objective

When giving positive feedback, you must attempt to be as specific as possible. Simply saying "Great Job" is not nearly as effective as saying "Great job on that presentation, it was well thought out and laid out nicely" or " you did an excellent job considering your audience for that presentation and addressing their potential objections ahead of time".

When giving negative feedback, the communicator should stay objective and discuss specific examples of the behavior that you're attempting to address.

You should avoid speaking in generalities about the receiver as this implies that the problem is *them* not their behavior, which will undoubtedly make them defensive. This emotion will derail the conversation and likely eliminate the possibility of a positive outcome.

Negative feedback should also be given in a private setting as giving negative feedback in a group setting is almost never productive.

You can prevent defensiveness from the receiver by ensuring that they feel respected and valued. You can achieve this by "sandwiching" negative comments between positive one.

If you find yourself receiving negative feedback, it's important to remember that the sender has a different perspective from your own which can reveal opportunities for improvement in your approach or behavior.

We humans are often unaware of our weaknesses and therefore need the perspective of others to reveal these weaknesses.

Barriers to Communication

Sometimes as a Quality Engineer, you will notice that there seem to be barriers to effective communication.

These include, but are not limited to the barriers created by the structure of an organization, language or cultural barriers, barriers created by a lack of context, & barriers created by differing frames of reference between the senders or receivers.

These barriers often result in miss-communication or under-communication and ultimately reduce the effectiveness of yourself or your team and delay your progress towards your goal.

Communication Plans

If you've ever observed Communication Barriers within your team, then you can develop and execute a Communication Plan, which is an effective method to identify & address these barriers.

This communication plan defines your audience (the who), the message (the what), the media (the how), the frequency (the how often), the person responsible for the communication and how any feedback will be addressed.

Your communication plan, if executed properly, will ensure that all stakeholders, managers and affected employees receive the right communication at the right time from the right person and in the right way. This will ensure that you in avoid the pitfalls of under-communication or miss-communication.

This communication plan will also aide you in setting expectations, clarifying key points and communicating the WHY about a project or situation.

Conclusion

Communication is a primary skill required for persuasion, collaboration, influence, negotiation, motivation, inspiration & informing which is why your *ability to communicate effectively can often be the difference between success and failure.*

We've discussed that the ability to speak and deliver information effectively requires the blending of 3 concepts - **Ethos, Logos & Pathos** which combine your credibility as a speaker, the logic of your argument and your ability to connect with your audience on an emotional level.

While speaking is an important aspect of communication, it's even more important that utilize your non-verbal communication skills like tone and body language in combination with a healthy dosing of *active listen* to make you an effective communicator.

Next, we discussed two important communication tools; questions and feedback. Both of these communication tools can make you more effective as an engineer, leader or team member.

Lastly, we discussed some of the potential barriers that can result in under-communication or miss-communication and an a tool that you can use, the communication plan, in order to break down those barriers and communication more effectively.

Below is the *Learning Objective* for **The Customer Relations** portion of the ASQ CQE Body of Knowledge**:**

- Define, apply & analyze the results of **customer relation measures** such as *quality function deployment (QFD)*, customer satisfaction surveys, etc. (Analyze)

Before we get into any sort of details, I wanted to start by saying - **Customer satisfaction IS WHY your company exists!**

Everything your company does should start and end with the customer in mind, and *your job as a quality engineer is to continually remind the organization that the customer is the only reason for the existence of the organization*.

Henry Ford once said - "*It is not the employer who pays the wages. Employers only handle the money. It is the customer who pays the wages.*"

Below I'm going to walk you through the details of achieving customer satisfaction, this includes:

- Identifying your Customers, both the internal & external ones
- Determining your Customer Expectations & why that matters
- 3 Tools to better Understanding Your Customers Needs
- The Dynamic nature of Customer Needs
- An overview of Quality Function Deployment

Identifying your Customers

Before you can determine what your customers needs and expectations are you first must understand WHO your customers are.

Similar to your suppliers, you'll find that *you have both internal and external customers*.

Nobody needs to be told what an external customer is - these are your end users and even your intermediate users (dealers, distributors, brokers, etc).

The idea of internal customers is a paradigm shift that is meant to break down barriers within your organization. Internal customers can be thought of as other groups or departments within your organization.

For example, The Quality department provides a service to other groups (Engineering, R&D, Operations, etc) and should view those groups as a customer.

R&D should view the Operations group as a customer because the product that they are designing should be easily manufactured (Design for Manufacturing).

In fact, the entire Design for X methodology is rooted in the concept of internal customers and drives R&D to consider other functions within the organization (and outside the organization) when designing a part.

This perspective should ultimately result in greater performance for the overall business.

Customer Expectations & Communication

Once you've identified who your customers are, it's now time to collect their **needs, wants & expectations (the things that they're willing to pay for)**. This is primarily achieved through communication with your customer - this is not based on your assumptions or the features you want in your product.

We collect our customers wants, needs & expectations so that we can create a product that fulfills those requirements. You will never deliver a *valuable* product without understanding what your customer finds valuable. ***Your customers define both Quality & Value.***

In competitive industries, the company that best understands their customers' needs, wants & expectations - and then translate those things into a product or service will end up delivering the most value to their customer & ultimately will win in the marketplace.

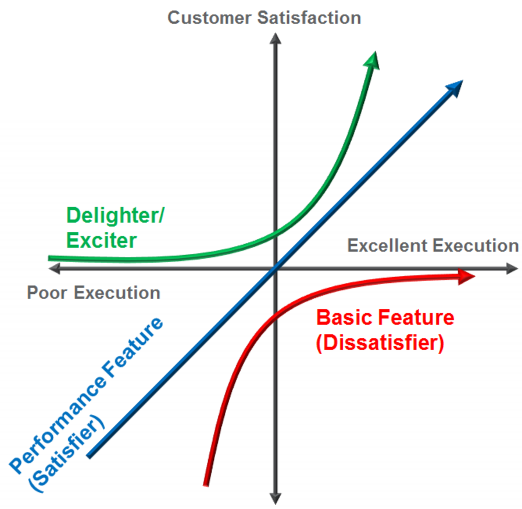
Tools to Understanding your Customers Needs

Oftentimes, your customer may not know what they want, or they may have a hard time verbalizing their needs or expectations. In these situations there are tools 3 you can use to better understand your customers needs, wants & expectations:

- *The Kano Model of Customer Satisfaction*
- *Juran's Classification of Customer Needs*
- *Customer-Defined Value*

The Kano Model

Noriaki Kano developed the Kano model of customer satisfaction which defines 3 types of product features that all impact customer satisfaction differently:



1. **Basic Features** (Needs)- These are product features that your customers expect and must be present. Meeting these needs will only achieve lukewarm customers satisfaction. These are also called Dissatisfiers because if they are not present, they can only result in dissatisfaction.
   - **Example:** A basic need for an automobile is to actually drive down the road. The fact that your car is operating correctly doesn't result in a high level of customer satisfaction.

2. **Performance Feature** (Wants) - These are the additional product features or benefits that can affect your customers satisfaction. To little performance can dissatisfy your customer and many performance features can impress your customers.
   - Continuing the automobile example, an example of a performance features are things like gas mileage, horsepower. Great gas mileage or a few extra horses could go a long way in satisfying you as a customer.

3. **Exciters/Delighters** (Extras) - These are the unanticipated product features that truly wow your customer and go way beyond their expectations. When these features are present, they greatly improve your customers satisfaction. On the flip side, when they're not present it does not result in any dissatisfaction because that feature is way beyond your customers expectations.
   - This might include the on-board computer that is voice activated, blue-tooth capable and linked to your backup camera, seat warmers, cell phone and A/C system.

The Kano model is a good reminder that your product or service should very reliably deliver all the basic and performance features, to prevent dissatisfaction. Continuous improvement should also be leveraged for performance features to expand your functionality & capability.

In parallel, you should seek to develop features that delight or excite your customer! These are the WOW moments that build a brands reputation and create raving fans that will sell your product for you!

"Nobody Raves About Average" - Bill Quiseng

Juran's Classification of Customer Needs

Like Kano, Juran was able to understand that our customers are complex creatures and that in is often difficult to fully understand them.

In response, he developed the 5 categories below to aid us in better understand our customers. Each category contains a different, and deeper perspective on the relationship between your product and your customers.

Need Category	Description	Example
Stated	What your customer says they want (Verbatim)	I need a CQE Primer
Real	What your customer actually needs or wants	I need study material
Perceived	Identify any other aspects (potential benefits) of the product that affect the way the user is perceived by others.	I need study material to become a knowledgeable expert in quality.
Cultural	Identify any cultural needs associated with the product, this would include any aspects of the product that would impact the person's social or cultural standing.	I need study material to help me get a new job or promotion.
Needs Traced to Unintended Use	Identify unintended uses associated with the product	I need study material to act as a paper weight.

What the best companies have realized is that a large part of a products success is going beyond the Stated or Real needs and ensuring that the product meets the Perceived and Cultural needs of the customers.

If you're going delight or excite your customers, you MUST go deep and meet their perceived and cultural needs.

Customer Defined Value

Another important perspective in delivering excellent customer service is that **value is in the eye of the customer**.

Unfortunately, *every customer will define value differently*, but in general, they consider many of the following Items when determining which product they will purchase.

For example some customers will highly value your brands reputation, while others will put more emphasis on your products feature & quality. Below are is a list of factors that can impact your products perceived level of value:

- Stated Performance
- Product Features
- Up Front Cost & Lifetime Cost
- Brand Reputation
- Product Quality & Reliability

This perspective reminds us that before you can deliver a valuable product you must go through the process of gathering information from your customer to determine what your customer finds valuable. What do they want or need & thus *are willing to pay for*.

Below are common sources of information that can be utilized to determine what your customers want or need.

Sources of Customer Information		
Customer Interviews	Customer questionnaires	Customer Surveys
Prototype testing	Competitive Benchmarking	"Things gone Right" Reports
Customer complaints	Warranty reports	"Things gone Wrong" Reports
Media analysis	Field service reports	Any Regulations or Standards
Trade Studies	Focus Groups	Product Recalls or Returns

Bill Gates - "*Your most unhappy customers are your greatest source of learning*"

All of this information should be reviewed and considered during the design phase of a product to ensure that all needs or wants are addressed, these sources are essentially the "Voice of the Customer" which should be utilized during the design process (more on this below - QFD).

Changing Customer Needs

It is also important to understand that customer needs, wants & expectations are dynamic - **they are always changing**.

As companies continue to deliver better and better products, their customers' expectations will increase.

This is why companies must adopt a culture of continuous improvement so that their product or service is continually improving and delighting the customer.

Think about your cell phone. 10 years ago, a camera in a cell phone was cutting edge. Nowadays we expect any new phone to contain a camera, and thus are not impressed by it.

Once a feature has been on the market for a while, customers come to expect that feature instead of being delighted by it.

QFD - Quality Function Deployment

Now that you've captured the voice of the customer - you must translate those needs into product features.

QFD or Qualify Function Deployment is a structured approach to the development process that translates your customers needs into product features which satisfy those needs.

QFD has been described as a cross-functional, concurrent approach to product design because it requires collaboration between many functions within the organization including quality, R&D, sales, marketing, operations, engineering, etc.

QFD has also been called the House of Quality because it's shaped like a house.

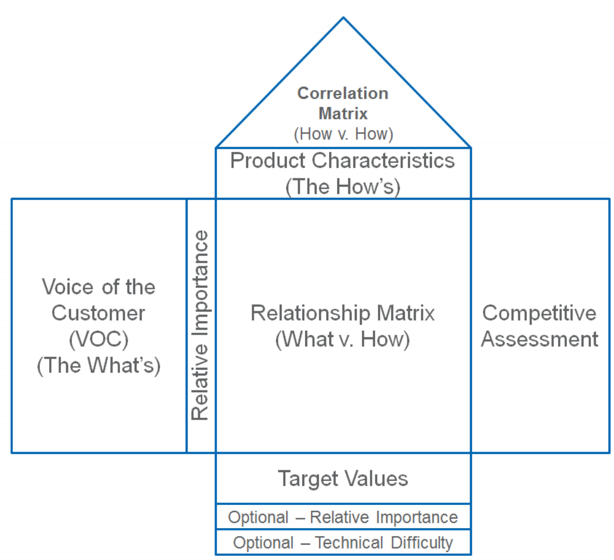
The **Voice of the Customer** (Wants/Needs, etc) are captured on the left had side, along with a Relative Importance (Priority) for each feature.

On top of the House is the Product Characteristics - these are the product features meant to meet the customers' needs.

In the middle of the house is the Relationship Matrix which compares the Customer Needs to the Product Characteristics.

A correlation matrix is the roof of the house which compares the relationship of different (potentially conflicting) product features.

There are also a few other additional features to the House of Quality which include Target Values for each product feature in the basement of the house. You can also include a Competitive Analysis for each Customer Need/Want.



The benefit of the House of Quality matrix is that is provides clarity during the design process which results in efficiency gains through reduces cycle times and lower development costs due to increased communication and collaboration.

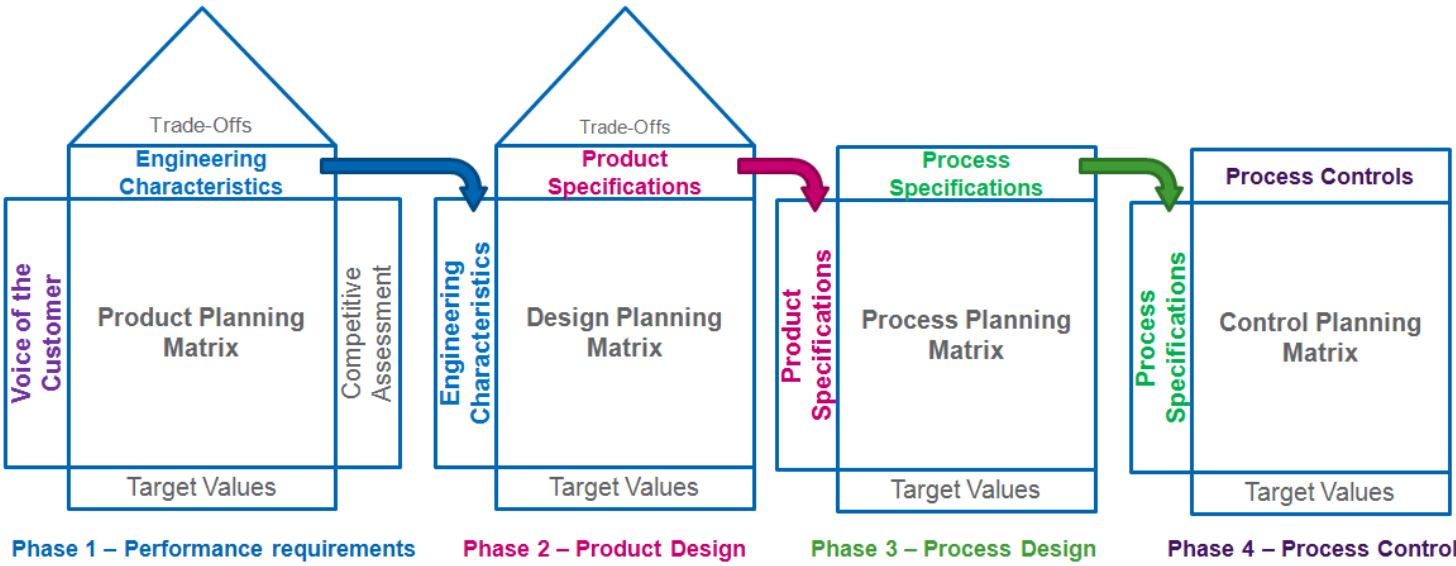
Phased QFD Approach

QFD doesn't stop at translating customer needs into product features - it is powerful enough to convert those customer needs all the way to the required specifications, processes, methods & control points needed to deliver that product.

You can see the phased approach below where, the customer needs (Voice of the customer) are first translated to Engineering Characteristics (Product Features).

Then those characteristics are then translated to product specifications which are then translated into process specifications and finally translated into the quality control process.

If the quality control process can sufficiently prove that the process met specifications - then the end product will function per specifications and meet your customers needs and expectations.



The functional deployment of Quality

The next perspective of the QFD methodology is to ensure that all customer needs are directly translated into an employee's job descriptions. This is the **functional deployment of quality** to all employees within an organization.

In this way, all employees in the organization exist for the satisfaction of a customer. This is the point of Quality Function Deployment.

Ken Blanchard - "*Customer Service is not a department, it's everyone's job*"

This perspective should also remind you that if there is a customer expectation, whether it's the product or service itself, or perhaps delivery times, etc -- that resources must be applied to meet that expectation. You must deploy resources in all areas to ensure quality (customer satisfaction).

Conclusion

I think it's important enough to repeat - **Everything your company does should start and end with the customer in mind, and your job as a quality engineer is to continually remind the organization of this.**

At this point, you should be familiar with Identifying **who** your customers are and how to *determine their needs & expectations* (3 tools).

You should also be familiar with the QFD process that's meant to translate your customer needs into the product features required to meet those needs.

This idea is possibly one of the most important of the entire primer - everything you do as a quality engineer should result in some sort of value or benefit for a customer, whether it's an internal or external customer.

Supplier Management

Supplier Management, or Supplier Quality is both a process and a collection of tool meant to achieve the following goals:

- *to ensure that your organization is only partnering with the best suppliers*.
- to *ensure that your final product achieves the highest level of performance for your customers.*
- *to ensure that you're engaged with your suppliers in continuous improvement activities for the benefit of both organizations.*

As you'll learn below, poorly performing suppliers can cost you big time -- you can prevent this by executing the Supplier Management process & tools to ensure that you're only doing business with the best suppliers.

Ultimately, Supplier Quality is meant to improve the performance of your suppliers, which in turn will improve the overall quality and performance of your final product - **resulting in success in the marketplace**.

Supplier Management is also a very effective form of Prevention (cost of quality) that will pay dividends in the long run.

Learning Objective

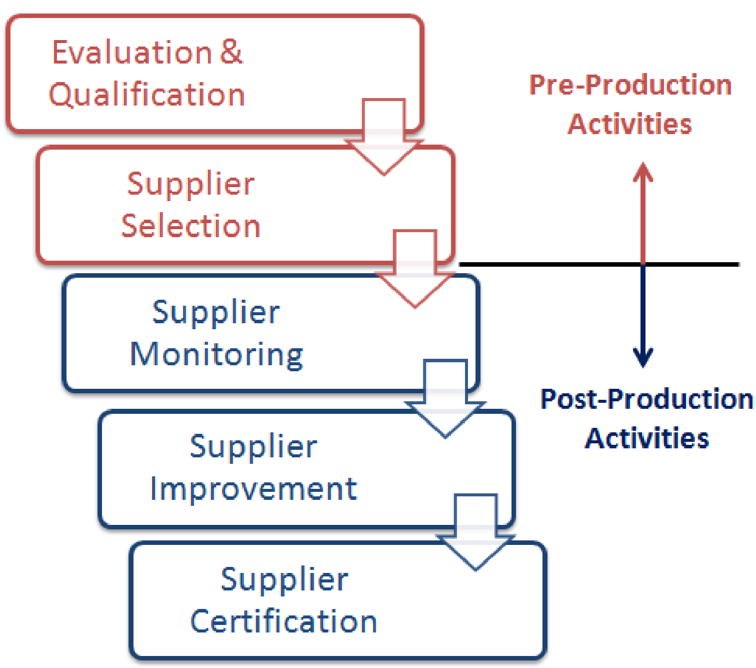
Below is the Learning Objective for **The Supplier Management** portion of the ASQ CQE Body of Knowledge**:**

- Define, select, and apply various *supplier management techniques* including supplier qualification, certification, evaluation, ratings, and performance improvements.

I've broken down the following lesson into **3 parts**:

1. First is the **WHY of supplier management** which includes a short history lesson of supplier management (supplier quality) and the recent improvements made in this area.

2. Second is an overview of **the supplier management process** itself. This process covers all the pre-production work required to evaluate, qualify and select the proper supplier, to the post-production work required to monitor, improve and certify suppliers.



3. Last but not least is an overview of the **tools and techniques** that are routinely used throughout the supplier management process to assist you in ensuring quality when dealing with your suppliers.

   This includes **Supplier Audits**, **Supplier Surveys** and your **Receiving Inspection** process - all which contribute to a larger tool, the **Supplier Scorecard**.

Part 1 - The WHY of Supplier Management

Importance of Suppliers

In today's word it is not uncommon to find that the composition of a product is largely comprised of supplied components.

So let's say that 50% of your product is made up of purchased components - then potentially half of your overall quality is determined by your suppliers.

Half of your products performance and safety is in the hands of suppliers & then ultimately, half of your ability to compete & win in the market place is in the hands of your suppliers, wow!

Supplier Relationships

Historically, many organization chose new suppliers based primarily on price alone.

This price-only perspective resulted in an *Us-Versus-Them,* adversarial mentality. Suppliers were miss-trusted and held under suspicion of constantly trying to charge higher prices and provide lower quality product.

More recently, market leading companies have uncovered *a major competitive advantage* through increased cooperation with suppliers where the two organization work together for mutually beneficial results.

These companies have shifted their buying decisions away from the negotiated piece-part price and have begun assessing the **overall lifecycle cost** associated with the supplier. This *overall lifecycle cost* is greatly impacted by **quality issues** (cost of poor quality) and **service issues.**

Service issues take the form of over-shipment or under-shipment and impact the overall cost as they result in *extra inventory* (over-shipment) or *unused machine capacity* (under-shipment) and then finally the *cost of expediting* and *overtime* that inevitably occur when the supplier finally ships the parts you've needed for weeks.

Quality issues impact the bottom line in the form of scrap, rejects, rework, customer complaints, recall, etc.

Bottom line - the best companies evaluate their suppliers on more than just cost alone.

Importance of Supplier Management

It may be obvious at this point, but suppliers are very important - but how important is supplier management or supplier quality? The answer is it depends.

It depends on how reliant you are on suppliers - or what percentage of your product is made up of purchased parts.

It also depends on how complex your supplied products are - are they commodities or customized parts. Customized parts require additional supplier controls to ensure the parts meet your specifications.

Another critical factor in determining the importance of supplier quality is the intended use of the supplied components - are the supplied items meant for safety features, or performance features - if so, this make supplier quality that much more important.

Part 2 - The Supplier Management Process

Supplier Evaluation & Qualification

The supplier management process begins when sourcing a new component or finding an alternate suppliers for an existing component.

This initial stage of the process usually involves the **evaluation** of multiple suppliers to determine which are **qualified** to source the component you need.

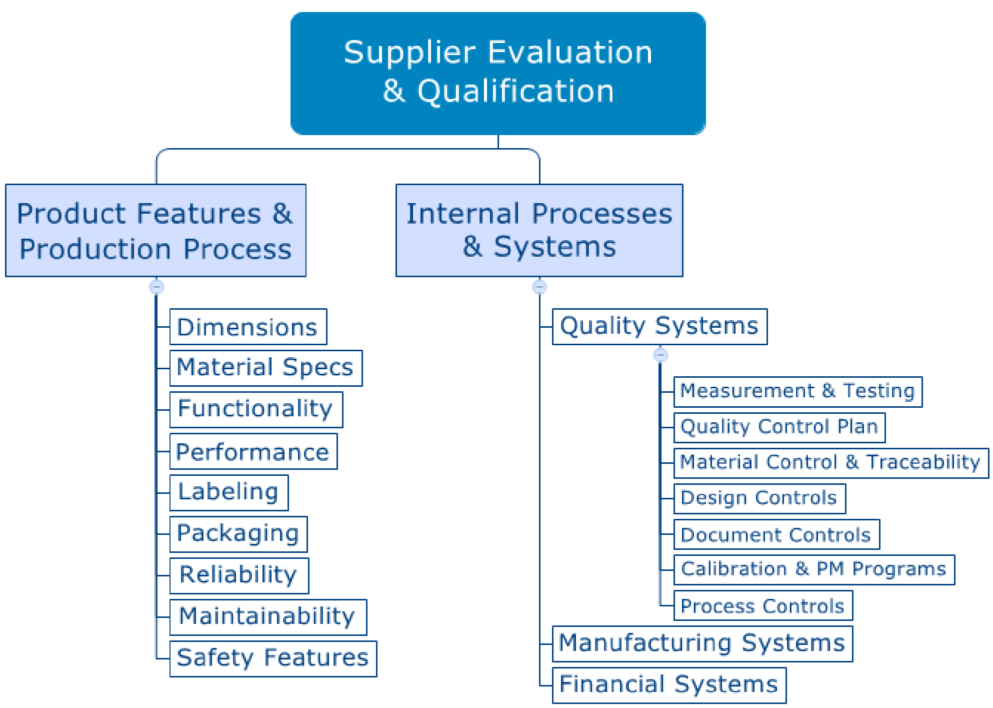
This qualification process is mean to ensure that the supplier is capable of meeting all of your expectations.

One key activity in the evaluation & qualification phase for you, as the purchasing is the clear and unambiguous communication of your expectations to the potential suppliers. They have to know exactly what your expectations are.

2 Primary Expectations:

1. The first expectation to communicate is related to the supplied product & supplier process.
    - These include things like dimensions, performance, functionality, material, reliability, etc

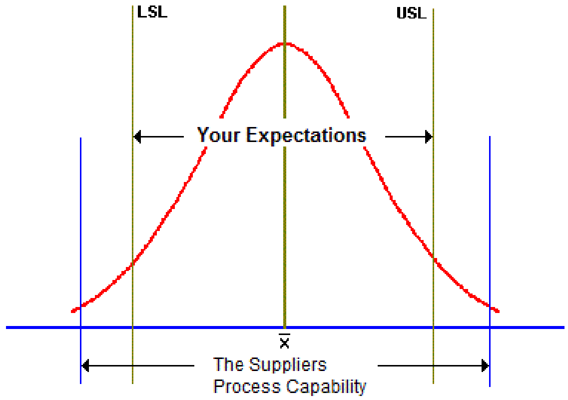
2. Second is your expectations for the suppliers internal systems that will ensure long term performance
    - These include things like their Quality System, Manufacturing System, Financial System, etc



Product Features & Production Process Expectations
This expectation is the easier of the two to check for -- this usually involves requesting samples and then testing/measuring those units to assess their fitness for use in combination with your product.

You must also gain confidence that this new supplier is capable of reliably delivering high quality product **over a long period of time**.

To really challenge the suppliers process, you should perform a **process capability study.** This will indicate if the suppliers process is capable of routinely delivering high quality goods and services throughout the entire *product lifecycle.*



Systems Expectations
The second requirement, for adequate internal systems can be a bit more difficult to evaluation.

As seen in the image above, your company should have expectations for the suppliers Quality System and may also have specific requirements for the supplier manufacturing system or financial system.

This is the first point in the supplier management process where many organizations perform a survey of the multiple suppliers being considered to aid in the evaluation process.

This systems level review can often require subject matter experts from both companies (suppliers & purchaser) in many different departments (Quality, Engineering, R&D, Operations, Finance, etc).

Supplier Selection & the Quality Agreement
Once you've determined which suppliers are capable of supplying the needed product, now it's time to select which vendor you will do business with. Similar to the evaluation and qualification stage, this process goes well beyond the simple price tag and considers quality & service as well.

The supplier selection process is simple when you've executed a supplier survey and can perform an objective analysis of each supplier across common criteria.

These criteria are similar to your eventual supplier scorecard process and usually consider cost, quality & service as explained before.

Once you've selected the supplier that you want to do business with, the next step is to obtain a **Quality Agreement** from the supplier.

This Quality Agreement sets the expectation for all Product related specifications and any other non-product related requirements (Recurring audits, shipping specs, packaging requirements, labeling, certification, documentation, etc).

The Quality agreement can also include the standardization of the test methods, critical dimensions & test conditions associated with your receiving inspection process & their outgoing quality control plan.

You can also use this Quality Agreement to set the expectation for quality threshold where a corrective action will be required. This may be for example, 2 out of 3 lot rejections in a row for a major non-conformance or any critical non-conformance, or any major/critical audit observation.

All of these requirements should then feed into your receiving inspection process once you've moved into full production.

Supplier Monitoring

Once a supplier has been selected & a Quality Agreement is in place, it is time for the routine monitoring of post-production quality.

This post-production phase includes the usage of tools like **receiving inspection** of material, **audits**, **surveys** & **supplier scorecard**. More on these specific tools below.

This primary purpose of this phase is to ensure that a supplier maintains the acceptable quality level that was determined and established during the evaluation and selection phase, and documented in the Quality Agreement.

Another key output of this phase is the need for supplier improvement, this could either be to address an observed non-conformance, or simply an improvement of the product or process meant to impact cost, lead time, etc(more on that below).

This phase is also where you can identify your top supplier and begin the process of supplier certification.

Supplier Improvement

The next major phase in the supplier management process is supplier improvement which can be seen as two separate activities.

- First, there are improvement that are **needed to resolve some sort of non-conformance** - this type of improvement is meant to raise the suppliers level quality back up to the expected baseline.
- Second is the **improvements that are meant to advance quality or performance** through product enhancements or process enhancements.

In either case, you as the receiving company should **work collaboratively with the supplier** to make improvements. This might include sharing technical expertise, information or measurement equipment to assist in the process.

Each of the Supplier Management Tools below (Audits, Surveys, Receiving Inspection & Scorecard) are all common sources for the first type of improvement (CAPA from a non-conformance).

The 2nd type of improvement, meant to advance quality or performance, can also original from the scorecard tool as well as audits and should be a collaborative effort between yourself and your supplier.

The ultimate goal of the improvement process is the mutual benefit for both companies in the form of quality, performance, service & cost!

Supplier Certification

One important point about suppliers that we haven't touched on yet at this point is that there are actually two different types of suppliers - Internal & External.

All the information prior to this can apply to either type of supplier - and so can Supplier Certification.

However I make this distinction because the idea of Certification originated from this perspective because over time marketing leading businesses have recognized that if they can find the best *external* suppliers in the industry and treat them like *internal* suppliers, that both organizations can greatly benefit.

This is the foundation for the idea of Certification - that you should can find the best external suppliers and certify them as a strategic partner that is mutually beneficial for each company.

This partnership will be based on a high level of trust developed through a history of consistent quality and will result in increased profitability for both organizations.

Suppliers become eligible for Certification as they move through, what I call the trust pathway - from an approved (qualified) supplier, to a preferred supplier and then finally arriving at a certified supplier after sustained high performance.

The movement of a supplier through these trust stages: Approved (qualified) -> Preferred -> Certified should be objectively based on their performance.

Certification should be based on two things:

1. The suppliers ability to prove that they understand *exactly* what your specifications are (material, dimensional, regulatory, non-product specs, packaging, labeling, etc).

2. Second - the supplier should prove that their processes & quality systems are capable of reliably achieving the specification.

This is where the supplier scorecard is a powerful tool. The scorecard allows you to evaluation a supplier on a number of common factors (more on this below) to assess their ability to meet your specifications.

As I said above, the certification process is mutually beneficial for both organizations - For the supplier, you will typically award them with a long term sales contract, and you should also be giving them the first consideration for any new business on similar products or services.

You as the receiving company can use the Certification process to reduce the number of suppliers needed for a particular product which will reduces overhead costs and reduces product variability as the source of the product is now consistent.

You can also greatly reduce or eliminate the need for receiving inspection process based on the trust established with the suppliers process.

This reduction allows both organizations to reduce their overall inventory and approach a true Just In Time delivery system (lean manufacturing).

The certification process should include a periodic review of the suppliers performance (scorecard) to confirm that a supplier can maintain their certified status.

If a suppliers scorecard begins to slip or a critical non-conformance occurs, then the supplier can be moved to a probationary status requiring corrective action. If the corrective actions are not affective, it may becomes necessary to decertify a supplier.

Part 3 - Supplier Management Tools

There are 4 primary tools that can be utilized throughout the supplier management process -Supplier **Surveys, Audits**, **Scorecard** & **Receiving Inspection (RI)**.

While these activities can often an upfront investment of time and money, many leading companies have shown that their value far outweighs the cost.

From a cost of quality perspective, three of these activities (survey, audits & scorecard) are considered prevention costs because they attempt to prevent issues from occurring.

The 4th activity, Receiving Inspection, is considered an appraisal costs as it's an investment in the inspection of already manufactured product. While prevention costs are preferred, appraisal cost is still considered to be part of the Cost of *Good* Quality.

Supplier Surveys & Audits

Supplier Surveys & Audits can oftentimes be very similar in purpose, scope, execution & outcome.

The purpose of each tool is to **assess a suppliers internal systems/process to ensure that they are capable of long term performance.**

This assessment is done through the collection of objective evidence and are oftentimes standardized through the usage of a checklist.

The scope of each tool is similar in that they both normally cover the entire quality system which include but are not limited to the following areas:

- Document control (Control of drawings & specifications, records retention),
- Material control (raw material storage, final production, labeling, etc),
- Product & process controls
- Control of non-conforming material
- Facilities, Measurement & Test equipment
- Shipping/distribution systems
- Financial controls

Because there are multiple areas within the suppliers operations that are under assessment, it means that a survey or audit is generally conducted by a team of folks from different areas, outside of quality.

Surveys & Audits are also similar in their end result which is generally a **Final Report**.

The final report should include a discussion of the strengths & weaknesses of the supplier along with any major or critical observations that require corrective action.

The final report should also conclude if the supplier is capable of continued business or new business. Another potential outcome is a probationary status pending the implementation of a corrective action.

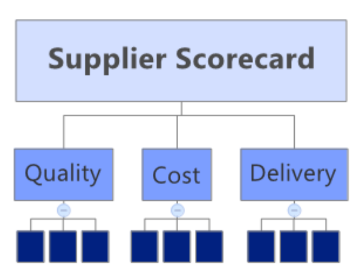
Differences between Audits & Surveys

The primary difference between an audit & a survey is the depth of assessment and the supplier management phase that you're in.

Generally, audits are a more in-depth, on-site assessment of the suppliers systems/process and are conducted in the post-production phases of the supplier management cycle.

The survey is usually less detailed and are performed in the pre-production phases of the supplier management cycle. Depending on the level of detail so surveys do not even require

Supplier Scorecards



As we've alluded to already - the Supplier Scorecard is a tool meant to combined a wide range of important supplier performance metrics (Quality, Cost & Service) in order to accurately assess a suppliers overall performance.

Similar to the supplier management process, the scorecard should not be limited to cost only and should instead be a combination of cost, quality service and any other important factors.

Your scorecard should also include the data collected in the other 3 supplier management tools (audits, surveys & RI). By including audit & survey results, your ensuring that the suppliers final rating includes the processes and systems (Quality, Manufacturing, Financial, ERP) utilized to deliver their product.

Below is an example of a Supplier Scorecard with commonly utilized metrics, where each metric can be rated on a defined scale from 1 - 5, which 1 being the worst, and 5 being the best:

- **Cost Factors - 40% of final score**
  - Defect (Scrap, Rework, Sort, RTV) Costs: $\frac{Total\ Defect\ Costs}{Total\ Costs\ Spent\ with\ Supplier}$
  - Defect Costs Recovered: $\frac{Total\ Defect\ Costs}{Total\ Costs\ Recovered\ from\ Supplier}$
  - Cost Adjustments required for downgraded material, etc
- **Quality Factors - 40% of total score**
  - % Product Nonconformance per unit inspected
  - % Lot Rejection per lot inspected
  - Non-product related rejections per lot inspected
  - Customer Complaints per Million units purchased
  - Audit History & Score
  - Survey History & Score
  - Requested Corrective Actions
- **Delivery Factors - 20% of total score**
  - % Early Delivery
  - % Late Delivery
  - % Partial Shipments
  - % Over Shipments
- **Other Factors** can include Risk, Innovation & responsiveness.

One key thing to keep in mind when creating your scorecard metrics is to always normalize by volume. You'll see in the example above that many metrics are normalized by things like the number of units inspected, or the number of lots inspected, or the total number of dollars spent with a supplier.

By normalizing by volume, you can then make a fair comparison of the performance of multiple suppliers.

For example, Supplier A might have had 5 lots rejected at receiving inspection which is better than Supplier B, who only had 1 lot rejection because Supplier A provided you with 10 times as much product.

This will assure that all suppliers are held to the same standard, and will provide an objective score or rating for each supplier that can be used to compare performance between suppliers.

Using the Scorecard Results

With all suppliers being assessed against the same requirements, you are now capable of determining who your best and worst suppliers are.

The best suppliers get rewarded with more business and are potential candidate for strategic partnership or certification.

The worst suppliers get SCAR's (Supplier Corrective Action Requests) to improve their performance.

The scorecard also gives you the opportunity to trend a suppliers performance over time. This trending can be a leading indicator of a potential problem or can be a reflection of the effectiveness of a suppliers corrective action.

Scorecard results should also be fed into the supplier selection process for new products. Suppliers who've maintained a solid score for a long period of time should be strongly considered for any new business.

Your scorecard data can also be utilized during any supplier audit or survey to guide your discussion with the supplier regarding performance.

Receiving Inspection (RI)

Receiving Inspection, or RI, is the final Supplier Management Tool and is a major part of the Supplier Monitoring phase.

The History of RI

Before companies began utilizing the receiving inspection process, purchased parts would be simply receiving into inventory. This meant that any defect parts would then simply be utilized during production resulted in customer complaints or in-process non-conformances.

This practice inflated the costs of poor quality because companies had invested time and effort into those defective parts.

By introducing an inspecting step into the receiving process, companies were able to greatly reducing this waste, and providing a higher level of confidence that the material flowing into the production process was conforming.

I use that phrase "higher level of confidence" because the receiving inspection process is rarely a 100% inspection and it is still possible for a supplier issue to result in an in-process non-conformance or customer complaint.

The Receiving Inspection Process

Receiving Inspection actually begins during product development.

Once you've determined that you will purchase a component, you should begin the process of specifying the critical features that should be inspected upon receipt.

So for every supplied component you should develop an **Inspection Plan** which normally includes:

- **Frequency of testing**: 100% testing or acceptance sampling or skip lot testing
- **Inspection points:** what to measure - these are normally your critical to quality attributes (CQA's) like dimensional requirements, material composition, functional performance, labeling, etc
- **Inspection methods:** How you plan on measuring those critical features
- **Acceptance criteria:** How many failures are acceptable (oftentimes this is 0) & the disposition associated with a deviation for each inspection point.

You should also communicate your inspection plan with your suppliers. This will allow them to gear their quality control techniques to your critical to quality attributes and perform an equivalent inspection.

Your RI process should also be setup to verify other non-product related requirements like packaging, labeling, shipping configuration & the certification of conformance provided by the supplier.

Source Inspection

One potential alternate to receiving inspection is called **source inspection**. This is where the inspection is actually performed at the source (the supplier), by a representative of the purchasing company (you) to ensure conformance to all requirements.

This again can reduce the cost impact of a non-conformance by preventing the shipment & handlings costs that are incurred when a non-conformance is shipped to the buyer and subsequently rejected.

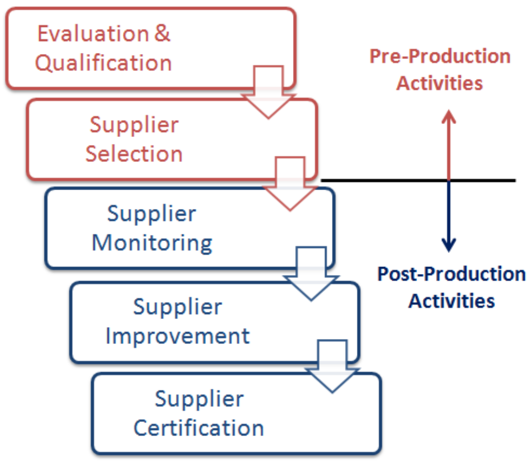
Conclusion

Supplier Quality or Supplier Management has become a very important part of the Quality Management Process because many organizations are becoming more reliant on suppliers.

To be successful in this changing world, organizations must change their perspective of suppliers to move their relationships from a cost-based adversarial relationship to a quality-based, strategy partnership.

As a Quality Engineer, you need to understand & work within the **supplier management process.**

This includes all the pre-production work required to evaluate, qualify and select the proper supplier, to the post-production work required to monitor, improve and certify suppliers.



You should also be capable of applying the 4 unique **tools and techniques** that are used throughout the supplier management process.

These include **Audits**, **Surveys** and the **Receiving Inspection (RI)** process - all which contribute to a larger tool, the **Supplier Scorecard**.

Barriers to Quality Improvement

Below is the *Learning Objective* for the **Barriers to Quality Improvement** portion of the ASQ CQE Body of Knowledge**:**

- Identify **barriers to quality improvement**, their *causes and impact*, and describe **methods for overcoming them**. (Analyze)

"Your *business* does not get better by chance, it gets better by change" - A variation of a quote from Jim Rohn.
For your business to make forward progress towards success, intentional change must be made to improve your business.

To take this one step further, William Pollard once said "Change is difficult, Not changing is fatal." This is so true is business today. If you're not changing & improving, you're not surviving.

Having the skill to successfully implementing change is more important than it's ever been.

To be successful at implementing change, you need to be aware of the barriers you might face and how to overcome those barriers. Addressing these barriers will allow you to achieve a rapid pace of change, improvement and innovation.

Common Barriers to Quality Improvement

First and most important - **Almost all barriers to quality improvement are *<u>deficiencies in management & leadership</u>***.

These deficiencies can take a few different forms but usually look something like:

- Lack of a desire to change or improve
- Lack of strategic planning needed to identify improvements
- Poor communication & oversight of needed changes
- A lack of empowerment & accountability to drive improvements
- Poor collaboration between leaders & their departments
- Having the wrong perspective of Quality as a short term initiative

Overcoming Barriers with the Quality Management System

The Top-Down Approach to Change

Managers & leaders can overcome the deficiencies above by more effectively utilizing the Quality Management System (QMS).

'Change is a process, not an event' - Unknown

The QMS process was developed to provide the user with a structured approach to Quality so that change becomes a natural part of the company culture.

For example, the QMS cycle start with vision setting & strategic planning.

This is where management evaluates the current state of the business and then sets the vision for the future state. *The outcome of this phase should reveal opportunities for improvement or gaps in performance where change is needed.*

Next, the QMS cycle then requires that **management communicate their vision down** to the functional groups where the change will take place.

It is here where the functional team will create a plan for the change, and then management that change through to completion. During this phase it **is managements job to ensure that the change agents are empowered & motivated to drive the change.**

Management can also **setup a steering committee** to periodically review the functional teams progress towards implementation. This will ensure that adequate resources are being applied, any hurdles are being addressed and that the team is headed in the right direction.

Finally, **management should give the functional team the tools needed for success**, including adequate training, coaching, time, money, etc.

The Bottom-Up Approach To Change

The solution presented above, for utilizing the QMS cycle as a standard process for driving continuous improvement (change), is the top-down approach to this problem.

Oftentimes however, the best ideas for improvement originate from the shop floor instead of the boardroom. In this instance, you must take the more difficult, bottom-up approach to change management.

Looking back at what we learned in the leadership section, you'll remember that to drive someone to action you know what motivates them. Lucky for you, it's a well documented fact that ***money talks***, especially with upper management.

This is why the bottom-up approach is more difficult because it requires to you take the extra step of motivating management to change by effectively communicating the benefits (money) of a particular improvement.

Money & Quality

This is where your knowledge of the Cost Of Quality can be so beneficial. You can use this knowledge to frame every Quality Improvement project from the financial or monetary perspective. On the flip side of that, you can also use the COQ perspective to frames each financial situation from the Quality perspective.

This perspective allows you to communicate more effectively with top management and drive change.

> Do you have a quality problem (non-conformances, scrap, rework, etc) that needs changed - determine the $$$ associated with that problem and make management aware.
>
> Do you have an inefficient process that needs changed - determined the $$$ associated with that problem and make management ware.
>
> Whatever your problem is, frame it around the cost associated with that problem and it will motivate management to drive change.

You can take this once step further - approach management with a completed **cost/benefit analysis** so that management is aware of what it will take to drive change. If the idea makes sense (the benefits far outweigh the costs), then management has to say yes.

Change & the Change Agent (Quality Engineer)

As we now know, any improvement will require change and change can often be difficult. This is where the roll of a change agent can be very beneficial, and Quality Engineers often fulfill this role.

As an agent for change, you must be prepared to overcome the resistance that will inevitably occur with change. This will challenge your skills as a leader, facilitator, project manager & communicator.

You must be able to articulate the current state, and the frustrations/downsides associated with the current state. You also must be able to see the future state and communicate that vision to the impacted individuals.

Conclusion

Remember that as a business, if you're not changing and growing, you're dying.

Also remember that growth & change do not happen by accident, you must be intentional about change. You must utilize the QMS process to develop a culture of change and growth in your organization.

The QMS Process is an effective tool at addressing many of the deficiencies of management and leadership that lead to barriers to quality improvement.

We also discussed the bottom-up approach to change, which requires that you motivate managers & leaders to change through effective communication of the benefits of change (money).

Lastly we learned that Quality Engineers are oftentimes called upon to be agents of change which require that you utilize your communication, facilitation, project management and leadership skills to effectively implement good change.