International Trade Centre

Developing Basic Quality Competence

Certified Quality Professional - Basic Level Program

GREGORY H. WATSON, PhD

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Preface

This electronic book represents the first installment in the design and development of a Global Quality Program (GQP) on behalf of the World Alliance for Quality (SAQ) for the Global Platform for Quality (GPQ) of the International Trade Center (ITC) performed under a multi-party Memorandum of Understanding between the ITC and the individual members of the World Alliance for Quality (WAQ):

- The American Society for Quality (ASQ)
- The European Organization for Quality (EOQ)
- The International Academy for Quality (IAQ)
- The Union of Japanese Scientists and Engineers (JUSE)

Other programs sponsored under the United Nations support an improvement among developing nations in the certification of quality management systems for Small-to-Medium Enterprises (SMEs) and development of inspection and testing capacity. so it is possible for these organizations to gain access to global trade markets.

The Global Platform for Quality (GPQ) seeks to develop the quality competence in SMEs of the least developed and developing nations by creating a cadre of quality professionals who can help these organizations go beyond market access to achieve commercial market success.

The fundamentals program contains six courses that provide the core content of quality management programs. This information will lay a foundation for the remainder of the program which has been developed and piloted.

Upon completion of these six courses, a practical project and the certification examination, quality practitioners are designed by WAQ as a Certified Quality Professional at the Basic Level. Afterwards it is possible for those designated with this credential to pursue the Certified Quality Professional program at the Advanced Level of proficiency.

Certified Quality Professional
Basic Level Curriculum Program

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Global Platform for Quality

Q101 – Quality Assurance

Instructor: Gregory H. Watson, PhD, EUR Ing

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GLOBAL PLATFORM FOR QUALITY

QUALITY 101: QUALITY ASSURANCE

Standard work must be managed effectively. When this work does not conform to quality requirements then corrective and preventive action (CAPA) must be taken to return the organization to compliance so that performance is acceptable in the marketplace. Quality assurance includes the basic testing of output delivered to product or service customers and entails the review of customer complaints and response to them so that the customer experience is assured at the standard level of performance (e.g., minimum acceptable level of performance). This organizational performance capability is achieved by conducting test procedures that assure conformance with documented requirements through "certificates of compliance" that report the outcomes of the tests. Quality assurance is a necessary and sufficient activity for local commercial success in a developing country.

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GLOBAL PLATFORM FOR QUALITY

Joseph M. Juran on "Quality Assurance"

"***Quality Assurance*** is the activity of providing the evidence intended to establish confidence, among all concerned, that the quality function is being effectively performed."

~ Juran's Quality Control Handbook, 4th edition, 9.2

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – QUALITY ASSURANCE:

- **Lecture 1: Understanding Assurance of Quality**
- Lecture 2: Product Acceptance Testing
- Lecture 3: Documentation and Record Management
- Lecture 4: Assuring Compliance to Standards & Conformance to Requirements

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Global Platform for Quality

Quality Assurance

Lecture 1: Understanding Assurance of Quality

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How do we define quality?

We define "**quality**" as **a relentless pursuit of goodness coupled tightly with the persistent avoidance of badness**.

This is a "***transcendental definition***" of quality – it is a relatively primitive way to define quality as its empirical meaning must be established in the context in which the term is used. Using this definition we observe that ***"quality" may be defined in different absolute ways based on the situation in which it is being applied***. Thus, ***an operational definition needs to be established that defines the limits of the characteristics for both "goodness" as well as "badness" of performance in terms of its application and the objective that is to be pursued***.

Goodness and badness represent ***boundary conditions*** within which performance may be considered by customers as acceptable (within the limits of toleration). This may be done for several different levels of results according to the application of the quality characteristic.

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How is quality applied across a product life cycle?

When a product is in its embryonic stage of conceptualization the emphasis on quality is placed on the ***development of a set of product or service characteristics that define its ability to satisfy stated or implied needs of customers***. As a product's design becomes more mature emphasis broadens to include the controls required in its production process to assure that product or service characteristics will be delivered to customers.

Thus, quality assurance, in this phase of a product life cycle, focuses on defining what is the ***set of quality characteristics*** upon which customer assessments about the delivered level quality will be judged. It should be a key ***design intent for any product, service or process that it operate with out deficiencies which means that it has the lowest total cost*** (internal to the organization and external to the customer or society at large).

These concepts led Joseph M. Juran to define quality from a customer perspective as "fitness for use" of a product while Philip B. Crosby defined quality more narrowly as the internally controllable aspect of "conformance to requirements" or producing the output "right the first time" (e.g., no mistakes or flaws). A systematic approach to designing operational definitions of quality can prove more helpful than a limited perspective.

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How do we apply this quality definition?

Each application of quality to product development or process management is a special activity which requires that the "goodness" and "badness" tolerance limits and targets for performance be set based on a combination of customer requirements and process capability.

The "transcendental definition of quality" will be operational defined for each of the different aspects of quality that organizations pursue:

- Quality Assurance
- Quality Control
- Quality Improvement
- Quality Planning

The next four training modules will address these four applications of quality and will specify the way quality is defined in each application context.

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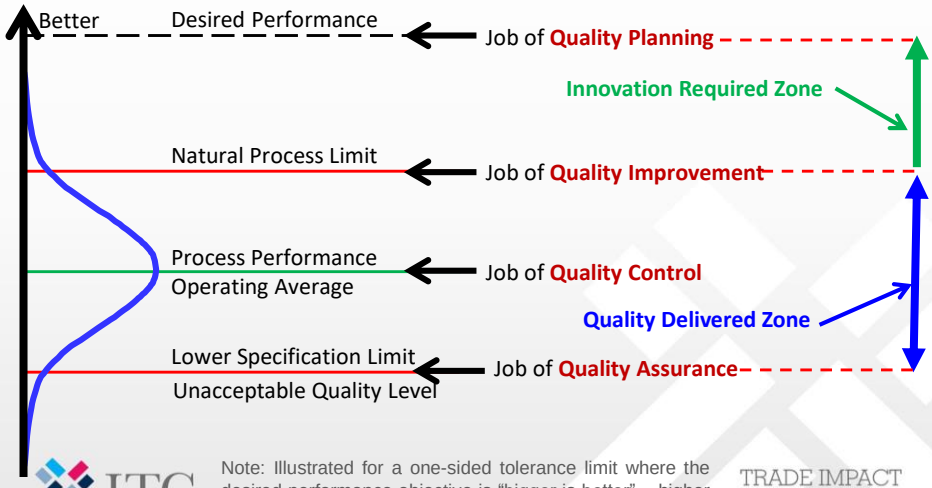
A systems perspective of "Quality Activities."



Note: Illustrated for a one-sided tolerance limit where the desired performance objective is "bigger is better" – higher performance above the lower tolerance limit is desirable.

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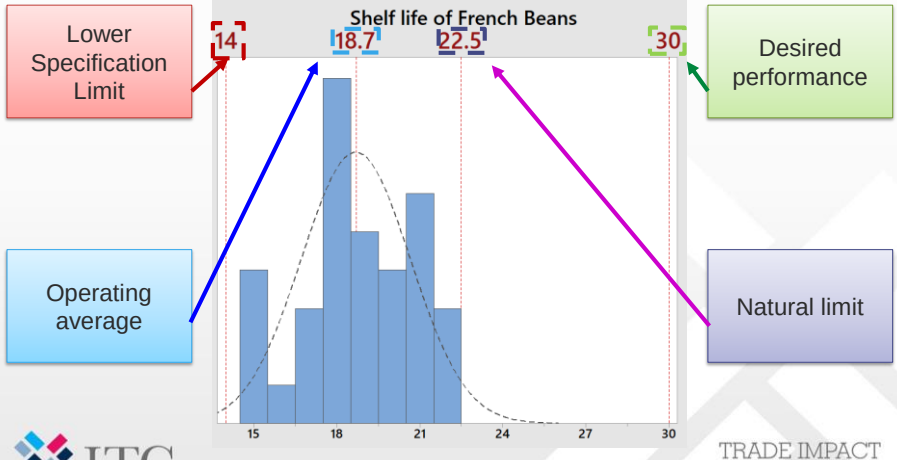
Example of different quality performance levels:



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What do we mean by "Quality Assurance" (QA)?

Quality Assurance (QA) is the set of administrative and procedural activities that are implemented in a quality system to ***provide confidence which ensures customers that the agreed-upon standards of quality are consistently being met*** and that requirements and goals for a product, service or activity will be fulfilled. QA systematic actions assure achievement of quality purposes.

QA prevents mistakes, defects, or non-conformities in manufactured products and avoids problems when delivering solutions or services to customers. ***QA is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention.*** It is applied to the management of quality in raw material, assemblies, products and components, services related to production, production and inspection processes, and well as schedule management for delivery to customers.

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What tasks define the "QA framework"?

An organization's QA framework typically includes the following activities that help prevent errors from reaching customers:

(1) Determination of adequate technical requirement for inputs and outputs,
(2) Certification and quality evaluation of suppliers,
(3) Testing of procured material for its conformance to established quality, performance, safety, and reliability standards,
(4) Proper receipt, storage, and handling of purchased material,
(5) Audit of measurement quality and production process quality,
(6) Evaluation of the process to establish required corrective response, and
(7) Audit of the final output for conformance to
    (a) Technical specifications,
    (b) Reliability and durability requirements,
    (c) Maintainability design rules and standards, and
    (d) Performance requirements.

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What does this imply about our "quality" definitions?

Each of the four levels of quality activity has a different objective and target that it seeks to achieve:

- ***Quality Assurance***: protects customers from less than minimal performance.
- ***Quality Control***: provides consistent performance within defined boundaries.
- ***Quality Improvement***: seeks incremental improvement to drive performance and applies ***kaizen*** planning – change of current processes for the better.
- ***Quality Planning***: seeks breakthrough performance to gain exceptional results through new projects that develop or extend current capabilities.

The first three approaches work within current design and budgetary constraints of the organization while Quality Planning applies new resources to design a higher level of performance.

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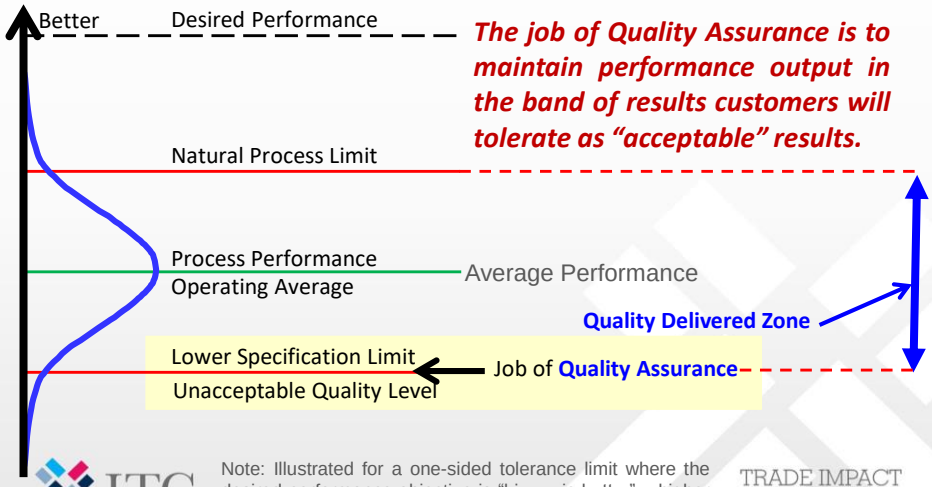
How does "Quality Assurance" fit in this model?



The job of Quality Assurance is to maintain performance output in the band of results customers will tolerate as "acceptable" results.

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Note: Illustrated for a one-sided tolerance limit where the desired performance objective is "bigger is better" – higher performance above the lower tolerance limit is desirable.

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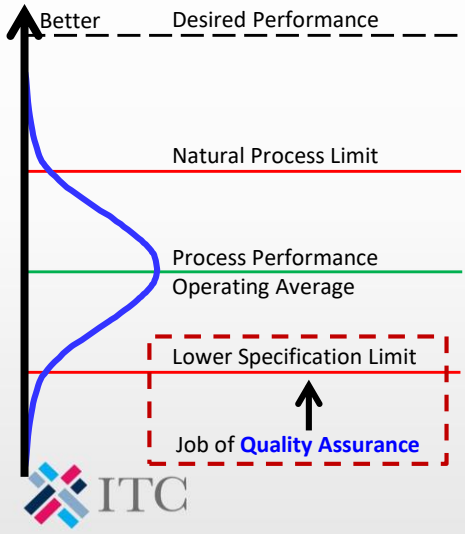
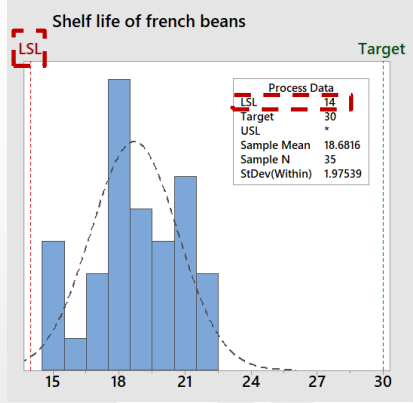
The job of Quality Assurance:





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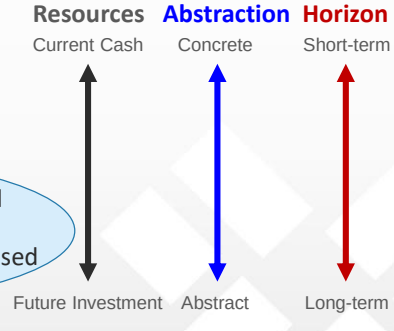
How do requirements change across quality levels?

What changes as quality systems become more comprehensive?

- ***Quality Assurance***: Product-focused
- ***Quality Control***: Process-focused
- ***Quality Improvement***: System-focused
- ***Quality Planning***: Transformation-focused



Business Development Plan

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CLASS DISCUSSION:

- For each of the four quality levels that are achievable in an organization discuss in your team how it would apply on your project and give an example of what type of activity would be involved in delivering this type of performance.

Quality Level	Example: How to Apply in Your Project?
Quality Assurance	
Quality Control	
Quality Improvement	
Quality Planning	

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CLASS DISCUSSION:

- Identify by the letter of the statements below which one belongs in which category of quality:

Assurance	Control	Improvement	Planning

A. Checking every package before packing it (size, filled volume, no flaws)

B. Developing a new product to a new market

C. Measuring temperature of avocados along the value chain (including transportation)

D. Measuring moisture content of coffee before shipping

E. Benchmarking best practices from the best operations and improving own operations based on lessons learned

F. Measuring and adjusting variables affecting coffee drying process

G. Removing waste from a processes

H. Investing in new automated measurement technology

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PROPOSED ANSWER:

- Identify by the letter of the statements below which one belongs in which category of quality:

Assurance	Control	Improvement	Planning
A D	C F	E G	H B

A. Checking every package before packing it (size, filled volume, no flaws)

B. Developing a new product to a new market

C. Measuring temperature of avocados along the value chain (including transportation)

D. Measuring moisture content of coffee before shipping

E. Benchmarking best practices from the best operations and improving own operations based on lessons learned

F. Measuring and adjusting variables affecting coffee drying process

G. Removing waste from a processes

H. Investing in new automated measurement technology

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Quality Assurance

Lecture 2: Product Acceptance Testing

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EDUCATIONAL PROGRAM – QUALITY ASSURANCE:

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What is product acceptance testing?

Product Acceptance Testing: Those tests that are conducted to determine if a product meets the requirements of its specification or contract. The testing may involve chemical tests, physical tests, or performance tests.

Acceptance testing is divided into classes of ***technical and operational testing*** which respectively evaluate outcomes from engineering and user or customer perspective. ***Field testing*** and ***factory witness testing*** are tests that determine if a system is in compliance with its requirements and is acceptable for delivery to the customer for operation whereas ***functional testing*** verifies that the product works as designed (e.g., ***verification testing***). Operational testing occurs in the final user's environment to validate the utility of a product from an expert user perspective (e.g., ***validation testing***). It answers the question: did the right thing get designed as demonstrated in the functional testing and is this what the customer really needs? These tests may be done with use cases, or case studies that replicate the expected environment of the product application.

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How is product acceptance testing applied?

Acceptance tests are targeted to specific quality characteristics for specification requirements and may be grouped into two major categories:

- ***Functional Tests*** (synonyms: ***Technical Tests*** and ***Verification Tests***) – the factory witness testing may is typically a functional test conducted by experts from the manufacturer but with the direct supervision and oversight of user-experts. The objective of functional testing is to assure that all critical product specifications are met at the time of manufacturing release of a product.

- ***Operational Tests*** (synonyms: ***User Tests*** and ***Validation Tests***) – all field testing and operator interface testing are considered operational tests. Control of operational tests is by the organization that is using the product and it has the purpose of assuring the utility of the product by typical operators in the context of the environment where the product will be ultimately used.

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What needs to be tested for acceptance?

Examples of applications of Product Acceptance Testing for food products:

Functional Tests (verified by performance measurement):

- Package dimensions (e.g., is a one-liter bottle really one liter?)
- Package sealing (e.g., how good is the sealing on a package of food?)
- Package sterility (e.g., is a food package truly bacteria-free?)
- Does the content of the package meet its product requirements (e.g., does a food item contain exactly what is advertised on its label?)

Operational Tests (validated by in operation observation):

- Does the packaging resist damage during typical handling and transport?
- Is the packaging easy for customers to open?
- Are the preparation instructions clear and easy to follow for customers?

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What rules apply to product acceptance decisions?

Product Acceptance Testing Decision Rules:

When performance measurements are taken during ***technical testing*** there are three different ways that the measures used in acceptance testing can be interpreted. Inherent in each performance measure is the type of decision criteria that should be used. The three categories of rules are illustrated for food products:

- ***Smaller is better***: smaller values than the specification are desirable, but not larger values (e.g., contaminants, purity, etc.).
- ***Nominal is best***: performance values should be contained within a tightly controlled range (e.g., nominal package contents, nutrients delivered, etc.).
- ***Bigger is better***: larger values than the specification are desirable, but not smaller values (e.g., weight or volume contained, product shelf life, etc.).

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Illustration of Product Acceptance Rules:

Smaller is better:

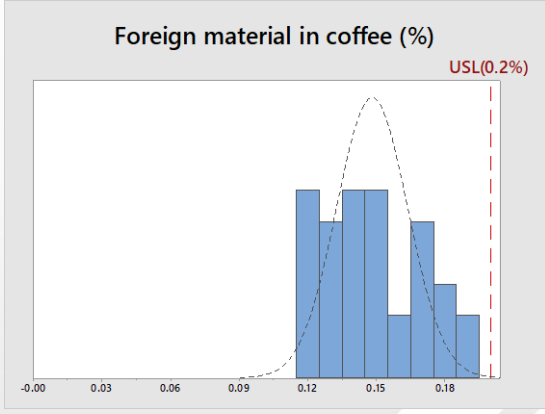

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Illustration of Product Acceptance Rules:

Nominal is best:

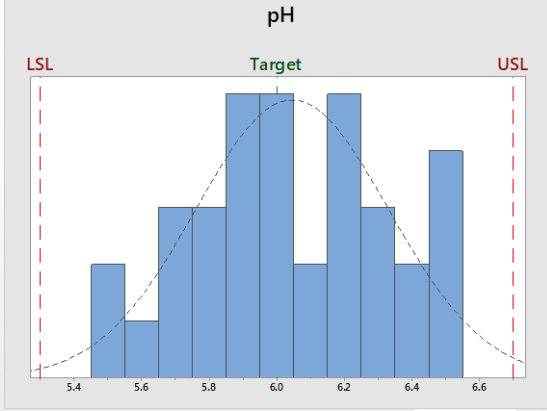

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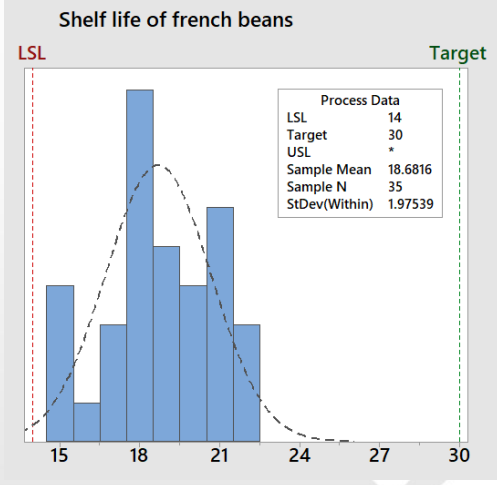
Illustration of Product Acceptance Rules:

Bigger is better:



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CLASS DISCUSSION:

- How does an operational test differ from a technical or functional test?
- In each of your project teams discuss what types of function and operational tests are done or should be done? Give two examples of each type.

Functional Testing	Operational Testing

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Quality Assurance

Lecture 3: Documentation and Records Management

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EDUCATIONAL PROGRAM – QUALITY ASSURANCE:

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Foundations of Quality: Documenting and Doing

When ISO9000 was launched in 1987, a phrase that was used to promote it: ***"Document what you do and do what you document!"***

This phrase summarizes the initial steps in developing a quality system and it focuses on designing and documenting standard work for operational tasks.

Development of ***Standard Operating Procedures (SOP)***, preparation of work documentation such as work instructions, and the control of these documents and quality records are critical aspects of the quality assurance discipline.

ISO9000:2015 states that "documented information required by the quality management system and by this international Standard shall be controlled."

Management of the lifecycle of these documents is required with traceability of their content and requirements across the stages of draft documents, to approved and released documents that are in active use, to archived historical documents and records of past quality records.

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Work Instructions – define what will be done.

Work instructions (also known as standard operating procedures (SOP), job aids, and user manuals) ***describe in simple terms how a particular working task is performed***. They cite step-by-step instructions of the operational sequence that is require to successfully and safely complete the required task with good quality and efficiency.

While ***work processes*** describe the chain of activities that transform inputs into the required outputs for deliverable to customers, ***procedures*** describe how to do the work required in a process across the participants in the work (who does what work when), ***work instructions*** define specifically how activities in a work process or work procedure is performed.

Work instructions are the core knowledge base about what organizations do to create output for customers. When properly managed they reduce risk and provide the "corporate memory" about how the organization works.

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Criteria for a Good Work Instruction:

Work instructions should be unambiguous and it is important to follow a set of simple ground rules for their development. Work instructions should be:

1. **Clear**: write work instructions so they are clear to each employee who does the actual work using simple sentences, avoiding jargon, acronyms (unless defined), complex technical terms and unnecessary text.
2. **Accessible**: available for review by the people doing the job.
3. **Credible**: helpful to those doing the job, accurate, realistic (match the job), and aligned to training received in doing the work.
4. **Consistent**: all work instructions should follow the same style and use a consistent vocabulary and structure.
5. **Short and Simple**: simple writing is easier to understand and follow.
6. **Visual**: prepare them visually in images or pictures that are easy to learn.
7. **Relevant:** written by experienced people who have been doing the job.

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Work Instruction Example:

Job Instruction Sheet	Part #	Required Quantity:	Date:	Dept. /Location:	Team Leader:	Supervisor:
	Part Name			Prepared By:		

#	Step	Quality Check		Note	Time	Takt Time	Cycle Time	STD WIP	◇ Quality ✚ Safety ● STD WIP
		Sampling	Tool						
						Add simple flow chart here.			
				Total					

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What is a "Check Sheet"?

A "***Check Sheet***" is a basic quality tool that is used to collect and record data in real time at the location where it is generated. It creates a tally of observations about quality characteristics that identify defects or errors that occur which may be either quantitative or qualitative. The check sheet is a prepared form that ***provides structure for collecting data and sorting data into categories***. It is used to tally observations based on predetermined rational sub-groups that will permit the collection and organization of data so it may be analyzed in a more usable form.

Check sheets come in various forms and they may be used to: classify defects by rational sub-groups; track the defects as a function of product location; gather information about frequency of occurrence of an error type; capture raw data to develop a histogram for frequency of measurement occurrence; or present a check list of tasks that operators need to accomplish in the order or sequence of task performance.

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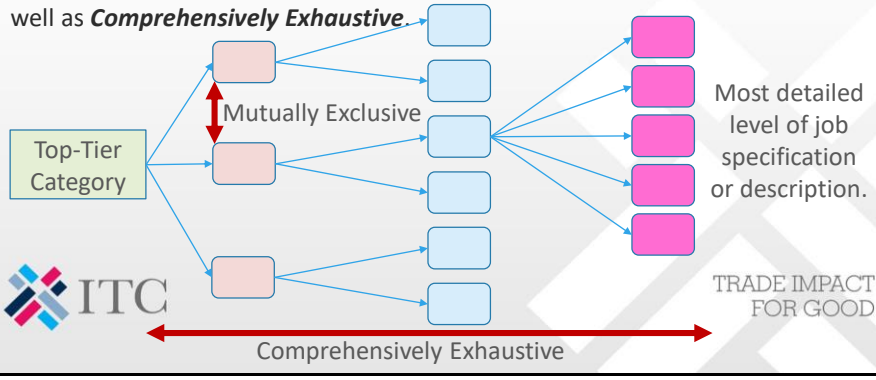
Check Sheet Example: Tree Diagram (Stratification)

The Tree Diagram illustrates the breakdown of rational subgroups into distinct categories that share similarities or affinities in their quality characteristics. A complete breakdown illustrates all possible logical categories from the highest level of abstraction to the lowest level while mutually exclusive decomposition identifies distinctive structures at each level. When combined these two types of structures create a ***MECE Stratification Analysis***: both ***Mutually Exclusive*** as well as ***Comprehensively Exhaustive***.



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Check Sheet Example: Check Form

A form that identifies essential information to be collected.

Job application form:

Applicant Information					
Applicant's Name:				Date:	
	Last	*First*		*M.I.*	
Position Applied for:				Interview Date	
Hiring Manager's Name:					
Reference Information					
Reference Name:			Email:		
Contact's Title:			Phone:		
Company:					
Address:					
	Street Address				*Apt #*
	City			*State*	*ZIP Code*
Reference Responses					
Was the applicant an employee of your company?		No		Yes	
			If Yes	*Start Date*	*End Date*
What was the applicant's position on the last day of employment?					
What were the applicant's job responsibilities?					
What are the applicant's strengths?					
What skills or abilities need improvement?					
How would you characterize the applicant's ability to work on a team?					
How does he/she handle it when faced with a very busy day?					
Please describe a time when he/she had a conflict with a co-worker. How did he/she handle it?					
Why did the applicant leave your company?					
Would you rehire this applicant?	☐ Yes ☐ No				
Would you share why (or why not?					
Do you have any additional comments regarding this applicant?					
Thank you for your time and assistance.					

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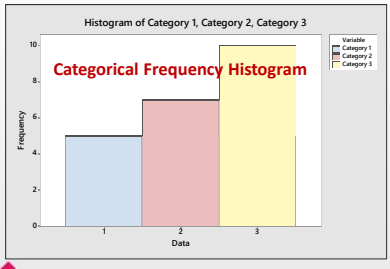
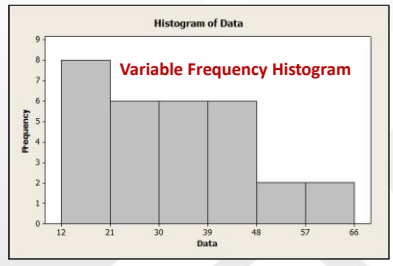
Check Sheet Example: Frequency Histogram

This graph uses the vertical columns to show how often an event (e.g., logical category of activity) or a data point (e.g., frequency of occurrence a specific quantity) appears in a specific data set. Histograms may be constructed for either categorical data (e.g., counting the number or repetitions of a labeled activity) or variable data (e.g., counting the number of times a specific number or spread of numbers is observed).





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Check Sheet Example: Check List

A sequential list of things to be checked or done. When each task has been completed or its condition satisfied, then it is marked with a status indicate that it has been accomplished or done.

Training preparation checklist:

Training Topic :
Training Date :
Participant : Department/Division/Branch
Location :
Project Officer :

No	Item	Specification	Quantity	Status	Remark
A	**Trainer**				
1.	Invitation Letter				
2.	Confirmation				
3.	Transportation				
4.	Accommodation				
B	**Participant**				
1.	List				
2.	Invitation Letter				
3.	Confirmation				
C	**Officer**				
1.	Assignment				
2.	Transportation				
3.	Accommodation				
D	**Venue**				
1.	Location				
2.	Chairs				
3.	Coffee Break				
E	**Support**				
1.	Projector				
2.	Sound System				
3.	Laptop				
4.	Training Kit				
5.	Training Material				
6.	Certificates				
7.	Photo and Video Documentation				
F	**Administration**				
1.	Guest Book				
2.	Participant List				
3.	Name Tag				
3.	Participant Profile Form				
3.	Feedback Form				

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Quality Records – describe what has been done.

Quality records provide ***documented evidence*** that processes and procedures have been executed according to the plan as described in work instructions or other documents that define work to be completed and what methods are to be applied. This includes such information as completed check sheets, audit and inspection results, measurement system calibration records, as well as the data sheets that are observations of this work.

Examples of quality records includes: ***proof of performance*** for specific tests, completed inspection records, history of equipment maintenance, calibration, employee training, and skills demonstration. Such quality records may be required for retention and inspection by external auditors.

Organizations must ***establish policies for what records must be maintained, how long the records must be retained, and how to dispose of records when they are no longer required.***

Quality records require support of a documentation management system.

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GLOBAL PLATFORM FOR QUALITY

Traceability in actions is a quality requirement.

Traceability is the capability to be able to trace somethings according to its historical record, location, or application by means of a documented record.

Traceability is enabled by unique marking or sequence code (such as a date-time-group) or serial number.

In a production environment, it enables the ability to trace products across the supply chain from the point where they are raw material to the point where a finished product has been delivered to the end customer. Each activity as well as the physical ingredients of a product are traceable to a specific deliverable which permits notification of product concerns to be issued to any individual who has received an affected product. Such product concerns may be related to safety or environmental issues or to quality problems that require a form of intervention for corrective action.

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Documentation management – basic quality process:

Documentation management systems are the set of procedures that are used to ***identify, collect, index, file, store, maintain, access, and dispose of quality records*** based on the organization's policy for quality record management and retention.

A Quality Management System (QMS) is a ***formalized system to document processes, procedures, and responsibilities for achieving quality policies and objectives.*** A QMS helps coordinate and direct an organization's activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis. A well-designed QMS will:

- Meet customer and regulatory requirements (e.g., food safety).
- Meet organization's quality objectives by providing products and services in the most cost- and resource-efficient manner, creating room for expansion, growth, and profit.

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CLASS DISCUSSION:

In the value chain of your team's project, where there is the biggest need for Work Instructions? How about for Quality Records?

Work Instructions	Quality Records

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Global Platform for Quality

Quality Assurance

Lecture 4: Assuring Compliance to Standards & Conformance to Requirements

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – QUALITY ASSURANCE:

- Lecture 1: Understanding Assurance of Quality
- Lecture 2: Product Acceptance Testing
- Lecture 3: Documentation and Record Management
- **Lecture 4: Assuring Compliance to Standards & Conformance to Requirements**

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What does compliance to standards require?

- Knowledge of which standards are required in targeted commercial markets.
- Knowledge of which standards are applicable to a specific enterprise.
- Understanding requirements imposed by compliance to these standards.
- Design of a quality management system that complies with requirements of applicable quality system standards.
- Development of quality assurance practices that document the performance of the quality management system to assure it compliance to standards.
- Conduct regular self-inspections and audits to assure constant compliance.
- Certify the quality system by third-parties as required for market acceptance.

Imperative:

Certify the production processes to global quality standards in order to gain market access and assure confidence!

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GLOBAL PLATFORM FOR QUALITY

What does conformance to requirements require?

- Discover which customers have what requirements of your organization.
- Identify the boundary conditions within which performance must be kept.
- Translate performance requirements into testable product specifications.
- Design products and productive processes to comply with requirements.
- Create a testing strategy for assuring requirement conformance.
- Develop test plans (sample size and frequency) to document compliance.
- Develop product-level quality control plans to assure ongoing compliance.
- Conduct in-production functional and quality tests and periodic reliability audits to assure conformance and provide early detection of any issues.

Imperative:

Qualify product performance to critical industry-wide requirements in order to provide objective evidence that increases consumer confidence!

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What is a "Check Point" in a work process?

Check Point: a location (e.g., the point or stage in manufacturing) where the critical-to-quality characteristics of a product or process may be measured to evaluate the quality progress or degree of control that has been achieved in producing the product.

Typical check points may occur at receiving inspection of raw materials; at the functional test of product performance; at process bottlenecks where the flow rate or physical characteristics may be measured (e.g., temperature, pressure, density, pH, flow rate, etc.); or at specific workstations where operators may perform a self-check of their work (e.g., evaluating torque on fasteners or the progress in performing a checklist).

If a check point not only takes a measurement of a critical production factor, but also has an ability to adjust the in-process performance to manage output, then that point could be called a "***Control Point***" (e.g., where a flow meter has been teamed up with a valve that adjust the rate of flow for a fluid).

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GLOBAL PLATFORM FOR QUALITY

Three steps toward assuring excellence in work flows:

Toyota Rule #1: "All work shall be highly specified as to content, sequence, timing and outcome." Standard work defines all the activities in a Daily Management System.

~ Steven Spear and H. Kent Bowen, "Decoding the DNA of Toyota Production System," ***Harvard Business Review***, September-October 1999.

Understand: The first step toward improvement is to gain an understanding of the current way of working. This is a "study" step and summarizes the work we have been doing in the first sessions of our lean development program.

Document: The second step is to document the process as we eliminate waste that was observed between all of the process steps that we have examined.

Simplify: The third step is to work in each process step to streamline and simplify work activities by eliminating those conditions that lead to losses or inefficiency in the ways that work is accomplished and to safeguard work activities so they do not revert to bad behaviors discovered in the past.

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How does self-inspection differ from internal audit?

Self-Inspection: Assesses own process activities or area of responsibility to see if it is in compliance with standard work and best practice. It evaluates the full operating system from every perspective to discover potential faults, flaws, or weaknesses in the system as well as to identify areas to prevent problems.

Internal Audit: Evaluates the controls put in place to assure that processes and critical operations are in compliance with laws, regulations, procedures, and the documented quality standards. Internal audits are conducted by a team of auditors who are managed independently from the organization or process that is being audited. This audit focuses on risk assessment, management of controls, and identification of opportunities for improvement. It provides an objective assurance of the organization's approach to pursing its objectives.

The ***difference between self-inspection and internal audit*** is that the person conducting an Internal Audit is independent and not responsible for the area being audited. The Self-Inspection is conducted by the responsible party.

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How does internal audit differ from external audit?

Internal Audit: An evaluation of the control mechanisms that have been put in place to direct the performance of people in a process and assure that events proceed as planned. Internal audit is conducted using an audit checklist and it may emulate the process used by external auditors. The team conducting the internal audit must be independent of the management structure of the group that is being audited.

External Audit: An independent third-party residing outside the organization being audited which checks if the organization's internal procedures follow the accepted practices, assures that internal records are complete and accurate, and certifies that an organization's records present a fair and accurate account of the organization's performance or position.

The key difference between internal and external audit is the degree to which the team conducting the audit is independent of the organization.

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What is the difference between self-inspection and audits?

	Self-Inspection	Internal Audit	External Audit
Compliance to what?	Standard work and best practices	Laws, regulations, quality standards	Laws, regulations, quality standards
Performed by whom?	Responsible people of the work area	From same organization, but from different area	Third party organization

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CLASS DISCUSSION:

- In your value chain, what kind of check items exist for self-inspection and audits?

Self-Inspection – Check Item	Audit – Check item

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Global Platform for Quality

Q102 – Quality Control

Instructor: Gregory H. Watson, PhD, EUR Ing

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QUALITY 102: QUALITY CONTROL

While Quality Assurance maintains performance above standard and manages outcomes to achieve a minimal level of results as defined by customers for a competitive market, Quality Control ratchets performance a level higher to consistently deliver at an acceptable quality level within boundary conditions set by the process capability. Control assures consistency of outcomes at a level of results that has been targeted based on market conditions to assure competitiveness in markets. The combination of mastery of Quality Assurance (QA) and performance in the band of Quality Control (QC) should lead an organization to an ability to obtain certification to ISO9001:2015. QC introduces new elements that are added to the QA program including statistical methods for work, process analysis and reporting, as well as development of in-process feedback and activities that correct performance during the operational processes (whether the productive system creates products or services) through intervention of the people in the process. QC is the necessary, but not sufficient, quality activity for entry into global competitive markets.

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Joseph M. Juran on "Quality Control"

"***Quality Control*** prevents things from getting worse – this includes putting out fires."

~ Juran's Quality Control Handbook, 4th edition, 2.7

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Global Platform for Quality

Quality Control

Lecture 1: Understanding the Meaning of Control

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EDUCATIONAL PROGRAM – QUALITY CONTROL:

- **Lecture 1: Understanding the Meaning of Control**
- Lecture 2: Bands of Tolerance for Levels of Control
- Lecture 3: Quality Control Plans
- Lecture 4: Statistical Quality Management

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How does Quality Control operate in a process?

Quality Control (QC) monitors performance of products in the production process to: assure integrity of the production process; procedures followed standards; and that results meet the quality criteria. QC operates by careful operational planning, use of proper equipment and inspection procedures, and application of corrective and preventive action to maintain compliance to defined requirements. QC tests completed products to specifications.

Corrective actions are implemented in response to: customer complaints, unacceptable levels of product non-conformance, issues identified during an internal audit, as well as adverse or unstable trends in product and process monitoring such as would be identified by statistical process control (SPC). They take immediate action to halt the flow of defective products to customers.

Preventive actions are implemented in response to the identification of potential sources of non-conformity and assure that the root cause issues are permanently removed from the productive process.

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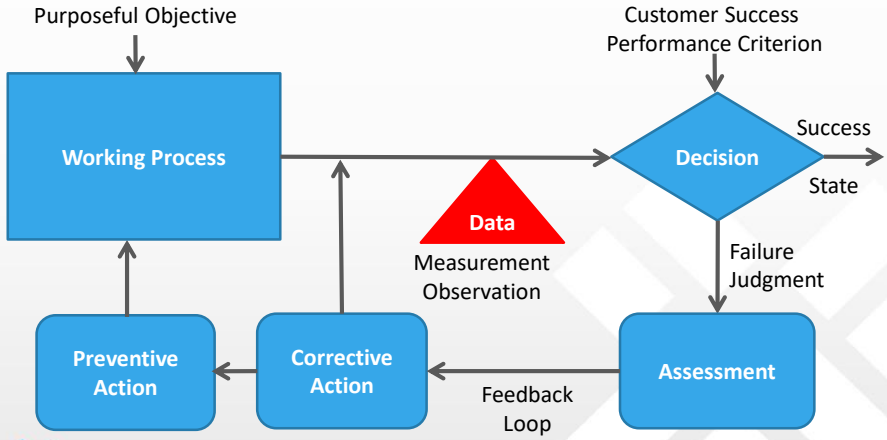
CAPA – Monitoring data & controlling feedback loops:



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Quality Control applies corrective action to defects:

Corrective Action: An action that removes an undesired condition. The purpose of corrective action is to inhibit the transfer of any detected defect problems from the company to the customer and prevent its recurrence. This has three tasks:

Preliminary tasks: testing or measurement, sorting, and quarantine. The benefit of this set of tasks is that they interrupt the stream of defective products from reaching the external customer and isolate the failure costs internally.

Subsequent tasks: rework or repair and scrapping or salvaging remaining defective items. The benefit from these tasks is that the residual value that is lost in the defective products is retrieved for inclusion in the product flow. Additionally, the reclamations that are negotiated with suppliers for defective parts help to decrease the losses from repair and service of the defectives.

Inhibit problem recurrence: identifying the root cause of a problem and remedial actions that fix, rectify, or eliminate the cause of the non-conformance.

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QC applies preventive action to potential problems:

Preventive Action: Change that is made to address a management system flaw or weakness that is not yet responsible for producing failures or causing any nonconformity in delivered product or service. These actions may come from a process of mistake-proofing to safeguard production processes or suggestions that are made regarding opportunities for improvement by employees or from customers. Preventive actions address technical requirements of methods in the productive process and may focus on preventing non-conformities or in improving process efficiency.

Prevent Non-Conformities: Whenever a change is made in product design or in its process of production, plans for corrective action should be initiated to reduce risks due to the change.

Improve Process Efficiency: production maintenance activities are conducted to assure continuity of production and increase efficiency by eliminating the risk of loss from production interruptions.

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What should you do with a customer problem?

- First, **define and diagnose the problem**: diagnosis is complete when the root causal system has been discovered and it is possible to evaluate the contribution of potential causes to the problem observed in the dependent variable.
- Second, **contain the problem**: containment is considered to be effective when the problem is no longer spreading to have an effect on additional customers.
- Third, **correct the problem:** corrective action is considered to be effective when the problem is no longer occurring.
- Finally, **prevent the problem recurrence:** preventive action is effective if it is no longer possible to generate the problem.

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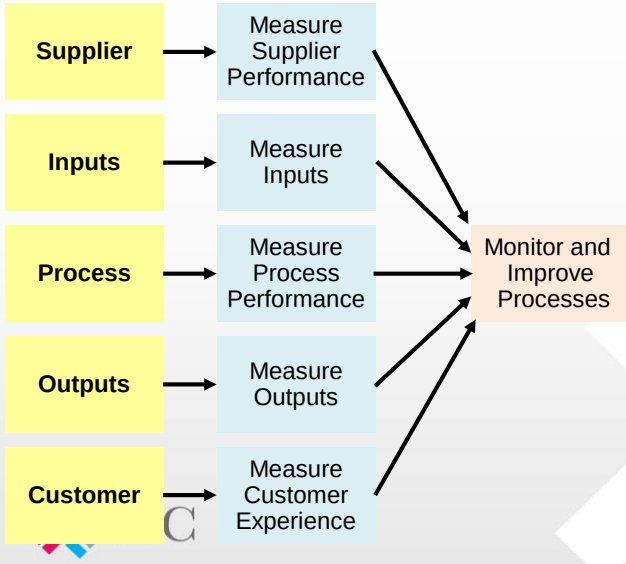
Process Characterization



Step 1 – Key Activities:

- Define expectations in customer's experience
- Determine contribution capability of suppliers
- Determine quality level of process inputs
- Determine performance capability of process
- Monitor performance of process throughputs
- Track performance of process deliverables
- Determine degree of process contribution to customer satisfaction

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How do you initiate the CAPA process?

- Describe the process deliverables in terms that are meaningful to the ultimate customer (critical to customer satisfaction (CTS).
- Understand physical process performance and define outcomes that are critical to quality (CTQ) for its key results indicators of quality.
- Determine what measures are meaningful for daily management of the process and are tied to outcome measures that deliver value to customers (establish Y = f (X) relationships).
- Establish measurement system integrity – define key terms operationally:
  - Are your key measurement systems capable of detecting changes that are important to customers;
  - Are standard service levels agreed with customers for key performance measures;
  - Have sensitivity studies been performed to understand the degree of impact from variation in key input measures (CTQ – X's) on critical to satisfaction (CTS) measures of performance outcomes (Y's); and
  - Are business controls in place to manage performance variation that can be normally expected based on the inherent process capability?

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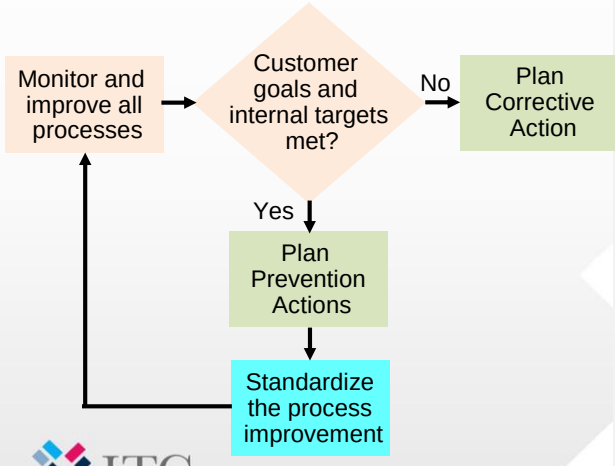
Problem Identification



Step 2 – Key Activities:

- Continuously monitor performance indicators against expectations
- Evaluate operational results – is process improvement needed?
- If a process does not meet customer goals or internal targets, then plan corrective action.
- If a process meets goals, is it economical, efficient and effective?
- If not, plan preventive improvement actions.
- Standardize all process improvements.

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Corrective Action

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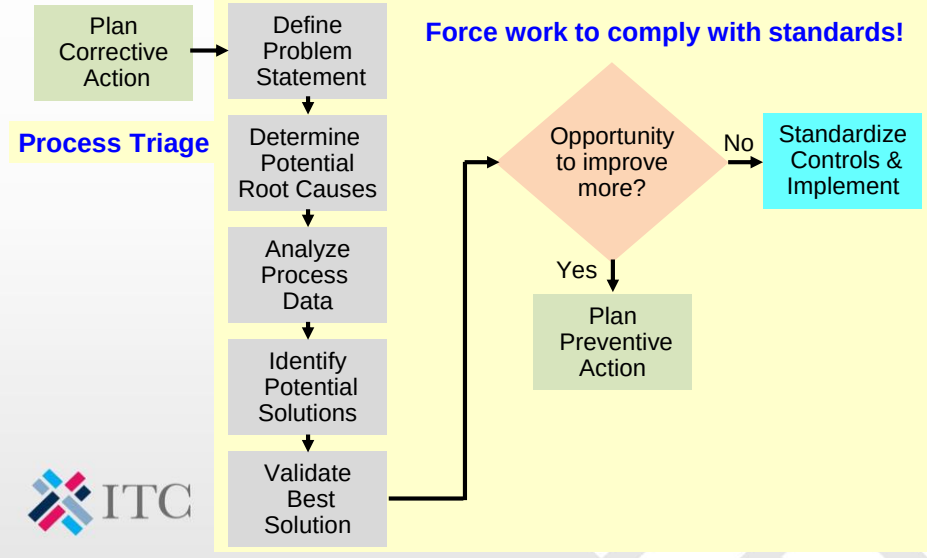

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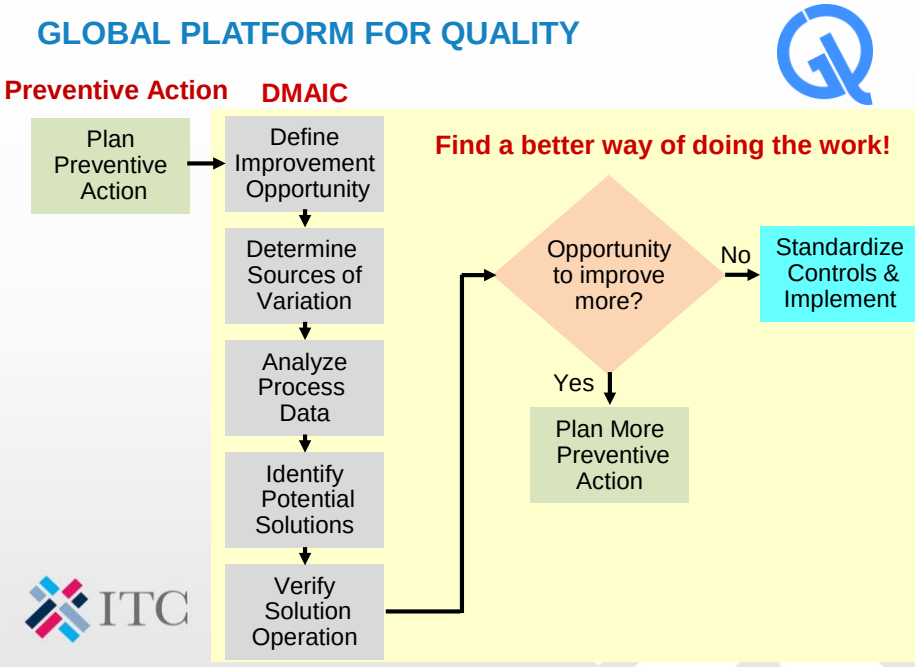

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How do we distinguish "assurance" from "control"?

- The terms ***Quality Assurance (QA)*** and ***Quality Control (QC)*** are often used interchangeably referring to the quality of product, service, or process. This occurs because of the multiple definitions for the words "assurance" and "control." For example, "control" can mean an evaluation to indicate a need for corrective responses or the act of guiding the process to a desired state, or the state of a process in which the variability is attributable to a constant system of chance causes.
- To eliminate this confusion and distinguish between these terms, a model of quality activities as a function of process performance for critical quality characteristics can help to separate the areas of focus for activities within a quality management system.
- The model was first developed by Dr. Kaoru Ishikawa as a means to define the responsibilities of the various quality management functions.

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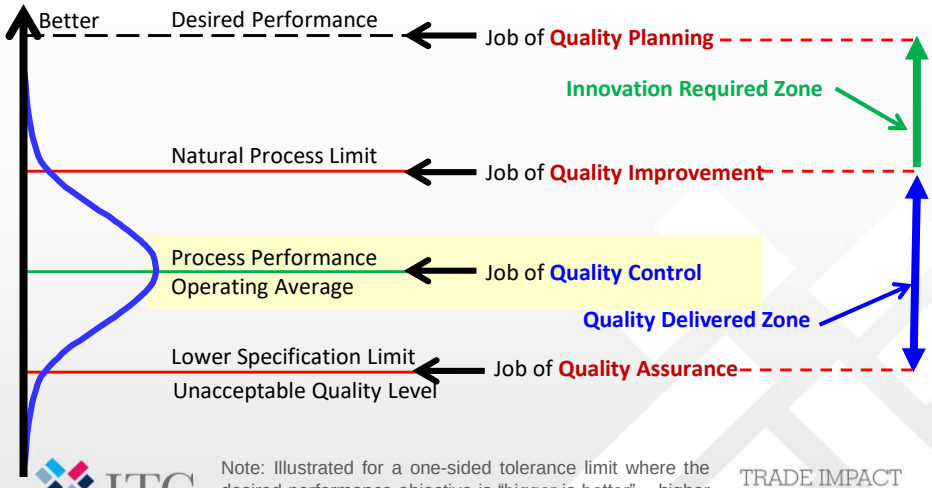
A systems perspective of "Quality Control".



Note: Illustrated for a one-sided tolerance limit where the desired performance objective is "bigger is better" – higher performance above the lower tolerance limit is desirable.

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CLASS DISCUSSION:

- CAPA activities will occur in response to customer feedback. List three different types of corrective and preventive actions that occur in the value chain of your team's product.

Corrective Actions	Preventive Actions

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Quality Control

Lecture 2: Bands of Tolerance for Levels of Control

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – QUALITY CONTROL:

- Lecture 1: Understanding the Meaning of Control
- **Lecture 2: Bands of Tolerance for Levels of Control**
- Lecture 3: Quality Control Plans
- Lecture 4: Statistical Quality Management

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What does "control within limits" actually mean?

What types of limits may be considered?

- ***Natural Process Limits***: the total range of performance that is observed for a performance indicator without any external intervention.
- ***Specification Limits***: the range in performance within which a customer will tolerate deviations in performance but outside which the customer will no longer tolerate as acceptable performance. The limits are imposed externally.
- ***Process Control Limits***: the band of performance around the average (mean) value of performance as measured over a sufficient period of time where all the significant factors influencing performance have an opportunity to act on the process. The width of this band is about +/- three standard deviations of the process measurement.
- ***Process Alert / Action Limits***: performance limits that, when exceeded, the process operator may intervene to adjust the process to maintain control.

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How do these performance limits differ?

- ***Natural Process Limits vs. Specification Limits***: Natural process limits are the maximum and minimum performance boundaries of a process while specification limits reflect that band of performance which is acceptable to external customers
- ***Specification Limits vs. Process Control Limits***: While Specification Limits set absolute performance boundaries for a process as designed, Process Control Limits define the range where process control can be statistically established and the process has a high probability of predictive operation. Within these limits a process is not being operated upon by any special causes of process variation.
- ***Process Control Limits vs. Process Action/Alert Limits***: Process Action/Alert Limits occur within the boundaries of Process Control Limits. These limits provide a sign to operators that they may consider adjusting the process to ensure that it continues to operate within the Process Control Limits.

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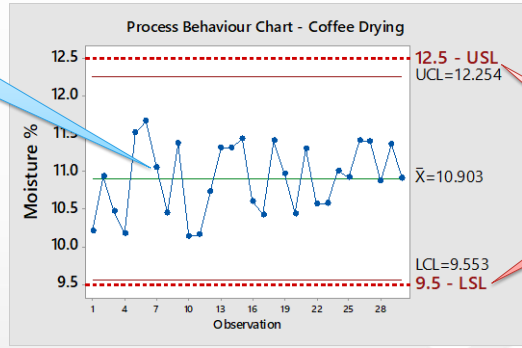
Natural Process Limits vs. Specification Limits:

Natural Process Limits



Specification Limits

Natural process limits are the ***maximum*** and ***minimum*** performance boundaries of a process while **specification limits** reflect that ***band of performance*** which is acceptable to external customers

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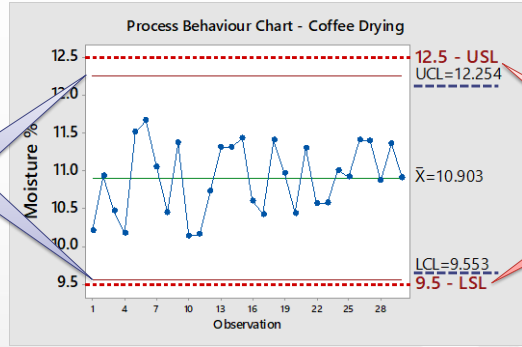
Specification Limits vs. Process Control Limits:

Process Control Limits



Specification Limits

While **Specification Limits** set absolute ***performance boundaries*** for a process as designed, **Process Control Limits** define the ***range*** where process control can be ***statistically established*** and it has a high probability of predictive operation. In these limits a process is not being operated upon by special causes of variation.

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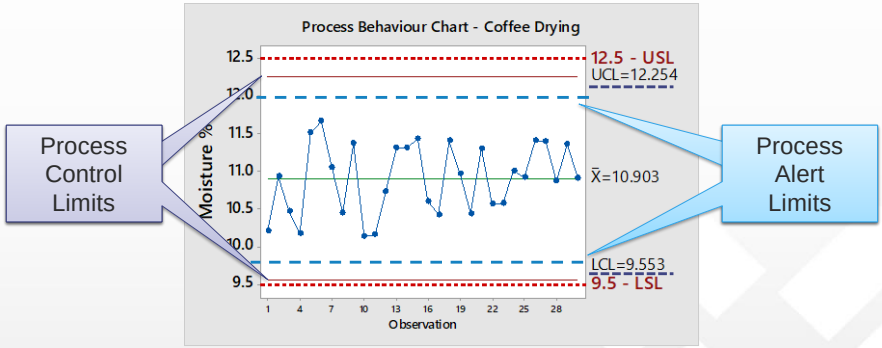
Process Control Limits vs. Alert/Action Limits:



Process Alert/Action Limits occur ***within the boundaries*** of **Process Control Limits**. These limits signal to operators that they may consider adjusting the process to ensure that it continues to operate within Process Control Limits.

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How are Specification Limits developed?

Specification Limits are assigned to the quality characteristics of a product or a process in an attempt to reduce the distribution of performance characteristics to a useful range. However, these limits are not part of the natural variation of the process but are arbitrary limits of performance set according to opinions of customers. There is no implied performance gradation: any performance inside these limits is considered equally good and everything outside the limits is bad.

Methods to set limits are listed in order of preference:

1. Set specification limits using transfer functions and margin analysis.
2. Set specification limits based on statistical distributions and analysis.
3. Set tolerances based on a worst-case margin analysis.
4. Set tolerances based on a percentage of the mean (e.g., ± 10% or ± 20%).
5. Guess at tolerances and set arbitrary limits.
6. Set no tolerances or targets: quality requirements are vague or undefined.

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How are Process Control Limits developed?

Process Control Limits are set based upon the analysis of a substantial sample of process output (e.g., 100 or more observations). These limits are typically set at a distance that is located at ± 3 standard deviations of the mean or process average for this measured data. This performance band will include at least 95% of the data when the performance measure is operating in a state of statistical control.

Control limits describe what a stable process is capable of producing (this result is often called "***the voice of the process***") while tolerance limits or specification limits describe how the process should operate to meet the customer's agreed expectations for performance (which is called "***the voice of the customer***").

Process observations ***describing the behavior of a process*** as either consistent or predictable or stable indicate that it is operating in a state of control, while a description of the opposite characteristics identifies a process as Out-of-Control and not capable of producing results within the Process Control Limits.

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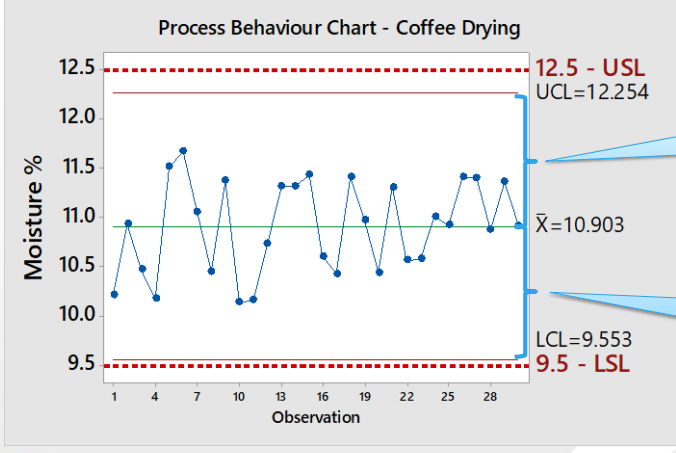
How are Process Control Limits developed?



Average + 3std*

Average - 3std*

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*std = standard deviation

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How are Process Action Limits developed?

Action Limits, also called "***Alert Limits***," define the boundary conditions that force decisions on process operators to take preventive action that will contain process change within the acceptable range of performance. These types of limits should be set with respect to the Process Control Limits to give warning that the process is approaching the boundary condition.

Frequent changes of process operating characteristics leads to a condition that is called "**tampering**" where the causal system is upset by frequent retuning of process performance characteristics (e.g., equipment operating characteristics or set points). Tampering results in increasing the overall process variation and does contribute to creating a stable, predictable process that is operating in a state of statistical control.

Therefore, action limits (or alert limits) should be used with great care so that process degradation does not occur as a result.

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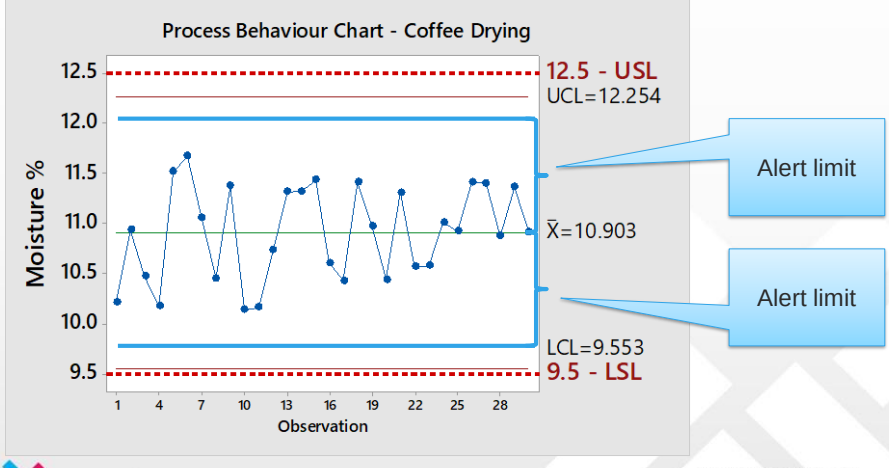
How are Process Action Limits developed?



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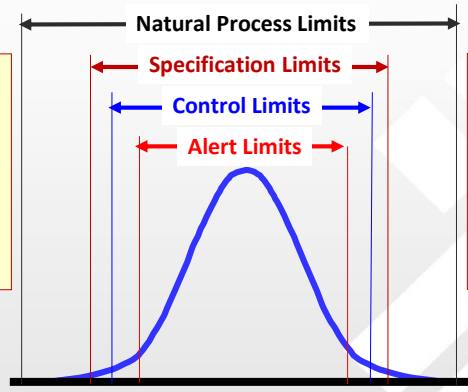
Illustrating contrasts in process performance limits:

Process limitations identify points in the performance range where a process owner or manager may apply decision rules about the operating conditions to assure performance stability within the limits. However, there are conflicts in the way these limits are applied and resulting stability a process can achieve:

Limits set using specifications must be outside the process control limits to assure stable process quality.



Only management rules that are set to manage process performance with respect to control limits can result in a stable process.

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CLASS DISCUSSION:

- Identify three examples of specification limits within the value chain of your team's process. How would you classify them: maximum (Bigger is Better), minimum (smaller is better) or average (Nominal is best)?

Specification Limits	Type of limit (Maximum, Minimum, or Average)

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Quality Control

Lecture 3: Quality Control Plans

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EDUCATIONAL PROGRAM – QUALITY CONTROL:

- Lecture 1: Understanding the Meaning of Control
- Lecture 2: Bands of Tolerance for Levels of Control
- **Lecture 3: Quality Control Plans**
- Lecture 4: Statistical Quality Management

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What is a Quality Control Plan?

What information is contained in a Quality Control Plan?

- Specifies desired quality characteristics of the output for a process;
- Defines the measurements that quantify it;
- Describes the sampling plan (size and frequency of sampling) necessary;
- Identifies the action limits where operator decisions about adjustments for process settings must be made; and
- Characterizes the set of countermeasures that must be implemented for the process to remain in control and sustain the desired performance output.

Who should develop the Quality Control Plans?

- Developed by a qualified quality engineer with knowledge of statistics.

How can a Quality Control Plan support the daily management system?

- Provides useful information for future training or trouble-shooting; and
- Needs to be a controlled document that is kept current with respect to any process or product changes.

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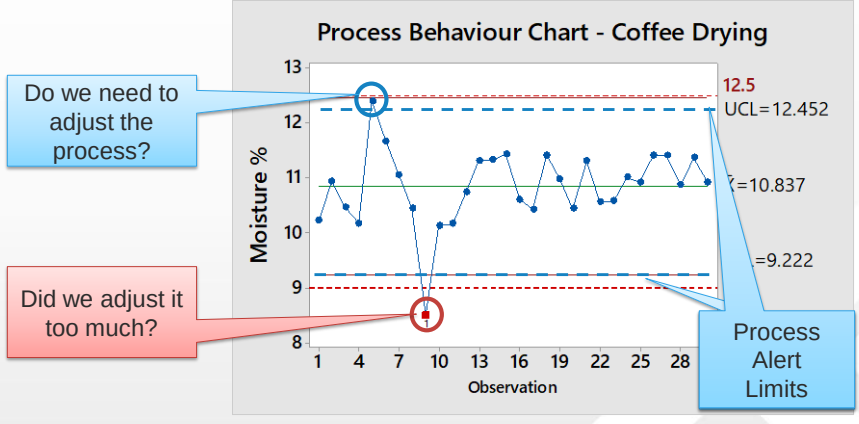
What is a Quality Control Plan?



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Process control plans help us to design and communicate when to act how to act when process changes

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GLOBAL PLATFORM FOR QUALITY

How is a Quality Control Plan structured?

Critical Parameter Identification:

Process	Activity	Task	Critical to Satisfaction		Quality Characteristic	Specification Requirement		
			KPIV	KPOV		LSL	Target	USL

The critical parameter identification locates quality measurements to a specific task within the process; defines the type of variable (as a Key Process Input Variable (X-measure) (KPIV) or Key Process Output Variable (Y-measure) (KPOV) and the quality characteristic it defines (e.g., physical characteristic such as dimension or chemical composition); and establishes the specification limits and target for its performance (Lower Specification Limit (LSL) or Upper Specification Limit (USL).

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How is a Quality Control Plan structured?

Measurement System Specification:

Measurement Method	Measurement Capability	Sample Size	Sampling Frequency	Who Measures	Where Recorded	Last Calibrated

The measurement system specification identifies the means by which the KPIV or KPOV measure is taken; the capability of this measurement system to accurately represent the indicator (e.g., by conducting a Gage R&R or Attribute Agreement Analysis); the sample size and sampling frequency for making observations; the identity of the person responsible for taking measurements (by job title or process step); where the data is recorded; and an indication of when the measurement device was last calibrated.

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How is a Quality Control Plan structured?

Response Characterization:

Action Limit	Decision Rule	Countermeasures	SOP Reference

The response characterization portion of a control plan identifies the magnitude of the limit for creating an alert or indicating that taking should be taken: the decision role to apply regarding the action; defines the countermeasures that should be taken as a way to correct the detected deviation from the alert/action limits; and references the Standard Operating Procedure (SOP) where additional information is available.

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Definitions of Quality Control Plan terminology:

- ***Key Process Input Variable (KPIV)***: a process input variable that demonstrates a significant influence on the variation of the process output quality.
- ***Key Process Output Variable (KPOV)***: a process output variable that has a very significant impact on its performance, efficiency, or customer satisfaction.
- **Upper Specification Limit (USL)**: The upper boundary condition of acceptable performance according to the performance agreement with a customer.
- ***Lower Specification Limit (LSL)***: The lower boundary condition of acceptable performance according to the performance agreement with a customer.
- ***Standard Operating Procedure (SOP)***: A standard operating procedure is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

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Control Plan Example: Coffee Bean Drying

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Control Plan Example: Coffee Bean Drying

Critical Parameter Identification:

Process	Activity	Task	Critical to Satisfaction		Quality Characteristic	Specification Requirement		
			KPIV	KPOV		LSL	Target	USL

Measuring moisture content after drying

- Temperature
- Time
- Thickness of bead

Moisture content of beans

Nominal

9% | 10.75% | 12.5%

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Control Plan Example: Coffee Bean Drying

Measurement System Specification: Moisture Content

Sampling method: Random – picking from different parts of bed

Measurement Method	Measurement Capability	Sample Size	Sampling Frequency	Who Measures	Where Recorded	Last Calibrated

Moisture meter

0.1%

5-10

Every two hours

Dryer*

Record sheet

TBD

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*The dryer is the job title assigned to the person who is operating the drying station.

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Control Plan Example: Coffee Bean Drying

Response Characterization:

Action Limit	Decision Rule	Countermeasures	SOP Reference

Above 12.5%

Dryer can decide

Continue drying

…

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CLASS DISCUSSION:

- Quality Control Plans (QCP) may be complicated or simple, but they must be well-defined and supported by measurement systems that indicate if and when ***Out-of-Control (OOC)*** conditions occur. What are three examples in your project work?

Control Plan Element	Example from Project

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Quality Control

Lecture 4: Statistical Quality Management

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EDUCATIONAL PROGRAM – QUALITY CONTROL:

- Lecture 1: Understanding the Meaning of Control
- Lecture 2: Bands of Tolerance for Levels of Control
- Lecture 3: Quality Control Plans
- **Lecture 4: Statistical Quality Management**

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What is Statistical Quality Management (SQM)?

Statistical Quality Management (SCM): applies statistical methods to determine quality and process performance capability at critical "touchpoints" in a process.

Process quality is evaluated by analyzing how a product changes across the steps of its production process as it transitions from raw material to final deliverable for customers. Statistics must be used at each process step to assure quality.

SPM describes a set of methodologies used for process control that:

- Identify the most critical factors to be managed;
- Assure the measurement system is able to detect significant deviations;
- Calculate tolerances based on the statistical performance of the process;
- Monitor process performance to assure that the process is predictable (producing common cause variation that is within the desired limits); and
- Evaluate performance using customer criteria to assure acceptable results.

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Developing statistical control of processes:

Critical Parameters → Reasonable Tolerances → Properly Measured → Effectively Monitored

Statistical control of a process requires four sequential decision-making stages:

1. ***Critical Parameters***: Critical-to-Quality (CTQ) characteristics are chosen to assure final performance to customers.
2. ***Reasonable Tolerances***: Tolerances are established based on risk and the process capability to perform within boundary limits.
3. ***Properly Measured***: Measurement systems have integrity and satisfy the criteria for sound measurement systems.
4. **Effectively Monitored**: process sample size and frequency is adequate to detect the periodic effects from all known sources of variation.

When these conditions are met then a possibility of effective process control is obtained: monitoring the process to assure that special causes of variation do not create instability in the process or excessive deviation in its performance.

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Developing Statistical Control for Coffee Bean Drying:

Critical Parameters	Reasonable Tolerances	Properly Measured	Effectively Monitored
What is critical-to-quality?	What would be target performance? (creation of specifications)	How do we measure it?	What we do with the measurements?
Moisture %	9 – 12.5%	?	Control plan

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What can be learned from a process measure?

- **Goodness**. Usually we have an idea of what is good and what is bad – this can be expressed as a set of rules about the goodness of the measure – is a performance measure better if it is bigger or smaller or more consistent?
- **Operating Range**. Targeted range within which to control performance.
- **Limits of Performance**. Maximum and minimum levels or effective range of process performance with respect to its central tendency.
- **Distribution**. Distribution of enumerative data provides a hint as to the type of function that is occurring (e.g., normal, Poisson, uniform, exponential, or Weibull distribution) which provides insight for performance expectation of the operating function over time (e.g. risk analysis); however, it does not indicate what is happening at any precise moment in the product life cycle.
- **Patterns of Change**. Process changes can be detected by observing patterns in a variable's history: clusters of data, excessive variation, data oscillation, insufficient variation, trends in performance over time, or shifts in level.

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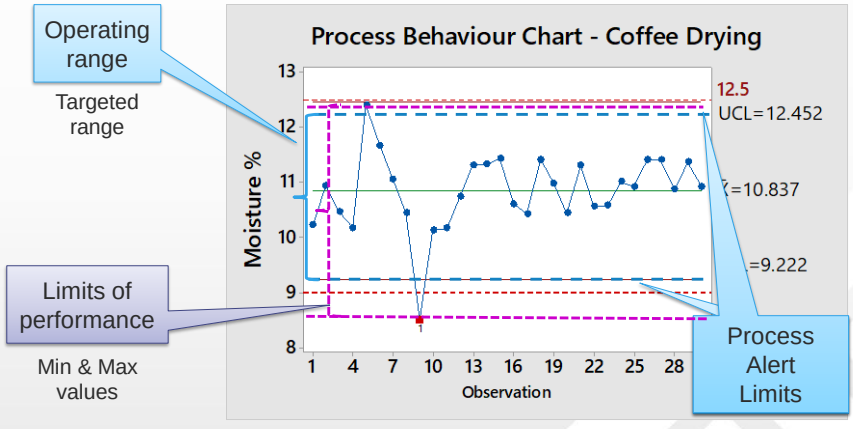
Example from Coffee Bean Drying:



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How does process behavior differ from capability?

Process Behavior: the actual performance of a process as observed through the objective measurement of a Critical-to-Quality parameter over a period of time using a capable measurement process. This measurement perspective will provide an analytical viewpoint of performance in the time domain. Any unusual patterns in these observations indicate presence of a "***special cause***" of variation which may be analyzed and assigned to a specific cause to correct the Out-of-Control condition. When there are no unusual patterns detected in the historical data then the result is a process that is in "***statistical control***" and subject to "***common cause***" variation that is not assignable to a specific cause.

Process Capability: the ability of a process to perform consistently within the valid specification limits agreed upon with customers. This measurement will provide an enumerative viewpoint of the performance distribution function. It describes the cumulative risk of non-performance to requirements and is the ratio between the specification limits and natural process variation.

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What is a "process behavior" chart?

The control that is developed through using a process behavior chart is called ***Statistical Process Control (SPC)*** as these charts are used to manage a control function that is based on observed performance of quality characteristics that are measured over a period of time. Control is maintained with a target set at the central tendency of the observed performance measure and within limits that reflect approximately +/- 3 standard deviations of the measure.

SPC charts were developed in the 1920s by Walter A. Shewhart to monitor the performance of Critical-to-Quality indicators and assure economic control of production so it is predictable within the natural control limits. Tests for deviation of performance based on unusual patterns were developed to indicate conditions when process performance is not behaving within its natural performance conditions but has an external influence or internal inconsistency that needs to be corrected so that the process can operate consistently within these limits.

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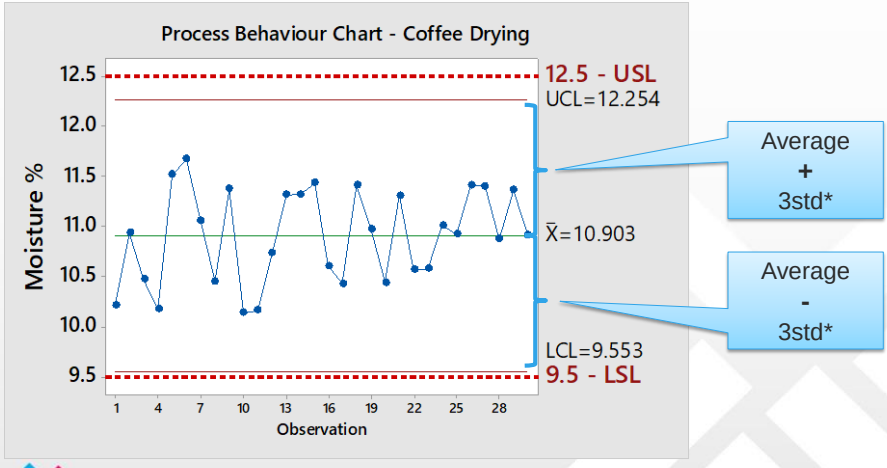
How are Process Control Limits developed?



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What is the logic of a "Process Behavior Chart"?

In a "***Process Behavior Chart***" the horizontal scale is the time order of the data observations (also called the run order) while the vertical scale represents the measurement scale of the. Each observation is plotted as a dot using paired data of time order and measurement magnitude. The dots are then connected between sequential points to illustrate the time history. If the individual data point observations are used then the chart is called an "individuals chart" and if sampled data is first averaged and then plotted then this chart is called an "X-bar" chart with a second letter indicating sample size. Typically two charts are illustrated – one chart illustrates trends in the central tendency while the other illustrates trends in the dispersion around the mean.

The process behavior chart illustrates the normal behavior of the process, but it also can be used to characterize abnormal behavior – variation above and/or below the control limits of the chart indicate excessive variation which is one of the tests that can be used to indicate unusual performance conditions.

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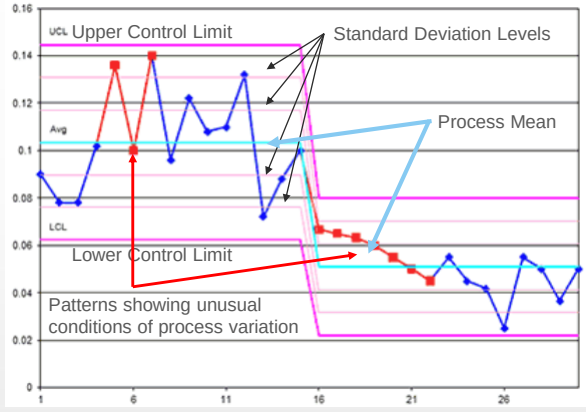
Example of a "Process Behavior Chart":



This process behavior chart shows a process that has 2 significant "special causes" of variation – the first is an indicator that an excessive amount of variation has occurred while the second indicates a shift in process performance where new limits are calculated for the upper and lower control limits.

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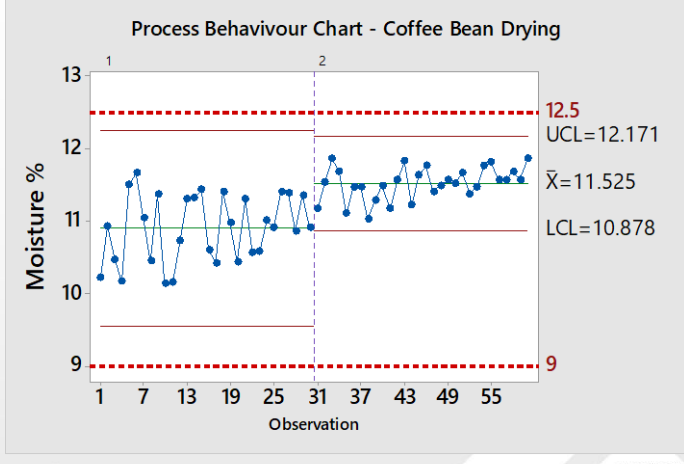
Can you see how the process behavior has changed?



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What is a "process capability" chart?

The control developed using a process capability chart is an ability to understand the state of control of process performance for customer specifications and to establish expectations for long-term performance based upon its past history. ***Process Capability Studies*** indicate the ***design capability*** (maximum) under ideal performance conditions (described as the or ratio of the range that is between the upper and lower specification limits for the same ***Critical-to-Quality (CTQ)*** characteristic as the process behavior chart divided the natural process variation (six standard deviations over the observed historical period). This ***ideal or design capability is labeled Cp defines process potential*** and should be the target for stable operation of a production process. ***Actual process performance is shown by the ratio labeled Cpk*** where the numerator is compared to the average of the process performance. (e.g., upper specification limit minus the mean and lower specification subtracted from the mean). Cpk is also the process capability of the process behavior chart over the same period of time.

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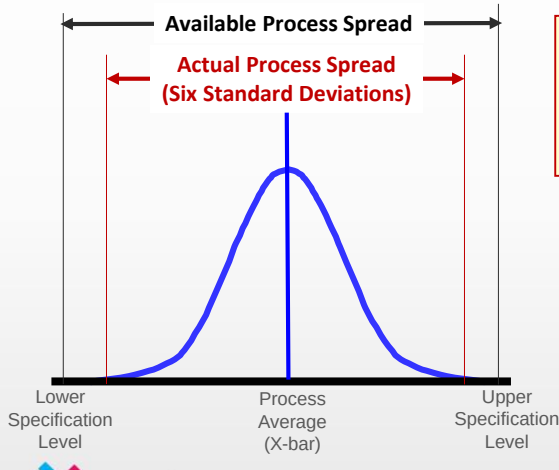
Interpreting a "Process Capability Study:"



$$C_p = \frac{\text{USL} - \text{LSL}}{6\sigma}$$

$$C_{pk} = \min\left[\frac{\text{USL} - \mu}{3\sigma}, \frac{\mu - \text{LSL}}{3\sigma}\right]$$

Capability index for Cp of 1.0 is an indicator that the process is just matching the requirements in a theoretical sense. If Cpk is also 1.0 then there is an exact match to requirements. Most of the time a ratio above 1.33 is required to provide required assurance of process capability.

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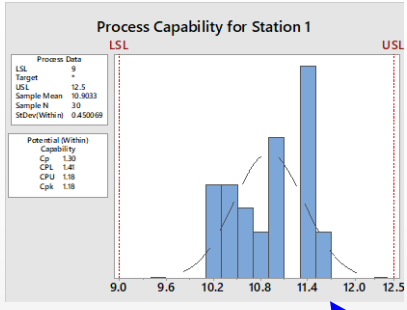
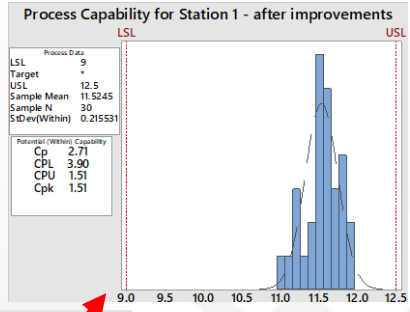
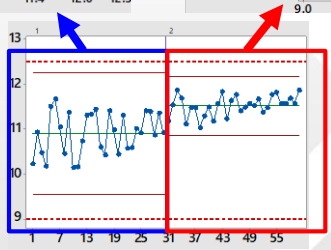
Process Control Charts:







Same specification limits but the process behaves differently in the two time periods!

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CLASS DISCUSSION:

- Managing performance of a process requires knowledge of both its behavior with respect to its natural variation as well as its long-term ability to deliver on customer defined performance requirements.
- Can you identify where and why you would need to apply these methods within the value chain of your process?

Process Capability Chart	Process Behavior Chart

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Global Platform for Quality

Q103 – Quality Improvement

Instructor: Gregory H. Watson, PhD, EUR Ing

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QUALITY 103: QUALITY IMPROVEMENT

Quality Improvement extends performance beyond QC and eliminates risks to elevate the process performance to the highest level of stable design capability that is achievable. Every process design has a limit to its performance based on the requirements that were targeted during its design process (e.g., a hotel designed for three stars needs work before it can qualify for five stars but it can still be exceptional hotel at the three star level). Thus, Quality Improvement increases the capability of performance to maximize results within the constraints of the resources available. If performance is required beyond this level then investment will be required and this need requires an entrepreneurial approach to develop business plans that deliver this capability through the next course on Quality Planning.

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Joseph M. Juran on "Quality Improvement"

"***Quality Improvement*** aims to achieve levels of performance which are unprecedented – levels which are significantly better than any past level. The methodology consists of a process."

~ Juran's Quality Control Handbook, 4th edition, 2.6

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Quality Improvement

Lecture 1: Understanding Quality Improvement

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EDUCATIONAL PROGRAM – QUALITY IMPROVEMENT:

- **Lecture 1: Understanding Quality Improvement**
- Lecture 2: Categories of Improvement
- Lecture 3: The Continual Improvement Process
- Lecture 4: Team Activities in Continual Improvement

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What do we mean by "Quality Improvement"?

Quality improvement is a defined, systematic, formal approach and a deliberate act of management which reflects on the way that past work activities have been performed and continually seeks opportunities to improve their operation by the identification and implementation of projects to increase efficiency, effectiveness and economic performance of work so it can deliver enhanced outcomes to its customers and thereby create value for the organization and society. Anything that creates a beneficial increase in quality performance is quality Improvement.

- Quality improvement requires the "art and science" of process management.
- Quality improvement requires statistics – data-driven and managed by facts.
- Quality improvement requires managing the end-to-end working system.
- Quality improvement requires real-time, real-world information access.
- Quality improvement requires engaged people and a culture of adaptation.

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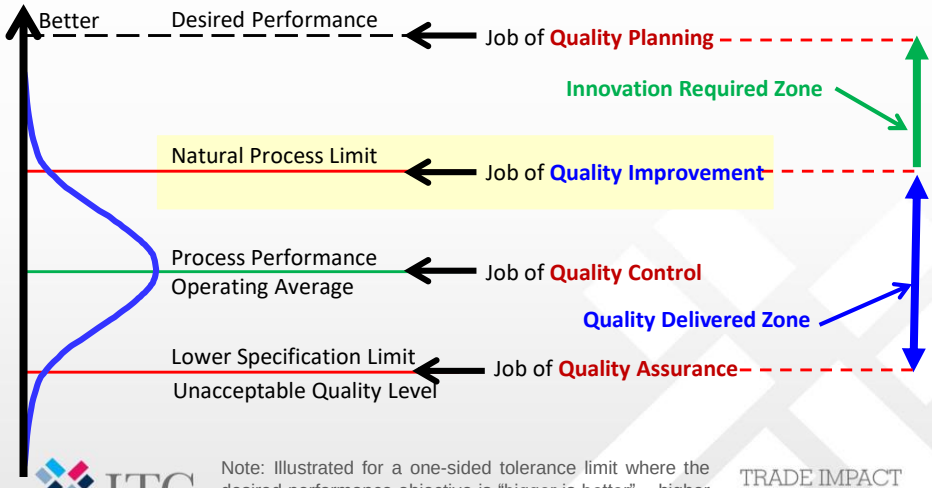
An evidence-based, systems perspective of quality:



Note: Illustrated for a one-sided tolerance limit where the desired performance objective is "bigger is better" – higher performance above the lower tolerance limit is desirable.

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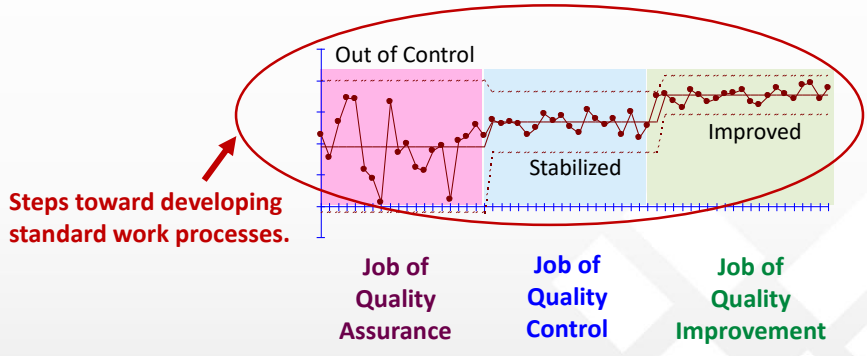
Move from Out-of-Control (OOC) to Improved:



Quality improvement designs and executes purposeful change to increase capability of processes and improve performance of products and services.

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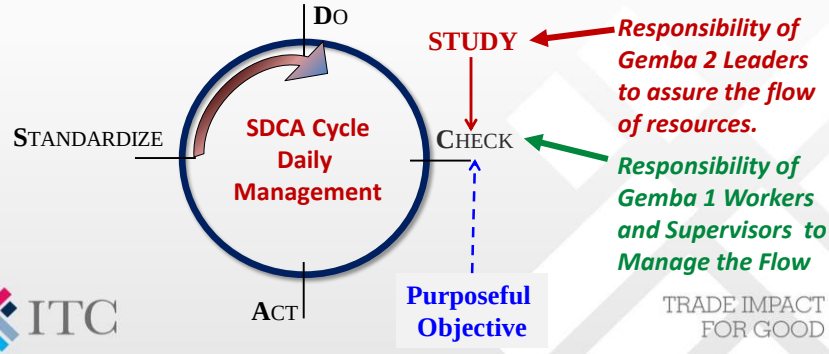
Begin improvement by establishing a work standard!

First, determine what needs to be standardized and then establish the purpose of that standardization. The initial "Study" step that precedes standardization should be focused on understanding the process flow, how value is produced for customers and eliminating waste and loss from the system. It does not pay to standardize a wasteful process that produces losses.



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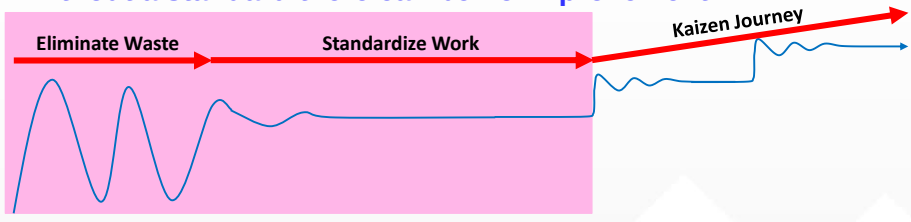
Without a standard there can be no improvement:



First identify waste and then eliminate obvious causes of waste.

- Waste causes process upsets and keeps work from flowing smoothly. Controlling and eliminating sources of waste is a good starting point for improvement.

Then, standardize the process so that the improvement journey can begin.

- The continual improvement journey (kaizen) moves one project at a time toward the increase of capability in the process of managing work.

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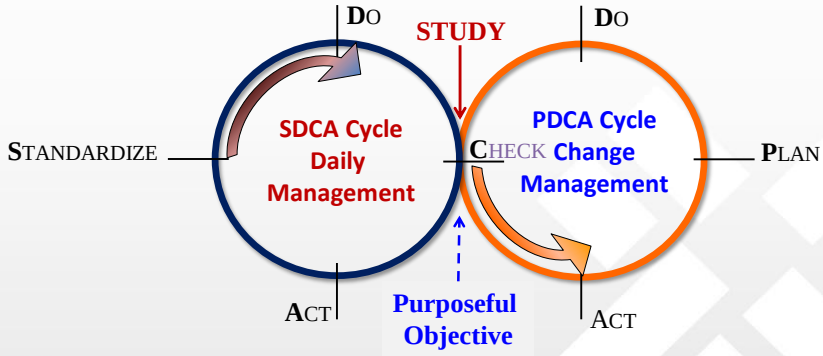
Improvement begins with a single project to advance a standard:

> ***"Without a standard there can be no improvement."***
> ~ Joseph M. Juran



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Distinguishing what is critical to quality & customers:

Critical-to-Quality (CTQ) characteristics of a process, product, or service are the set of factors that assure control and delivery of quality as agreed upon to the customer. CTQ factors need to be maintained in a state of control in order to assure that the specified performance is consistently delivered using stable productive processes. Managing CTQ factors is typically a function of the QA and QC activities of an organization.

Critical-to-Satisfaction (CTS) characteristics of a product or service are the set of factors that deliver marketing features that are desirable to customers and which set a product or service apart from its competition. CTQ factors are deliverable characteristics which customers tend to use as decision points in their commercial choice of a product or service. Many customers tend to place a constant pressure on the improvement of these characteristics – wanting to have more, better, and less expensive for these items. Managing CTS factors is a function that requires quality improvement (QI) activities.

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CLASS DISCUSSION:

- Identifying which process, product, or service factors are CTQ and CTS is an important step in quality management.
- Identify examples of three factors in the value chain of your projects processes that could be classified as CTQ or CTS.

Critical-to-Quality (CTQ)	Critical-to-Satisfaction (CTS)

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Quality Improvement

Lecture 2: Categories of Improvement

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EDUCATIONAL PROGRAM – QUALITY IMPROVEMENT:

- Lecture 1: Understanding Quality Improvement
- **Lecture 2: Categories of Improvement**
- Lecture 3: The Continual Improvement Process
- Lecture 4: Team Activities in Continual Improvement

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Responsibility for Improvement:

- Quality improvement is a responsibility of everyone involved in an organization.
- Workers are responsible for improving the quality of their own work.
- Supervisors are responsible for improving the quality of end-to-end work flows.
- Cross-functional integration is the responsibility of the functional managers.
- Executives are responsible for assuring allocation of resources to improvement.
- The executive in charge must have an unrelenting pursuit of improvement.

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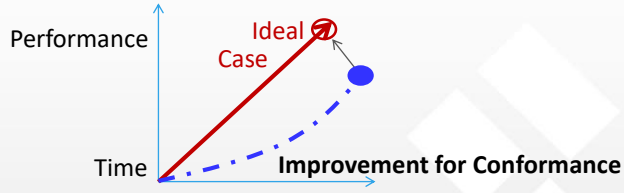
Types of improvement opportunities – 1:

What improvement requirement does your process dictate?

"Backward-Looking Quality" eliminates negatives: defects, losses & inefficiency.



Task: Shift actual to target

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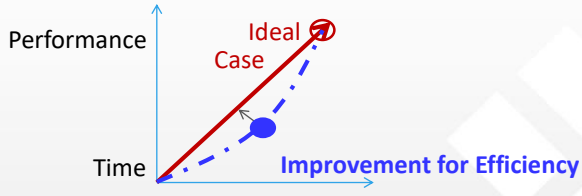
Types of improvement opportunities – 2:

What improvement requirement does your process dictate?

"Backward-Looking Quality" eliminates negatives: defects, losses & inefficiency.



Task: Reduce process variation

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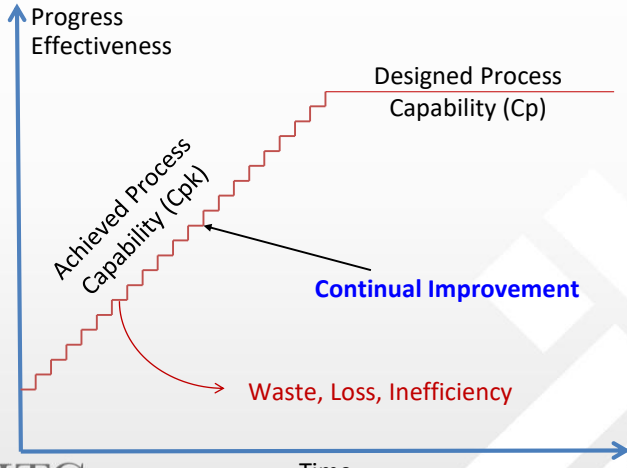
Incremental improvement achieves a local maximum:



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Incremental improvement from evolutionary change:

Incremental improvement, ***kaizen*** or "improvement for the better," is the way that much improvement occurs. The objective is to continually seek out new ways of working that will increase efficiency, effectiveness, and the economic performance of an organization.

This type of improvement focuses on how to change standard work for process designs that are already implemented so that they are performing better than they have in the past. These projects are led from the organization's bottom.

Continual improvement seeks to:

- Stabilize process performance,
- Remove waste and defects,
- Eliminate safety hazards, and
- Maximize process capability, and thereby
- Reduce the costs of operations.

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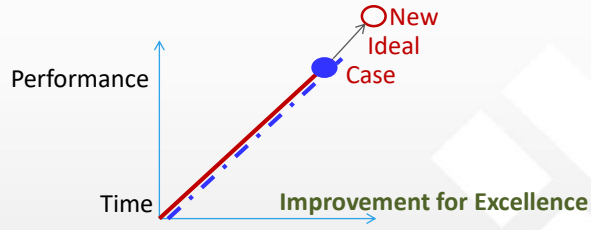
Types of improvement opportunities – 3:

What improvement requirement does your process dictate?

Forward-Looking Quality: builds on positive and creates new value.



Task: Expand process capability

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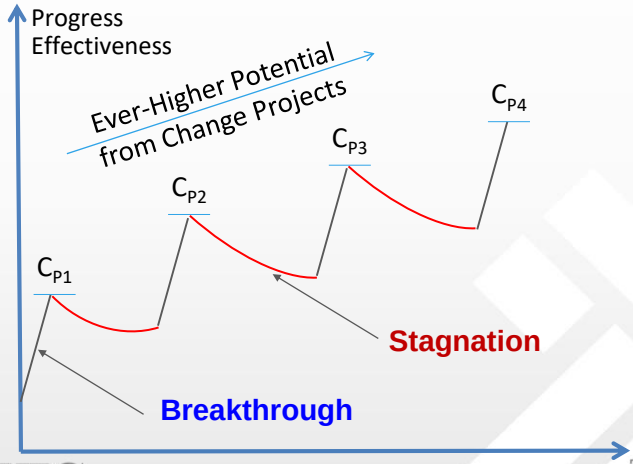
GLOBAL PLATFORM FOR QUALITY

Capability must be designed into systems:



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Breakthrough improvement from radical change:

Breakthrough improvement tends to be induced by management in order to change the inherent design of business system components. These projects are chosen to alleviate system-wide problems in an organization:

- "A project is a problem chosen for a solution; it is also a way of managerial life." ~ Joseph M. Juran, *Juran's Quality Control Handbook*, 22.18.
- "A project provides a forum for converting an atmosphere of defensiveness or blame into one of constructive action." ~ Joseph M. Juran, *Juran's Quality Control Handbook*, 22.19.
- "Participation in a project increases the likelihood that the participant will act on the findings." ~ Joseph M. Juran, *Juran's Quality Control Handbook*, 22.19.
- "***All breakthrough is achieved*** [one project at a time] ***project by project, and in no other way***." ~ Joseph M. Juran, *Juran's Quality Control Handbook*, 22.19.

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Breakthrough projects require quality planning!

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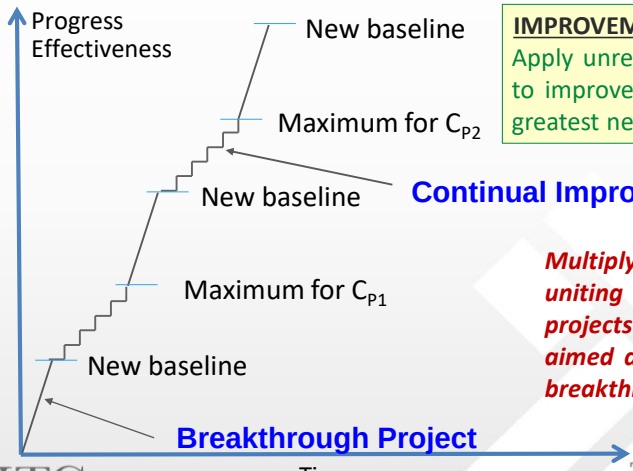
An integrated approach to continual improvement:



Continual Improvement

Breakthrough Project

IMPROVEMENT STRATEGY:
Apply unrelenting pressure to improve at the point of greatest need.

Multiplying effect of uniting incremental projects and projects aimed at achieving a breakthrough.

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GLOBAL PLATFORM FOR QUALITY

Quality systems must have a strong foundation:

Ideal Performance – Flawless Execution – Aspiration Level

Customer Performance Measure

"All systems of control, no matter how well they are documented, will tend to deteriorate due to changes in the business as well as due to human nature."

~ Joseph M. Juran

Compliance Level **Routine Working**

Quality Management System ← **Operational linkage**

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GLOBAL PLATFORM FOR QUALITY

What is an acceptable boundary for routine results?

Ideal Performance – Flawless Execution – Aspiration Level

Customer Performance Measure

This represents the range of performance where most customers will be satisfied and commercial viability of performance may be considered for comparison with competitors.

Compliance Level **Routine Working**

Quality Management System ← **Operational linkage**

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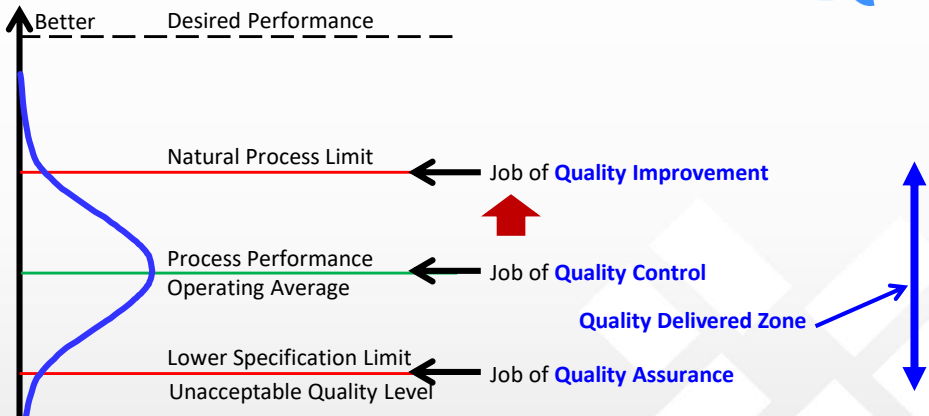
GLOBAL PLATFORM FOR QUALITY

Quality improvement seeks market leadership:



QIP activities drive waste, loss, and inefficiency from current products and production processes to maximize their cost-effectiveness.

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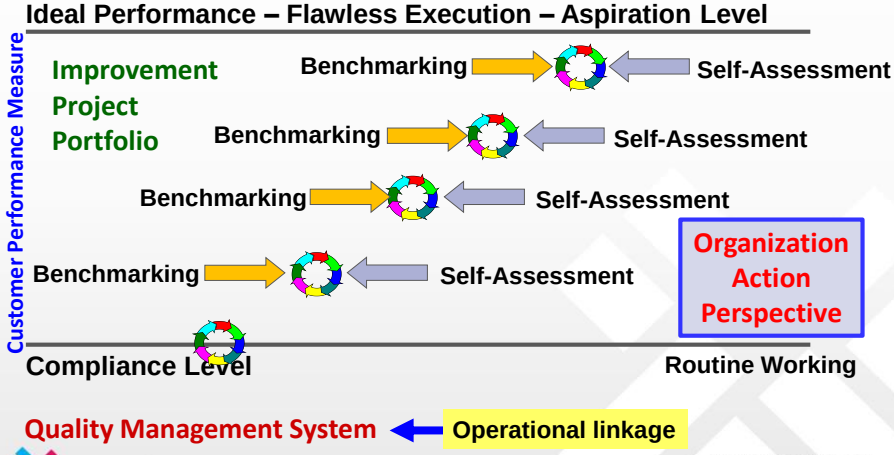
Quality improvement links and aligns the changes:



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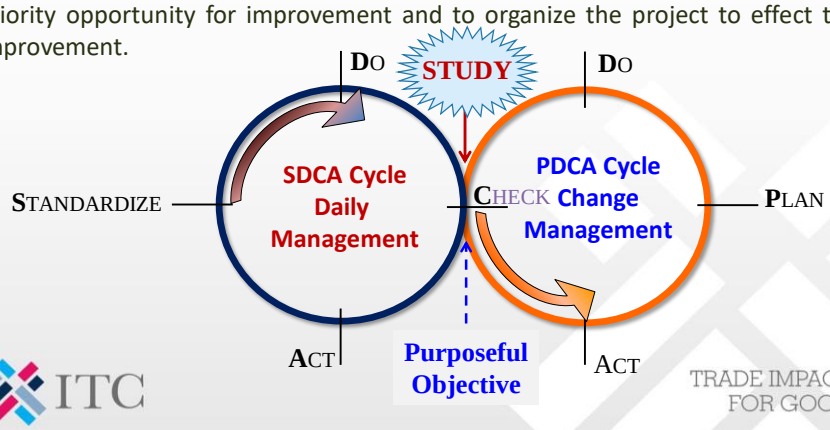
Managing cycles of organizational improvement:

The "Study" phase preceding the "Check" step in SDCA provides opportunities for reflection by workers and management on what is necessary for improvement in a work process. Reflection is needed to consider what will be the next highest priority opportunity for improvement and to organize the project to effect this improvement.



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GLOBAL PLATFORM FOR QUALITY

How are improvement opportunities managed?

- The workers and supervisors must focus on improvement of the work by eliminating waste and streamlining the process to assure smooth work flow and harmonious operations.
- Business leaders must focus on improving work by eliminating flow constraints that are caused by unbalanced assignment of resources or lack of the proper resources to assure the flow. Bottlenecks and constraints caused by insufficient resources assigned (human, capital, or equipment) need to be addressed by management as they have not provided sufficient resources to the process to achieve the required throughput flow.

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GLOBAL PLATFORM FOR QUALITY

CLASS DISCUSSION:

- Incremental improvement is the responsibility of all workers in an organization: the challenge to do their work better – with decreased defects, cost, or losses relative to CTQ requirements. Defining breakthrough improvement is the responsibility of management to increase the competitive ability of the organization.
- In the value chain of processes in your project what opportunities exist to make either incremental improvement or breakthrough improvement? Please provide three examples of each.

Incremental Improvement	Breakthrough Improvement

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Global Platform for Quality

Quality Improvement

Lecture 3: The Continual Improvement Process

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EDUCATIONAL PROGRAM – QUALITY IMPROVEMENT:

- Lecture 1: Understanding Quality Improvement
- Lecture 2: Categories of Improvement
- **Lecture 3: The Continual Improvement Process**
- Lecture 4: Team Activities in Continual Improvement

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Step-by-step walk the 1,000-mile road (*safari*):

The model is a seven-step project management process that pulls data through a series of questions and operates at three competence levels to conduct an inquiry:

1. Maintaining and improving standard work (***process doers*** who operate at a basic problem-solving level);
2. Solving more complex problems and integrating all the flows across work processes (***process facilitators*** who operate at an intermediate problem-solving level); and
3. Increasing work performance capability by designing improved cross-process work flows (***process designers*** who operate at an advanced process management and problem-solving level.

This model measures work processes: throughput quality, consistency, safety, economy of operations, and worker motivation. It applies team-based improvement methods as supervised by a trained facilitator.

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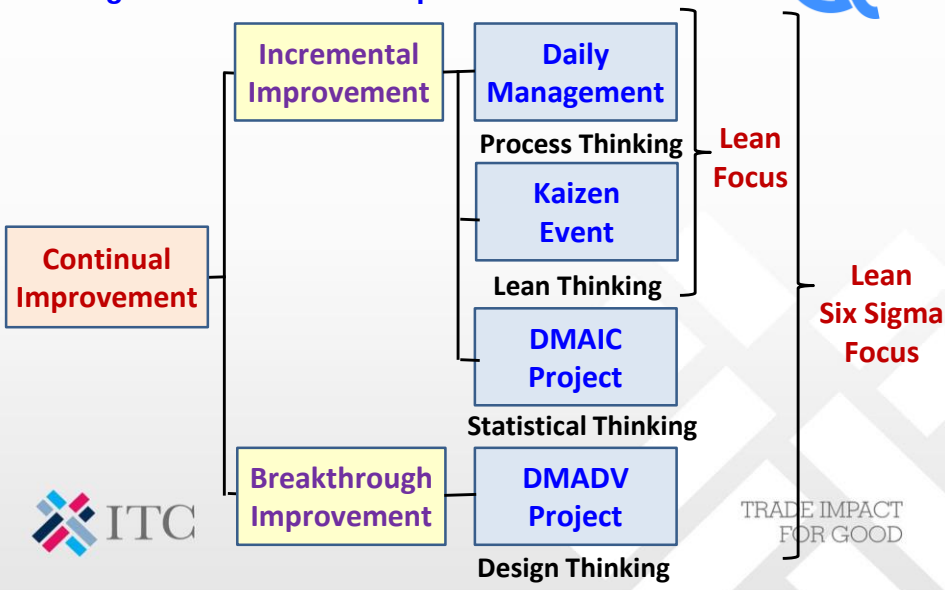
Categories of Continual Improvement Processes:



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Categories of Continual Improvement Processes:

There are many approaches for driving organizational improvement. Quality-based improvements are needed continually and have been divided according to their effect as "incremental" or "breakthrough." These categories may be subdivided according to applications of "thinking functions" to distinguish their practical applications as follows:

- ***Process Thinking***: viewing work as a system of interconnected processes whose flow can be studied to understand the way throughput is produced and efficiency is routinely managed daily (e.g., the daily management system of the organization).
- ***Lean Thinking***: viewing work through the "efficiency lens" to discover those sources of waste, loss, and inefficiency that can be eliminated through the normal course of work process improvement or through "kaizen" events.
- ***Statistical Thinking***: Add to process thinking that processes can be measured to discover sources of variation and improve or control work outcomes. This is the foundation of the DMAIC project management process of Lean Six Sigma.
- ***Design Thinking***: An innovative approach to design new products, services, and/or products based on analysis of customer needs, market trends, competitor moves, and technological advances. This approach is embedded into the Design for Six Sigma project management method called DMADV.

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Need for a Generic Continual Improvement Process:

There are a wide variety of so-called "problem-solving" or "improvement" models available and each discipline seems to have its own approach and use its own language to interpret how to approach the issue. However, underlying all this diversity there is a similarity in application of the four "thinking styles" of continual improvement and the methods and tools that are applied:

- ***Accounting***: Activity-Based-Cost (ABC) Analysis
- ***Information Systems***: Business Process Reengineering (BPR) Analysis
- ***Information Systems***: Business Process Management (BPM) Analysis
- ***Software Design***: Systems Engineering Management (SEM) Analysis
- ***Quality Management***: Standardize-Do-Check-Act (SDCA) Management
- ***Quality Management***: Plan-Do-Check-Act (PDCA) Breakthrough
- ***Quality Management***: Lean Six Sigma Define-Measure-Analyze-Improve Control (DMAIC) Improvement
- ***Quality Management***: Lean Six Sigma Define-Measure-Analyze-Design-Verify (DMADV) Breakthrough

ITC **There is a need for a more collaborative approach and standard methodology for Continual Improvement.** TRADE IMPACT FOR GOOD

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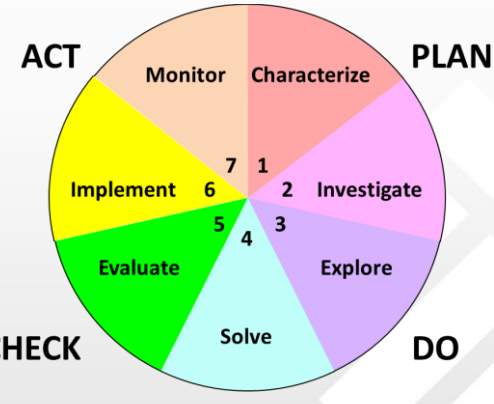
Step-by-step walk the 1,000-mile road (*safari*):

A thinking process to pull observations into data that shows causality and improves the way that people work:



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GLOBAL PLATFORM FOR QUALITY

Step-by-step walk the 1,000-mile road (*safari*):

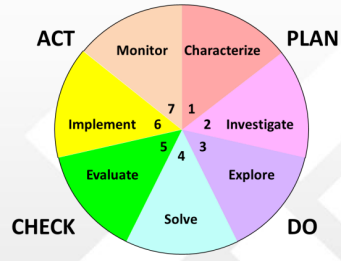
1. Characterize

Objective:

- **Characterize**: Describe issue, scope and opportunity to improve.

Questions:

- What is the issue or concern?
- What are the symptoms?
- How big is the potential impact?
- Where is the situation occurring?
- How does it affect our customers?
- Who should take responsibility?



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GLOBAL PLATFORM FOR QUALITY

Example applying Continual Improvement Process:

1. Characterize

Objective: Describe issue, scope and opportunity to improve.

- **What is the issue or concern?**
  - Moisture content of beans is not within specifications in next process step
- **What are the symptoms?**
  - Some beans are too light and some too heavy -> deviations in the milling process
- **How big is the potential impact?**
  - Re-drying in milling -> increased cost
- **Where is the situation occurring?**
  - Effects are seen in milling and problem might be in drying
- **How does it affect our customers?**
  - Possibly Increased delivery time to end customers
- **Who should take responsibility?**
  - Manager responsible for the coffee station

Coffee bean drying

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GLOBAL PLATFORM FOR QUALITY

Step-by-step walk the 1,000-mile road (*safari*):

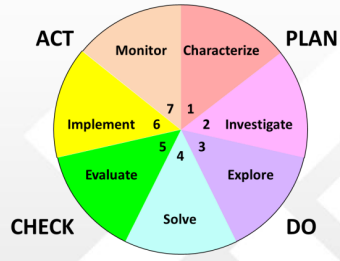
2. Investigate

Objective:

- **Investigate**: Evaluate facts to find boundary constraints that limit an opportunity.

Questions:

- What is the situation?
- How well is the process doing?
- How well could it be doing?
- Can the process detect problems?
- How can the process fail?
- What is the process loss function?
- Does the history show any trend?
- Where should the project focus?



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GLOBAL PLATFORM FOR QUALITY

Example applying Continual Improvement Process:

2. Investigate

Objective: Evaluate facts to find boundary constraints that limit an opportunity.

- **What is the situation?**
  - Some of the beans might be too moisture when leaving the station
- **How well is the process doing?**
  - Data
- **How well could it be doing?**
  - Data
- **Can the process detect problems?**
  - Measurement system??
- **How can the process fail?**
  - Air not flowing constantly
- **Where should the project focus?**
  - Drying station and air flow under The drying beds
- **What is the process loss function?**
  - E.g. difference of beans coming and leaving
- **Does the history show any trend? -> data?**

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GLOBAL PLATFORM FOR QUALITY

Step-by-step walk the 1,000-mile road (*safari*):

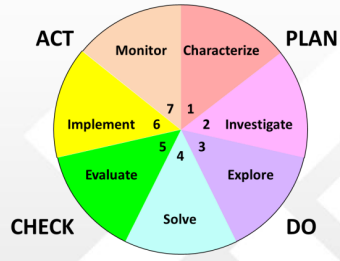
3. Explore

Objective:

- **Explore**: Identify the essential nature of the opportunity to improve.

Questions:

- Is anyone doing this work better?
- What are the potential causes?
- What is the cost of poor quality?
- How can the work be simplified?
- Which factors affect variation?
- Where is productive time lost?
- Where is cost wasted?
- How much variation is explained?
- What are potential root causes?
- Are there any 'missing' variables?



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GLOBAL PLATFORM FOR QUALITY

Example applying Continual Improvement Process:

3. Explore **Objective:** Identify the essential nature of the opportunity to improve.

- **Is anyone doing this work better?**
  - Going to see the best drying station
- **What are the potential causes?**
  - Wind speed, direction, humidity, temperature changes
- **What is the cost of poor quality?**
  - Rework time and rejections
- **How can the work be simplified?**
- **Which factors affect variation?**
  - Data& Statistics
- **Where is productive time lost?**
- **Where is cost wasted?**
- **How much variation is explained?**
  - Statistics
- **What are potential root causes?**
  - Combination of windspeed and direction
- **Are there any 'missing' variables?**

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Step-by-step walk the 1,000-mile road (*safari*):

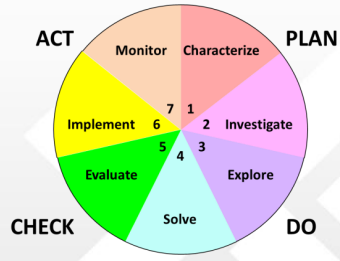
4. Solve

Objective:

- **Solve**: Determine alternatives for improving outcome performance.

Questions:

- Which factors affect performance?
- What factors manage variation?
- What factors shift the average?
- What factors reduce operating cost?
- What is their operating envelope?
- What happens outside this range?
- How are these factors controlled?
- How can the process be controlled?
- How easily can it be implemented?



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Example applying Continual Improvement Process:

4. Solve

Objective: Determine alternatives for improving outcome performance.

- **Which factors affect performance?**
- **What factors manage variation?**
- **What factors shift the average?**
- **What factors reduce operating cost?**
- **What is their operating envelope?**
- **What happens outside this range?**
- **How are these factors controlled?**
- **How can the process be controlled?**
  - Fans to control the air flow
- **How easily can it be implemented?**

Statistical analysis of the process is required

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GLOBAL PLATFORM FOR QUALITY

Step-by-step walk the 1,000-mile road (*safari*):

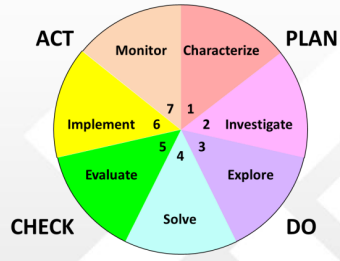
5. Evaluate

Objective:

- **Evaluate**: Demonstrate the efficacy of the proposed solution.

Questions:

- How to optimize factor settings?
- Is the solution sufficiently robust?
- Do indicators need to change?
- Are measurement methods valid?
- What financial benefit will result?
- How to capture the benefits?
- Who is responsible for action?



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Example applying Continual Improvement Process:

5. Evaluate

Objective: Demonstrate the efficacy of the proposed solution.

- **How to optimize factor settings?**
  - Different setting for the fan to control the air flow
- **Is the solution sufficiently robust?**
- **Do indicators need to change?**
- **Are measurement methods valid?**
- **What financial benefit will result?**
  - Decrease in Cost of poor quality
- **How to capture the benefits?**
  - Define actions for the future to see the benefits
- **Who is responsible for action?**

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GLOBAL PLATFORM FOR QUALITY

Step-by-step walk the 1,000-mile road (*safari*):

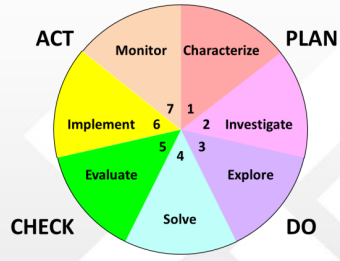
6. Implement

Objective:

- **Implement**: Develop plans for implementation and benefit capture.

Questions:

- What will be standard work?
- Which factors must be managed?
- What is their tolerance range?
- How will the process be maintained?
- What training will operators need?
- How will work errors be prevented?
- What is the action plan?
- How to leverage this knowledge?
- How to capture the benefits?



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Example applying Continual Improvement Process:

6. Implement **Objective:** Develop plans for implementation and benefit capture.

- **What will be standard work?**
- **Which factors must be managed?**
- **What is their tolerance range?**
- **How will the process be maintained?**
- **What training will operators need?**
- **How will work errors be prevented?**
- **What is the action plan?**
- **How to leverage this knowledge?**
- **How to capture the benefits?**

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Step-by-step walk the 1,000-mile road (*safari*):

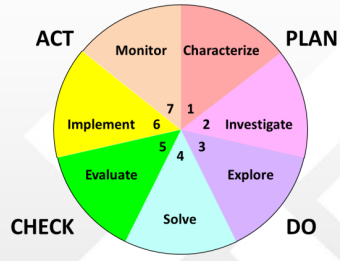
7. Monitor

Objective:

- **Monitor**: Monitor the process to ensure sustained, consistent performance.

Questions:

- How is the process operating?
- Where is standard work not right?
- Does the team work consistently?
- Where is waste occurring?
- What can be improved?
- What conditions are not safe?
- How does it affect our customers?
- What people should address it?



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Example applying Continual Improvement Process:

7. Monitor **Objective:** Monitor the process to ensure sustained, consistent performance.

- **How is the process operating?**
- **Where is standard work not right?**
- **Does the team work consistently?**
- **Where is waste occurring?**
- **What can be improved?**
- **What conditions are not safe?**
- **How does it affect our customers?**
- **What people should address it?**

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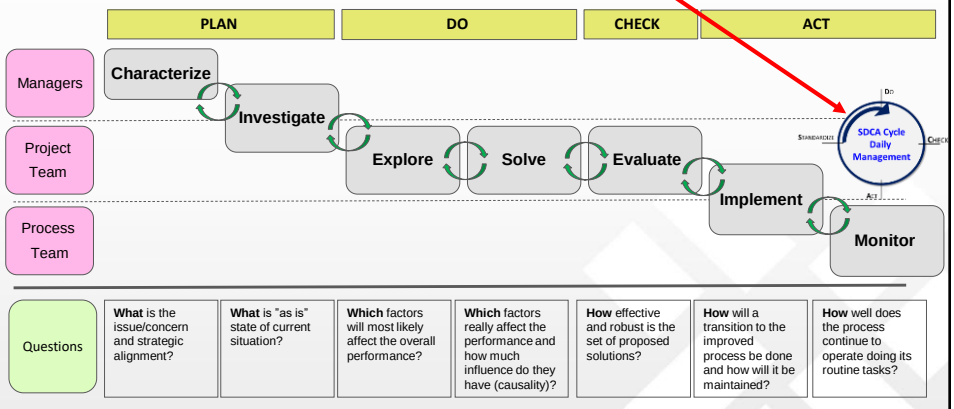
SDCA is embedded in the Monitor step:



Questions							
	What is the issue/concern and strategic alignment?	**What** is "as is" state of current situation?	**Which** factors will most likely affect the overall performance?	**Which** factors really affect the performance and how much influence do they have (causality)?	**How** effective and robust is the set of proposed solutions?	**How** will a transition to the improved process be done and how will it be maintained?	**How** well does the process continue to operate doing its routine tasks?

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CLASS DISCUSSION:

- Identifying opportunities for improvement is the responsibility of everyone in any organization.
- What opportunities for improvement can you suggest for making your project organization better? Identify three opportunities. Which of these opportunities will require team-based problem-solving in order to find a potential solution?

Key Business Activity	Potential Improvement Project

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Lecture 4: Team Activities in Continual Improvement

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EDUCATIONAL PROGRAM – QUALITY IMPROVEMENT:

- Lecture 1: Understanding Quality Improvement
- Lecture 2: Categories of Improvement
- Lecture 3: The Continual Improvement Process
- **Lecture 4: Team Activities in Continual Improvement**

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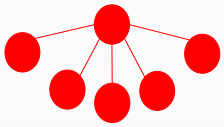
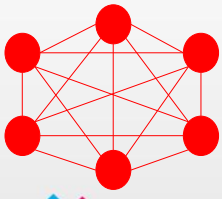
A "team" is distinct from a "group:



Characteristics of Groups:

- People work on shared objectives by concentrating on own activities
- Individual roles create synergy in combination of their unique actions
- Each member has their own unique skills, competence, and aptitudes
- Communication among members is infrequent
- People complete their daily work without information from others
- Information is shared for learning about common interest.



Characteristics of Teams:

- Objectives cannot be accomplished without collaboration of all members
- Individual roles overlap and individuals may be substituted
- People have complementary skills, competence, and aptitudes
- Communication occurs frequently and stimulates the group creativity
- People depend on shared information to progress in their own tasks
- Information is shared and this is a key catalyst in obtaining results

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Different reasons for distinct types of teams:

What is a team? It is a small group of people who: possess complimentary knowledge, skills, and competence; are committed to a common purpose; apply an integrated approach to working; to achieve a shared goal for which they are mutually accountable.

People have differing degrees of interdependence in their work environment. Ask the following questions to evaluate if you work as a group or a team:

- Why has this collection of people been asked to work together? What is the purpose?
- Are we expected to operate as a team or contribute as individuals?
- Where would we rate on this scale of interdependence:

High	Medium	Low
Football Team	Production Team	Jazz Band

- How does each of the above groups operate?

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Work-group Team:

Work-group Teams are naturally formed from those people who are operating on a similar work area and share responsibility for the output of that work which has a repetitive nature of recurring tasks.

This team is formed from people working in a natural group which meets to address the daily problems of managing their collaborative work. The team is charged with the following objectives related to their work together:

(1) Managing the consistency of their daily work process discipline;
(2) Seeking opportunities to improve efficiency and effectiveness;
(3) Eliminating waste and loss from the process:
(4) Assuring mutual support of the members in the conduct of their tasks; and
(5) Sharing in training and development of team colleagues.

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Project Team:

Project Teams are formed deliberately to meet a specific business objective that it is not possible for individuals to meet effectively. These teams are formed from members who belong to different groups or functions and they have been assigned to activities to work collectively toward a shared goal that is addressed over a fixed period of time (from weeks to years).

These teams may be further divided into sub-teams to accomplished focused objectives that contribute toward the overall group goal. An example of such a team is a product development team where members may come from technical or research, marketing and sales, accounting, or purchasing functions. They may establish sub-teams within the overall team for different technology areas or for different sales regions to concentrate their efforts on particular objectives. A project managers will coordinate the team's work; manage the distribution of resources across the team; and assure compliance to the schedule and intermediate progress targets.

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Steering Committee:

A ***Steering Committee*** is a group of managers who have specific decision rights and resource allocation authority. This committee is composed of high-level stakeholders and/or experts who provide guidance and direction on such key issues as company policy and objectives, budgetary control, market strategy, resource allocation, and decisions involving large expenditures. In SME-type organizations this may be the owner with members of the Board of Directors as supplemented by external subject matter experts who provide the specific knowledge that is not resident within the small business.

The Steering Committee does not actually manage a project or a Work Team, but it provides advice and direction which help to facilitate either a project manager's or team leader's activities. A Steering Committee provides for effective governance of an organization or a particular segment of the organization.

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CLASS DISCUSSION:

- Different problems require forming different types of teams with membership that is appropriate to address the issues at hand. In your project, what types of problems are systemic or chronic? Give three examples of problems in your value chain.
- What is the appropriate composition of the team (project or work group?).
- What type of competence would be needed by the team members?

Problem Statement	Appropriate Team Type	Competence needed

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Global Platform for Quality

Q104 – Quality Planning

Instructor: Gregory H. Watson, PhD, EUR Ing

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GLOBAL PLATFORM FOR QUALITY

QUALITY 104: QUALITY PLANNING

Quality Planning develops a business plan for improvement to elevate quality to a higher level than available under the current constraints of resources and competence. It provides the plan for implementation of a funded business plan for change. Change management and project management provide ingredients for this approach. The conceptual framework of Design for Six Sigma (DFSS) and "D-School" or integration of innovation in an engineered program of development by applying the concepts of design thinking. Quality Planning will document a business case for change and develop the implementation plan to achieve the desired transformation.

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GLOBAL PLATFORM FOR QUALITY

Joseph M. Juran on "Quality Planning"

"***Quality Planning*** is the activity of developing the products and processes required to meet customers' needs. It involves a series of universal steps:

1. Determine who are the customers.
2. Determine the needs of the customers.
3. Develop product features which respond to customer needs.
4. Develop processes which are able to produce those product features.
5. Transfer the result plans to the operating forces."

~ Juran's Quality Control Handbook, 4th edition, 2.6

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – QUALITY PLANNING:

- Lecture 1: Understanding Quality Planning
- Lecture 2: Process-Based Approach to Continual Improvement
- Lecture 3: Project-Based Approach to Continual Improvement
- Lecture 4: Planning for Incremental Gains or Breakthrough

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Global Platform for Quality

Quality Planning

Lecture 1: Understanding Quality Planning

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- **Lecture 1: Understanding Quality Planning**
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GLOBAL PLATFORM FOR QUALITY

Components of Quality Planning

- ***Quality Plan***: Documented information that provides the activities or methods to be taken to achieve objectives and meet specified requirements.
- ***Quality Trilogy***: A three-pronged approach to managing for quality. The three legs are quality planning (developing the products and processes required to meet customer needs); quality control (meeting product and process goals); and quality improvement (achieving unprecedented levels of performance.
- ***Quality Management (QM)***: Managing an organization's activities, resources, and people to achieve objectives and prevent nonconformances.
- ***Quality Management System (QMS):*** A formal system documenting structure, processes, roles, responsibilities, and procedures needed to achieve effective quality management.
- ***Quality Policy:*** A documented statement of commitment or intent that needs to be implemented to achieve quality.

Reference: "Speaking Your Language," ***Quality Progress***, Vol. 51, No. 8, pp. 16-37.

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Planning is done on operational and strategic levels:

Operational Quality Planning: This planning is directed toward the design and development of the daily management system for an organization. It includes both design, development, and commercial deployment of products as well as the same functions related to the processes by which these products are to be produced. Concurrent engineering of products and processes permits a rapid streamlining of waste from the overall process and the integration of quality concerns from the cross-functional stakeholders in this new product design / development process.

The processes of quality planning must be integrated with quality control and quality improvement in an environment of inspirational leadership that actively engages workers in an effective quality culture that is based on teamwork that is aimed at achieving harmony in shared goals to achieve mutual success.

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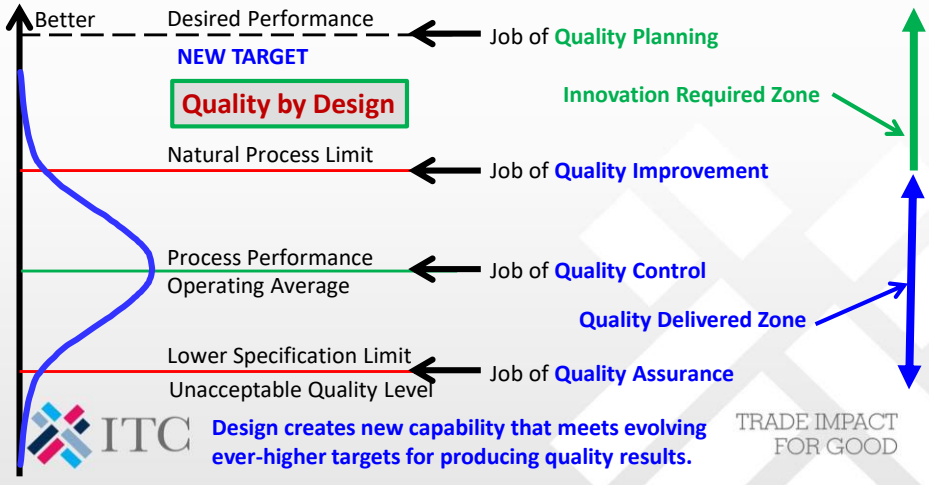
Quality management systems (QMS) should organize performance across the full 'life cycle' of needs that organizations deliver to their customers.



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Design creates new capability that meets evolving ever-higher targets for producing quality results.

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The "Juran Quality Trilogy" – analogy to finance:

This analogy was created by Joseph M. Juran (1986) which drew a parallel for financial planning, control, and improvement to similar activities in quality: quality planning, quality control, and quality improvement. He described this relationship in a graphic:

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Juran's Quality Trilogy has universal processes – 1:

The first component in Juran's Quality Trilogy is Quality Planning. The quality planning process is really operational quality planning that has been directed toward the concurrent development of products and their productive processes. Steps that are involved in Quality Planning include:

- Establish the project
- Identify customers
- Discover customer needs
- Develop product
- Develop process
- Develop process controls
- Transfer to operations

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GLOBAL PLATFORM FOR QUALITY

Juran's Quality Trilogy has universal processes – 2:

The second component of Juran's Quality Trilogy is Quality Control which is analogous to Financial Control. Financial control has a fiduciary responsibility. Quality Control has an operational responsibility with fiduciary ramifications.

Quality Control:

- Chose meaningful control objectives and points
- Establish measurement capability at the control points
- Establish standards of performance and boundaries
- Measure actual performance
- Compare actual performance against standards
- Take action to reduce any differences in this gap

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Juran's Quality Trilogy has universal processes – 3:

The third component of the Juran Quality Trilogy is Quality Improvement. It is focused on incremental improvement between states of control that will be either the removal of the root cause of sporadic instances of variation or the reduction of chronic sources of variation.

Quality Improvement: (there are two categories – Incremental or evolutionary; breakthrough or revolutionary)

- Demonstrate the need for improvement
- Identify the project to accomplish the improvement
- Organize the project improvement team
- Diagnose the cause of the issue that created the flawed situation
- Provide remedies, prove that the remedies are effective
- Deal with resistance to change
- Establish controls that will assure the improvements

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Planning is done on operational and strategic levels:

Strategic Quality Planning: a process of establishing long-range customer-focused goals and determining the best approach to meet those goals. This is an integral part of the overall strategic planning process of an organization and is typically led by senior management (often referred to as "***Big Q***"). Thus, it is a quality activity of the upper regions of an organization's structure while operational quality planning focuses on product and process planning a the middle management level (which coupled with the operational quality plans and processes is often referred to as "***little q***").

Projects that focus on delivering strategic quality plans are typically referred to as "***Breakthrough Projects***" as they seek to develop a "step-change" function for revolutionary improvement. Projects that focus on delivering operational quality plans are typically referred to as "***Continual Improvement Projects***" or as ***Kaizen*** projects (using the Japanese word which means "change for the better").

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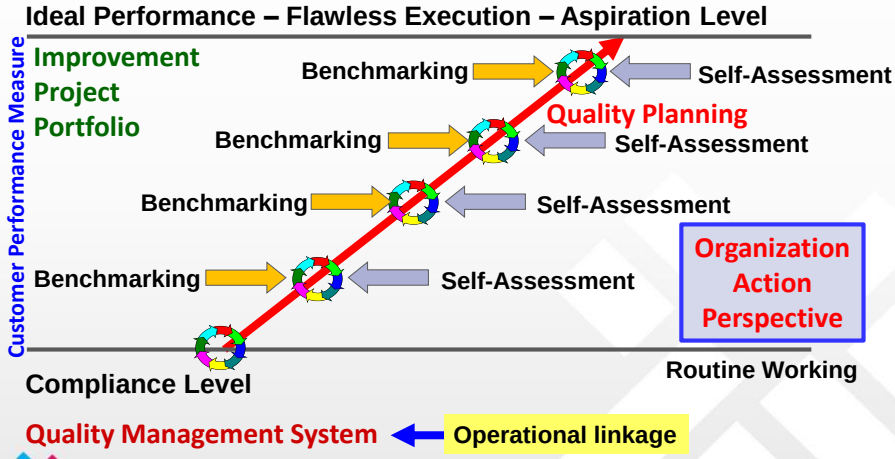
Quality improvement links and aligns the changes:



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Quality Planning & Management Systems (ca. 2000):

ISO9001 Quality Management System:

- This QMS covers the three initial levels of quality: Quality Assurance, Quality Control, and Quality Improvement in the context of the commercial contract with customers. This standard is non-prescriptive in that it does not define a particular set of methods or tools that must be applied for compliance.

Six Sigma Breakthrough Strategy:

- This project-management based improvement strategy integrates a process management approach to systems with statistical problem-solving to define specific improvements that can transform an organization. It specifies tools and methods to be applied within the constraints of its project process.

Business Excellence Assessment Criteria:

- This set of criteria presents areas to address in creating business excellence. It is not prescriptive and does not define any particular tools or methods that must be employed to maximize the assessment scoring.

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GLOBAL PLATFORM FOR QUALITY

Building a comprehensive quality management system:

ISO9001 Standard	+	Lean Six Sigma Method	+	Business Excellence
•Customer Management		•Exploratory Data Analysis		•Leadership and Governance
•Commercial Requirements		•Variation Reduction Process		•Strategic Linkage
•Work Standards		•DMAIC Problem-Solving		•Strategic Plans and Projects
•Process Mapping		•Risk Analysis		•Ethics and Social Responsibility
•Work Documentation		•Hypothesis Testing		•Organizational Assessment
•Control Plans		•Measurement System Analysis		•RADAR Methodology
•Documentation Control		•Pull System Work Flow		•Review
•Management Review		•Cycle Time Reduction		•Approach
•Work process Audit		•Constraint/Bottleneck Relief		•Deployment
•Managing by Fact		•Waste Elimination		•Assessment
•PDCA Problem Solving		•Mistake-Proofing		•Results
•Basic Quality Toolkit		•Just-in-Time/Kanban flow line		•Performance Measurement
•Basic Statistics		•ANOVA/Regression		•Business Results
•Corrective action		•Design of Experiments		•Operational Indicators
•Preventive action		•Statistical Process Control		•Comparative Benchmarks
•Continuous improvement		•Visual Factory		•Knowledge Management

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CLASS DISCUSSION:

- Select a specific **objective** for your improvement project. After that think about possible improvements **along the value chain** to support that objective.
- Give at least two examples of both.

Objective of project:

Part of value chain	Incremental Improvements

Part of value chain	Breakthrough Improvements

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Quality Planning

Lecture 2: Process-Based Approach to Improvement

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EDUCATIONAL PROGRAM – QUALITY PLANNING:

- Lecture 1: Understanding Quality Planning
- **Lecture 2: Process-Based Approach to Improvement**
- Lecture 3: Project-Based Approach to Improvement
- Lecture 4: Planning for Incremental Gains or Breakthrough

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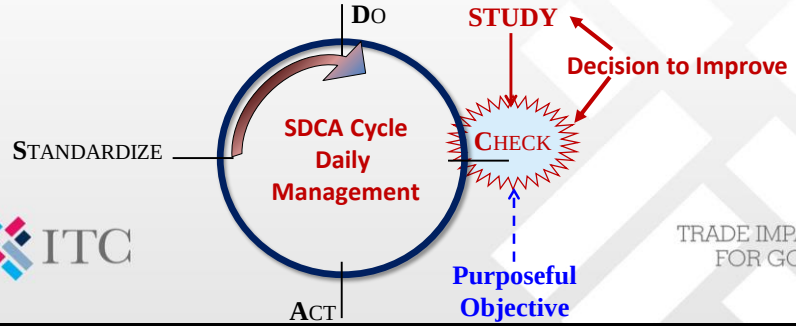
Improvement of productive processes – 1:

Process-based improvement tends to be evolutionary or incremental type of improvement and focuses on improving the quality of standard work so that it approaches the ideal process capability of the design.

Process-based improvement is conducted by either individual workers or by a work team as a joint effort.

Initiation of the improvement effort typically occurs when the "Check" step of the daily work cycle – SDCA – identifies an opportunity for improvement.



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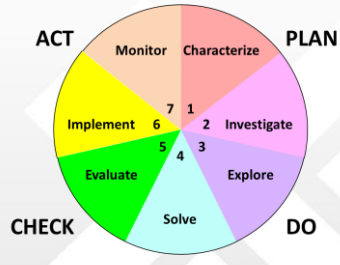
Improvement of productive processes – 2:

The decision to improve occurs as ***SDCA*** is being operated during the ***Monitor*** phase of the ***Continual Improvement Process***. Self-assessment leads to the identification of opportunities for improvement. This identification occurs as process doers continually question themselves by inquiring about this set of reflective questions:

Questions:

- How is the process operating?
- Where is standard work not right?
- Does the team work consistently?
- Where is waste occurring?
- What can be improved?
- What conditions are not safe?
- How does it affect our customers?
- What people should address it?



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Improvement of productive processes – 3:

Classical "***Opportunities for Improvement (OFI)***" include the following process characteristics which identify "***things going wrong***" in the process:

- Eliminating errors that recur in the process.
- Reducing cycle time in process performance actions.
- Minimizing wasted in scrap and associated rework time.
- Achieving increased productivity through efficiency methods.
- Eliminating safety hazards that are discovered in the process.
- Decreasing worker or material movement in the process activities.
- Assuring tests results are provided in a timely manner.
- Increasing the skill of operators through cross-training so they may be more flexibly assigned to process activities/
- Simplifying process flow to assure more consistent throughput

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Improvement of productive processes – 4:

Process improvements may be done rapidly using a basic PDCA method when the process is failing to keep up to the established work standards. At other times a more detailed improvement activity will require some loss of time in production operations in order to rearrange the work. In this case planning is more extensive even through incremental improvement is gained.

Examples of this type of activity are:

- Rearrangement of the layout of production equipment.
- Cross-training operators in new work skills.
- Re-organization of material flow or handling systems.
- Operating a Kaizen Blitz activity to rapidly re-structure work tasks.

Sometimes incremental improvement projects may require application of the complete ***Continual Improvement Process (CIP)*** to arrive at the improved state of work process control.

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Opportunities for Process Improvements

CLASS DISCUSSION:

- Process improvement is a fundamental enabler of improved quality. It focuses on the removal of **waste**, **loss** and **inefficiency** as well as creating streamlined flow of work and improving the way people work in processes.
- For your value chain identify **four opportunities for process improvement.**

Process Improvement Opportunity

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Quality Planning

Lecture 3: Project-Based Approach to Improvement

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EDUCATIONAL PROGRAM – QUALITY PLANNING:

- Lecture 1: Understanding Quality Planning
- Lecture 2: Process-Based Approach to Improvement
- **Lecture 3: Project-Based Approach to Improvement**
- Lecture 4: Planning for Incremental Gains or Breakthrough

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Initial Approach to Planning for Quality:

A "***Quality Policy***" is a guide to action – a statement of principles and values. It differs from other quality management system elements by stating "***what***" is to be accomplished and not "***why***" or "***how***" the result is to be accomplished.

Quality planning starts with a **review of the product design**. Then it moves on to ***review the process design*** in order to: identify the key product and process quality characteristics, determine the relative importance of these characteristics, analyze the flow of the process as it produces the product, error proof the process, plan a neat and clean workplace organization, validate the quality measurement processes, plan for operator self-control, and document the basic working procedures for the quality management system.

Throughout this planning process statistical measures are used to guide the focal areas for improvement and to determine the "***stopping point***" for efforts at improvement – the point where sufficient improvement has occurred, so no further effort is required to satisfy customer demand.

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Project-based improvement activity:

Juran commented: "All improvement happens one project at a time and in no other way." He also commented that "quality improvement is a process."

The way that he defined the basic project management process for continual improvement was adapted and reformulated as the ***Define-Measure-Analyze-Improve-Control (DMAIC)*** project management process for improvement that is applied for ***Lean Six Sigma (LSS)*** teams. This is the basis for the ***Standardize-Do-Check-Act (SDCA)/Plan-Do-Check-Act (PDCA)*** management approach that is applied in Japanese-style ***Total Quality Management (TQM)*** and also in the ***Continual Improvement Process (CIP) model***.

This module will demonstrate how Juran's approach to ***problem diagnosis*** and ***problem remediation*** is applied in the DMAIC process.

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Define – Focus on a "Vital Few" Customer Projects:

The initial DMAIC step in a project planning process focuses on these activities in the ***Define Phase***:

- Identify a portfolio of potential improvement projects (these are also called Opportunities-for-Improvement (OFI)).
- Evaluate projects to determine which have the highest potential for return and the sequence in which the improvement projects should be conducted.
- Select a priority project for improvement.
- Develop a problem statement and charter or mission statement for the team that will be dedicated to conduct the project.
- Select the team members based on the competence and/or skill requirements; identify an experienced project manager; launch the project; and agree upon a schedule, milestones, and goals in order to evaluate progress.

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Measure – Establish the performance baseline:

The ***Measure Phase*** identifies key product and process characteristics which will measure and describe its performance.

- Document the end-to-end flow of the process activities.
- Identify the key output process measures that are either Critical-to-Quality (CTQ) or Critical-to-Satisfaction (CTS).
- Chose meaningful control objectives and points for this measure.
- Establish measurement capability at the control points.
- Validate the measurement system.
- Establish standards of output performance and boundaries.
- Plan for data collection to measure actual performance.
- Compare actual performance to standard for process capability.
- Characterize and document initial process performance baseline.
- Define the overall project objective.

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Analyze – Evaluate process performance measures:

The ***Analyze Phase*** of DMAIC evaluates process history and current data to diagnose and discover the causes of process performance deviations as well as the sources of variation. The following steps are applied:

- Breakdown results measures into process measurements.
- Collect historical process measurement data.
- Analyze data by key rational sub-groups for trends, correlations, and interaction effects.
- Determine which parameters have the greatest impact on total process performance.
- Develop and test theories about variation and cause-and-effect relationships.
- Diagnose the process symptoms to identify the determinants of process performance deviations and parametric variation.

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Improve – Determine effective remedies:

The ***Improve Phase*** of DMAIC designs the remedy that eliminates the cause(s) that were discovered during the diagnostic phases (Define-Measure-Analyze), proves the effectiveness of the remedy, and prepares an implementation plan for capture and realization of the potential benefits. The following steps are a standard approach to this phase:

- Identify alternative remedies for gap closure of deviation and reduction of variation.
- Design experiments (statistical or operational) to optimize the process performance.
- Design the system requirements for the remedy.
- Test the remedy in its ultimate operational environment.
- Identify factors that will cause resistance to change and correct.
- Transfer the remedy to the daily management system.

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Control – Integrate remedy into operational use:

The DMAIC ***Control Phase*** implements product and/or process improvements to consistently maintain the improved performance level and transfer project operations to the process owner(s). The steps in this phase are:

- Design controls to mistake-proof the process and safeguard the performance capability.
- Document the improved process in work instructions and / or standard operating procedures.
- Validate the measurement system integrity for the improved process and product to assure that the capability is sufficient for the accuracy and precision requirements.
- Implement the changes and train the workers.
- Monitor the process performance controls.
- Maintain the focus on continual improvement.

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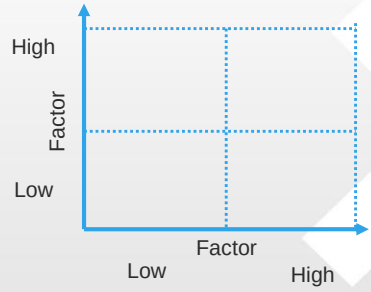
Process for selecting improvement projects:

CLASS DISCUSSION:

- Let's think about what kind of factors we can put for axes to help us prioritize different improvement projects



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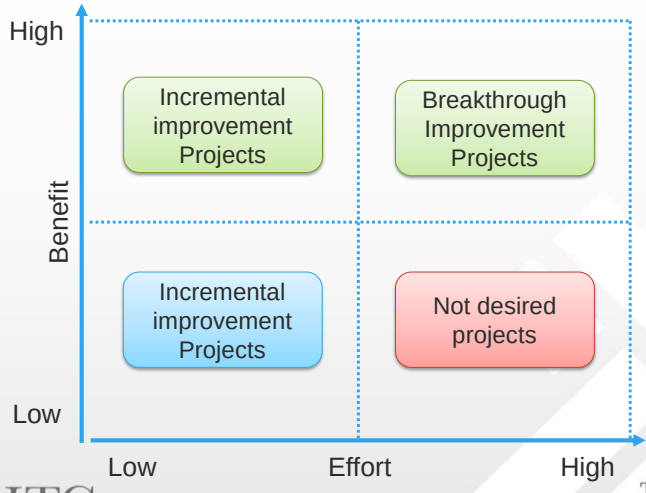
Prioritization Matrix:



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CLASS DISCUSSION:

- Managing an improvement project should follow the DMAIC project management approach. Choose one improvement project that can be developed for your project company. What are the activities that you would plan for the team that is pursuing this improvement for each step in the DMAIC project management process?

DMAIC Project Step	Thought Experiment: What team actions to plan?
Define	
Measure	
Analyze	
Improve	
Control	

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Quality Planning

Lecture 4: Planning for Incremental Gains or Breakthrough

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EDUCATIONAL PROGRAM – QUALITY PLANNING:

- Lecture 1: Understanding Quality Planning
- Lecture 2: Process-Based Approach to Improvement
- Lecture 3: Project-Based Approach to Improvement
- **Lecture 4: Planning for Incremental Gains or Breakthrough**

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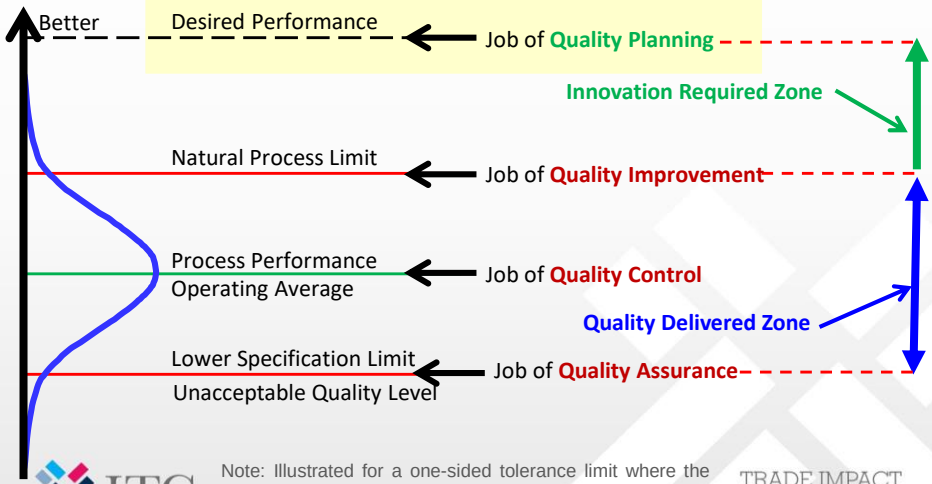
A systems perspective of "Quality Planning".



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Note: Illustrated for a one-sided tolerance limit where the desired performance objective is "bigger is better" – higher performance above the lower tolerance limit is desirable.

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Two types of improvement musts be considered:

Incremental or Evolutionary Improvement:

- Relatively small steps in progress, one-step-at-a-time.
- Slow but steady increase in the capability of a single process.
- Low-cost, low-risk, low-complexity, low-effort improvements.
- Typically implemented by front-line workers within their own process.
- On-going, relentless effort to drive improvements in every business area.

Breakthrough or Revolutionary Improvement:

- Projects that make "step-function" change all at once.
- Projects tend to be major, cross-functional activities.
- Projects may be formally designated by management and assigned a full-time project manager.
- Projects tend to be facilitated by implementing new generation technology.

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Responsibility for continual, incremental change:

Paying constant attention to capturing opportunities for incremental types of process and product improvement is the responsibility of everyone who has an interest in a particular aspect of the business – process doers, facilitators, managers, and designers. Improving the quality of work output is a natural activity for all workers at all levels of every organizations.

Incremental changes should be investigated in all areas of improvement: in the safety of operations by eliminating hazards; in the cost of the business by the reduction of unnecessary expenditures and waste; in the quality of production output by eliminating sorting, rework, scrap, and waste; in the flow of work as it transitions from material inputs across the productive process to the finished goods or services provided to customers. Decrease in internal performance loss function should be accompanied by increase in external customer satisfaction.

Incremental change is a "***never-ending journey***" toward process perfection.

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Responsibility for managerial breakthrough change:

Managers who possess decision rights about process design and also fiduciary responsibility for work are typically the sponsors of ***Breakthrough Projects***. This is because these projects tend to require major capital investments for their completion and they also have major cross-functional ramifications for project management as well as implementation implications.

Breakthrough change projects are part of the strategic plan for improvement of an entire organization. Japanese management systems refer to this type of project as a "***hoshin kanri***" project – and fewer than 5-7 such projects is all that a major corporation would initiate at one time. These projects may be a major shift in technology (e.g., digitization) or software (e.g., enterprise-wide management system) or new product developments that change architecture or transition to new technologies (e.g., nanotechnology). Such projects need to have the constant attention of management and teams that are performing this work need to be dedicated to the accomplishment of that one project.

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CLASS DISCUSSION:

- Improvement projects are managed in different ways and have different scopes for their implementation. Now that you know more about these different ways to do improvement, identify examples of incremental, evolutionary improvement projects and breakthrough, revolutionary projects that could be considered in your project. Let's think about together factors differentiating improvement project types:

Factors / Characteristics:

Incremental Improvement Project	Breakthrough improvement Project

Should the project selection be different for different type of projects?

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EXAMPLE OF DISCUSSION RESULTS:

- Let's think about together factors differentiating improvement project types!

Factors / Characteristics:

Incremental Improvement Project	Breakthrough improvement Project
Short time	Long time
Few resources needed	Strategic
Operational/process focused	Investments usually
Benefits can be small of high	Only a few at the time
Less complex	More complex
Front line workers	Driven by management

Should the project selection be different for different type of projects?

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Global Platform for Quality

Q105 – Quality Management

Instructor: Gregory H. Watson, PhD, EUR Ing

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QUALITY 105: QUALITY MANAGEMENT

The task of quality management is the administration and supervision of all the activities of the organization that were previously designed as a smoothly operating system. This occurs at a point in the growth of the organization when it transitions from an informal teamwork approach to a formalized structure with operating functions. This developmental activity coaches business leaders in developing a formal quality organization that is capable of managing the administrative aspects of quality while the responsible line organizations deliver operating performance that achieves quality outcomes through quality processes.

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GLOBAL PLATFORM FOR QUALITY

Frank M. Gryna on "Quality Management"

"***Quality Management*** is the process of identifying and administering the activities needed to achieve the quality objectives of an organization."

~ Frank M. Gryna
Quality Planning and Analysis, 2nd edition, p. 11

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – QUALITY MANAGEMENT:

- Lecture 1: Understanding Quality Management
- Lecture 2: Quality Management Manages the Organization's Quality Function
- Lecture 3: Quality Management Manages Routine Control Functions
- Lecture 4: Quality Management Delivers Assurance to Customers

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GLOBAL PLATFORM FOR QUALITY

WHAT HAVE WE LEARNED SO FAR?

Work engages people in a sequence of activities characterized as processes:

- ***Process Thinking*** is a foundation for understanding how work is structured and for examining the way that work flows across various organizational activities.

Redesigning work requires that objectivity is applied to evaluate all of the opportunities for process improvement:

- ***Statistical Thinking*** provides the approach to achieve analysis objectivity in work to determine the current level of process performance as well as to determine how much improvement is available to be made.
- Combining process thinking with statistical thinking and developing standard ways to conduct work that meets specific needs of targeted customers is the means by which organizations can influence the quality of their work.

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GLOBAL PLATFORM FOR QUALITY

What is bad quality?

Hamartia (Greek: ἁμαρτάνειν or *hamartánein*): means ***"to miss the mark"*** or "to err." It is associated with Greek tragedy and refers to a tragic flaw which leads to a chain reaction that results in fatality which is the culmination of the reversal of good fortune. The error or flaw typically results from ignorance, wrongdoing, an error in judgment, or a flaw in character.

Quality management systems (QMS) must be built upon a strong foundation of Quality Assurance (QA) that protects consumers by maintaining the performance "on target" for their expectations.

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Global Platform for Quality

Quality Management

Lecture 1: Understanding Quality Management

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – QUALITY MANAGEMENT:

- **Lecture 1: Understanding Quality Management**
- Lecture 2: Quality Management Manages the Organization's Quality Function
- Lecture 3: Quality Management Manages Routine Control Functions
- Lecture 4: Quality Management Delivers Assurance to Customers

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GLOBAL PLATFORM FOR QUALITY

Quality Management focuses on the customer in three ways:

- Develop an understanding of ***what did satisfy customers in the past*** (relates to quality improvement).
- Develop an understanding of ***what is currently satisfying customers*** in performance (relates to quality assurance and quality control)
- Develop an understanding of ***what will satisfy customers in the future*** (relates to quality planning)
- Taken collectively, this emphasis on customer focus and aligning work to their needs describes the end-to-end process of quality management.
- In addition, ***quality management operates*** by:
    1. Managing the organization's quality function.
    2. Managing the routine process control functions.
    3. Delivering assurance to customers of conformance to quality.

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GLOBAL PLATFORM FOR QUALITY

What is quality management?

Quality Management oversees all acts and tasks needed to maintain a desired level of excellence. This oversight includes determination of a quality policy, creating and implementing elements in the quality system: quality assurance, quality control, quality improvement and quality planning. The actions assure product quality achieves requirements and specifications and process quality yields stable production that manages consistent operation within acceptable boundary conditions. Additionally, quality management focuses on achieving long-term goals by implementing short-term improvement initiatives.

Quality management enables business to gain competitive edge in its industry by obtaining a better understanding of market forces influencing it and is able to align with customer expectations better using its imaginative understanding of customer needs which allows it to deliver attractive quality by an innovative adaptation of intimate customer observations to permit anticipation of their evolving needs even when the needs are not fully understood by customers.

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GLOBAL PLATFORM FOR QUALITY

Taking a systems approach to quality management:

Quality Assurance +

Quality Control +

Quality Improvement =

Quality Management

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GLOBAL PLATFORM FOR QUALITY

What else is included in Quality Management?

Auditing is an important activity to assure quality management. Auditing will provide an independent evaluation of a Quality Management System's degree of compliance with its quality requirements.

Quality Audit: A systematic, independent process to gather objective evidence that will determine whether audit criteria are being met. Audits are based on a sample and are independent of the productive system, process or product being audited, unlike verification activities, which are part of the process.

Product Audit: A quality audit which reinspects product CTQ characteristics to verify the adequacy of acceptance and rejection decisions.

Process Audit: A quality audit of production activities an engineering process audit provides a detailed assessment of all technical activities in production. A process monitor audit checks managerial conditions and documentation.

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GLOBAL PLATFORM FOR QUALITY

Audits provide independent assurance of quality:

Areas that require independent evaluation through the audit process:

- Plans for attaining quality.
- Products comply with requirements and are fit to use and safe for users.
- Standards and regulations defined by authorities are being followed.
- Products conform to specifications.
- Procedures are adequate to produce quality and are being adhered to.
- Data collection and management systems are accurate and provide enough evidence to make proper judgments regarding quality for all stakeholders.
- Deficiencies are identified, and corrective action is promptly taken.
- Opportunities for improvement are identified, the appropriate people are alerted, and preventive action is taken.

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Quality audits provide useful functionality:

Typical approaches and policies that are embedded within quality audits:

1. Verification of facts and reporting to management.
2. Discovery of causes that have resulted in major deficiencies.
3. Offering recommendations for remedies to observed issues.
4. Reporting audit findings audit independently to senior leaders.

Quality Audits differ from ***Quality Assessments*** in that audits focus on alarms that indicate issues regarding conformance to requirements while the quality assessment survey the entire business to identify unexpected business and operational threats as well as opportunities for improvement. Assessments are often associated with Business Excellence Criteria that are applied in national quality award programs.

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GLOBAL PLATFORM FOR QUALITY

CLASS DISCUSSION:

- Quality management provides a comprehensive approach to assure performance of an organization to its commercial customers' needs and set of market regulatory requirements. What type of activities related to quality management can your team identify in the value chain of your process under these different elements?

Quality Management Element	Activities
Quality Assurance	
Quality Control	
Quality Improvement	
Quality Auditing	
Quality Planning	

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EXAMPLE OF RESPONSES IN THIS CLASS DISCUSSION:

- Quality management provides a comprehensive approach to assure performance of an organization to its commercial customers' needs and set of market regulatory requirements. What type of activities related to quality management can your team identify in the value chain of your process under these different elements?

Quality Management Element	Activities
Quality Planning	Selection improvement projects, innovation of new concepts & products
Quality Assurance	Checking/inspection of temperature of product receiving & shipping
Quality Control	Monitoring the temperature along the value chain
Quality Improvement	Acquiring refrigerated trucks
Quality Auditing	Auditing against certification criteria / requirements set for suppliers

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Quality Management

Lecture 2: Quality Management Manages the Organization's Quality Function

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EDUCATIONAL PROGRAM – QUALITY MANAGEMENT:

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GLOBAL PLATFORM FOR QUALITY

Contributions of various disciplines to quality:

Discipline	Example of Contribution
Finance	Measuring cost/loss from quality defects and inefficiency
Industrial Engineering	Design of work, integrated systems and problem-solving
Information Technology	Measurement, analysis and reporting quality outcomes
Marketing Research	Competitive status and understanding voice of customers
Operations Management	Managing the integrated end-to-end productive system
Organizational Behavior	Understanding quality culture and making teams effective
Organizational Effectiveness	Satisfying the needs of internal and external customers
Strategic Planning	Using quality strategically to gain competitive advantage
Systems Engineering	Translating customer needs into products and processes
Value Engineering	Analyzing essential functions to achieve lowest total cost

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GLOBAL PLATFORM FOR QUALITY

Functions of the quality department of the future:

- Company-wide quality planning (operational and strategic)
- Establishing quality measurement systems (integrated bottom-to-top)
- Auditing out-going product quality
- Auditing internal process quality
- Coordinating and facilitating quality improvement projects
- Participating in supplier partnerships (auditing, assessing, and training)
- Training in quality methods and practices
- Consulting on quality applications across business functions
- Coaching business leaders on quality-related matters
- Developing and integrating new quality methodologies
- Transferring quality functions into responsible line organizations

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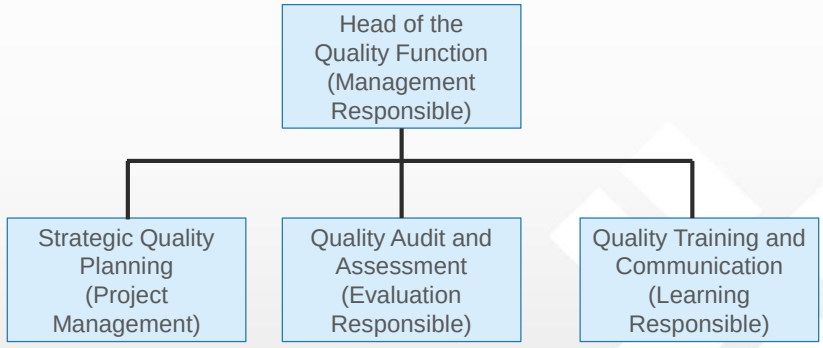
GLOBAL PLATFORM FOR QUALITY

How should you organize the quality function?



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Assisting senior management with strategic quality:

- Developing quality strategies to increase revenue and decrease costs.
- Formulating actionable policies and goals
- Delegating organizational responsibilities for quality
- Assessing effectiveness, efficiency, and economics of the quality system
- Reviewing progress on product and process quality improvement projects
- Managing quality reward and recognition programs
- Determining and coaching senior managers in personal quality roles
- Facilitating organizational quality council or quality steering committee
- Establishing quality agenda for senior management meetings
- Integrating quality activities into the strategic business planning cycle

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GLOBAL PLATFORM FOR QUALITY

Success Ingredients for the quality function leader:

- Focus on customer orientation, satisfaction, and advocacy
- Ability to establish collaborative relationships across functional boundaries
- Goal orientation
- Political astuteness
- Good oral and written communications to encourage information sharing
- Ability to analyze complex situations and generate innovative plans
- Ability to organize activities and projects
- Initiative, perseverance, and self-confidence to drive improvement activity
- Ability to develop subordinates and mentor employees
- Ability to teach complex topics to non-technical people

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Quality role of the senior management:

- Setting policy for strategic direction by applying quality to achieve business differentiation and competitive advantage.
- Allocating resources to eliminate systemic quality problems that have been detected in the daily management system as “chronic issues” and assuring that the front-line team has sufficient capability to apply corrective action.
- Encouraging a constant state of alertness within the organization for the detection of opportunities for improvement.
- Establishing an example for the organization by paying attention to efforts at improvement of the business through operational and strategic projects.
- Prioritizing customer relationship information, operational process data on efficiency and effectiveness, and product quality statistics at the same level of interest as financial measures of performance.
- Serving internally and externally as the visible purveyor of quality culture.

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Quality role of the middle manager:

- Nominating quality problems for solution.
- Serving as leaders of cross-functional quality improvement teams and also leading kaizen efforts within own functional area of responsibility.
- Participating as a member of quality teams in related areas.
- Working on task forces that assist the quality council or quality steering committee in developing focus areas of the organization's quality strategy.
- Leading the quality activities in their own area, encouraging supervisors to pursue quality improvement efforts, and demonstrating a commitment to quality through supportive activities and personal communications.
- Identifying customers and suppliers of their work area and meeting with them to discover their needs then pursuing activities that will meet any of their needs that are unfulfilled.

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Quality role of the workforce:

Most quality problems are either management or system controllable. It is the responsibility of management to lace workers in the situation where it is possible for them to exercise self-management (or self-control) over the work processes they use. The role of the workers includes:

- Nominating quality problems for solution.
- Identifying elements of their own jobs that are in need of improvement and suggesting opportunities for improvement to their supervisor.
- Serving a member of quality teams for developing improvements.
- Becoming knowledgeable about their jobs and related activities within the work area and expanding their skill and competence to increase in their ability to provide valuable contributions.
- Contributing innovative ideas about how improvements for safety, quality and productivity can be made in their work.

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CLASS DISCUSSION:

- Not all quality-related activities need to be managed within the Quality Function. In your teams discuss how you would assign responsibilities for quality activities for the various management functions within the company's quality function. How big should your organization be to have such a structure?

Quality Function	Responsibilities & Activities
Head of Quality Function	
Strategic Quality and Planning	
Quality Audit & Assessment	
Quality Training & Communication	
Organizational Quality Network	

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CLASS DISCUSSION:

- Which actors in the value chain can be involved in these functions?

Quality Function	Actor
Quality Audit & Assessment	
Quality Training & Communication	
Strategic Quality and Planning	

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GLOBAL PLATFORM FOR QUALITY

EXAMPLE OF CLASS RESPONSES:

- Which actors in the value chain can be involved in these functions?

Quality Function / activity	Actor
Quality Audit & Assessment	Certification bodies, QCs, Consulting firms, Research institutions, Technical managers, workforce, regulators,
Quality Training & Communication	NQI, Associations, QCs, Training institutions, Consulting firms, (ITC)
Strategic Quality and Planning	Quality Champions, top management, line ministry of sectors, association(s) relevant for the value chain, regulators

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Lecture 3: Quality Management Manages Routine Control Functions

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EDUCATIONAL PROGRAM – QUALITY MANAGEMENT:

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- Lecture 4: Quality Management Delivers Assurance to Customers

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GLOBAL PLATFORM FOR QUALITY

Quality-related business controls:

Business Controls include restrictions with respect to financial, legal, regulatory, safety, and decision rights. Constraints may be placed in these subject areas to assure that there is no waste, fraud, or abuse and assure that processes will comply with laws, regulations and policies. Business controls may be:

- ***Visual***: Reminders that people can observe in the workplace and raise a flag when work processes deviate or people fail to remember and cause people to focus on correcting the situation. Visual business controls can include checklists, dashboards, budgets, and scorecards.
- ***Procedural***: Work procedures or Standard Operating Procedures (SOP) that must be followed to assure compliance. This also includes the "two-person rule" where two unrelated parties check to assure proper actions are taken.
- ***Embedded***: These controls work without human intervention such as data back-ups that are automated or financial controls that operate in the deep background of the organization's processes.

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Quality-related planning controls:

Planning Controls assure the uninterrupted flow of productive processes and will attempt to optimize the productive capacity of manufacturing operations. These controls permit the proper scheduling of production equipment so that idle time and overuse are equally avoided. Production controls include:

- ***Safety Stock***: Ordered materials that are beyond production requirements but are maintained "just-in-case" of quality or production problems.
- ***Lead Time***: The advance time required to order materials before delivery.
- ***Buffer Inventory***: Excess inventory maintained in the production process.
- ***Standardized Material***: Limiting raw material usage to one specification.
- ***Production System Design***: Process for designing measurement controls and feedback mechanisms into the production process.
- ***Production Policies***: the policies that govern execution of the end-to-end production system.

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Quality-related product controls:

Product Controls assure that product specifications are managed within limits that have been demonstrated to work properly during R&D development and testing. Examples of product controls include:

- ***Preferred Supplier Qualifications***: Identifying and approving suppliers of parts, materials, or services that have been demonstrated to have ability to meet production demands for quality, cost, and delivery responsiveness.
- ***Control Parameters on Part Specifications***: Measured test items that need to be produced exactly to requirements and whose control must be shown in quality records at the source of supply.
- ***Incoming Raw Material Inspections***: Inspections made of critical control parameters when they are received at the production facility.
- ***Control Points in the Productive Flow of Manufacturing Process***: Locations within a production process where control parameters are tested in order to assure compliance and to demonstrate quality progress.

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Quality-related process controls:

Process Controls assure that the end-to-end productive process is capable of delivering specified performance. Such controls may be automated through application of sensor systems with computer-controlled feedback loops or by simple manual tests that may be executed with hand measurement devices. Examples of process controls includes:

- ***Operator Go/No-Go Testing***. The use of gauges to demonstrate maximum and minimum performance boundaries for mechanical parts.
- ***Engineering Process Control (EPC) systems***. Fixed-control mechanisms that are "hard-wired" and built into the production process.
- ***Computer Numerical Control (CNC) systems***. Software-control mechanisms
- ***Design for Manufacturability and Assembly (DFMA) methods.*** The smart controls designed into part specifications (e.g., color-codes or the use of that will assure parts are only capable of assembly in one way).

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Quality-related people controls:

People Controls assure that the human aspect of production is managed in the most consistent manner. Examples of these controls includes:

- ***Recruiting and Selection Process***: The process for obtaining workers with a set of required skills.
- ***Training and Development Process***: The process of advancing the state of worker performance through on-the-job or supplemental education.
- ***Skill-based Certification or Qualification Process***: The process of training in specific work-based skills required on-the-job (e.g., welding or testing).
- ***Standard Operating Procedures***: The documentation of the "one-best-way" to perform the work tasks of production operators.
- ***Mentoring Process***: The personalized coaching process in which the senior leaders provide one-on-one career and technical guidance to junior workers.
- ***Recognition and Promotion Criteria***: The criteria for recognizing, promoting, and rewarding workers for producing desirable outcomes in their jobs.

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GLOBAL PLATFORM FOR QUALITY

CLASS DISCUSSION:

- What controls are applied within value chain that can be identified by your team? Are additional controls needed? Have adequate controls already been put in place (yes/no)?

Part of value chain	Controls Applied	Already in place

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Quality Management

Lecture 4: Quality Management Delivers Assurance to Customers

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EDUCATIONAL PROGRAM – QUALITY MANAGEMENT:

- Lecture 1: Understanding Quality Management
- Lecture 2: Quality Management Manages the Quality Function
- Lecture 3: Quality Management Manages Routine Control Functions
- **Lecture 4: Quality Management Delivers Assurance to Customers**

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GLOBAL PLATFORM FOR QUALITY

Quality management of customer relationships:

Developing more intimate relationships with customers is a "secret ingredient" for sustainable success. Creating an "***Imaginative understanding of user needs***" assures that current needs, developing needs, and "latent" or future needs of customers can be characterized, understood and included in the design of the products or services that are delivered to them. This "deep empathy" that is developed with customers can be purposefully developed by establishing clear communication pathways with targeted customer segments. Examples of some mechanisms to achieve this objective include:

- ***Major Account Teams***. Marketing teams that are assigned to deliver focused service and attention to customers who purchases dominate the sales.
- ***Customer Executive Advocates***. Assignment of senior executives to develop personal relationships with the executives or leaders of its major accounts.
- ***Customer Members on Design Teams***. Inviting key customers to advise the product development team on requirements and performance creation.

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GLOBAL PLATFORM FOR QUALITY

Quality management for consumer advocacy:

The idea behind "**customer advocacy**" is that there is an internal function or role in which a company representative assumes the role of a customer and interprets the company's way of doing business from that perspective. In this role the advocate monitors design, production, service, and the end-to-end process of customer relationship management to "***speak for the customer***" and complain about lack of responsiveness or make suggestions about how to improve the organization's processes from the customer's perspective. A few examples of actions that could be taken in assuming this role include:

- ***Reviewing Specifications***: Analyzing product specifications or guarantees of service from the customer's perspective for adequacy of performance level, band for performance margin, and performance notification alerts.
- ***Reviewing Communications***: Review user documentation for clarity.
- ***Reviewing Customer Interfaces***: Assess the way that customer touchpoints operate and assure that performance meets customer expectations.

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GLOBAL PLATFORM FOR QUALITY

Measuring customer-related quality performance:

Development of a "***customer scorecard***" or "***customer dashboard***" to focus on the way that a company performs at "customer touchpoints" in its end-to-end customer engagement process. Examples of measurements that can be taken for understanding customer-related quality performance include:

- ***Customer Satisfaction Survey***: Directly question customers about their level of satisfaction with products and services. Includes willingness to repurchase and willingness to recommend. Compare with actual behavior!
- ***Customer Complaint Analysis***: Evaluate customer complaints by product and type of complaint – evaluate trends in various ways important to customers.
- ***Field Failure Reports***: Analyze field failures to look for patterns and trends.
- ***Customer Return Analysis***: Analyze customer product returns to determine how to improve performance and assure more satisfied customers.
- ***Lost Sales/Bid Analysis***: Determine why the company lost bids and sales.

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CLASS DISCUSSION:

- What are the activities that can be taken in your value chain to understand customer attitudes and requirements?

Possible actions to collect "Voice of the Customer"

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GLOBAL PLATFORM FOR QUALITY

EXAMPLE OF CLASS RESPONSES FOR THIS EXERCISE

- What are the activities that can be taken in your value chain to understand customer attitudes and requirements?

Possible actions to collect "Voice of the Customer"
Surveys, customer complaints & feedback
Customer event (e.g. open day for farmers), focus groups, Customer tasting (e.g. in super market)
Customer visits,
Open platform / communication channel e.g. webpage
In case of policy change – public participation

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Global Platform for Quality

Q106 – Managing for Quality

Instructor: Gregory H. Watson, PhD, EUR Ing

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GLOBAL PLATFORM FOR QUALITY

QUALITY 106: MANAGING FOR QUALITY

This course is the capstone for the basic program in quality. Managing for Quality identifies those activities that are essential to assure long-term sustainable quality of an organization. Over the long-term quality becomes elevated from an operational activity that assures the deliverable to customers to a strategic approach for assuring organizational competitiveness in a global marketplace. In this application of quality strategic business planning is linked to improvement projects that are executed to achieve business results. When an organization operates at this level of performance they become highly competitive in their international market based on the level and consistency of their operational performance and the quality of goods and services offered to customers. When quality is a strategy that differentiates an organization form its competitors, ten it has the ability to sustain results as it has married its quality strategy with its requirements for successful financial performance which permit it to endure as an organization.

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GLOBAL PLATFORM FOR QUALITY

Joseph M. Juran on "Managing for Quality"

"***Managing for Quality*** is done by use of the … three management processes of planning, control, and improvement."

~ Juran's Quality Control Handbook, 4th edition, 2.6

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GLOBAL PLATFORM FOR QUALITY

Two perspectives for thinking about Quality:

Internal Viewpoint (Operational): Operationally-focused quality sees quality with respect to company targets: performance to specifications; products are evaluated at final inspection; defects are prevented in productive processes or during warranty periods; emphasis is placed on manufacturing quality; metrics of performance relate to bottom-line cost and internal indicators that drive cost; quality is considered a technical issue managed by a functional manager.

External Viewpoint (Business): Strategically-focused business quality will take the perspective of external customers and competitors by: comparing how the deliverables to customers rank for customer satisfaction against the best that its industry has to offer; performance of deliverables is evaluated over the full product lifetime (beyond warranty periods); current and latent customer need must be met or exceeded; all organizational functions contribute to generating quality as measured in terms responsive to customers; and quality becomes a business issue that engages significant executive oversight and leadership.

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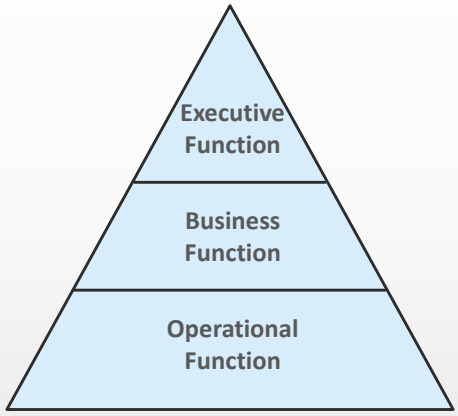
GLOBAL PLATFORM FOR QUALITY

Organizing the quality function for competitiveness:



The ***quality function must be managed across organizational functions*** as well as within organizational functions. It is necessary to engage the organization completely to ***develop business culture applying the quality strategy for control and improvement***. It is of equal import to ***establish a strategy for quality that will assure commercial sustainability*** of the organization and contribute to the social and environmental sustainability of humanity. This is the organizational principle of "***Managing for Quality***."

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GLOBAL PLATFORM FOR QUALITY

Organizing the quality function for competitiveness:

The ***foundation of quality infrastructure*** is the combined way that the ***Quality Assurance*** and ***Quality Control*** systems operate to deliver the required standard performance, assure conformance to all quality requirements and compliance to applicable standards. Whenever deviant conditions are detected these systems need to rapidly ***develop corrective acts to protect customers*** and then assure that appropriate ***preventive action will be implemented to make improvement permanent***.

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GLOBAL PLATFORM FOR QUALITY

Organizing the quality function for competitiveness:

When ***Quality Planning*** and ***Quality Improvement*** are added to a QA/QC system foundation, then the result is ***Quality Management***. Quality plans are designed at two levels: ***continual improvement*** plans, that are designed to incrementally improve results of the daily management system by the workers in that system, and plans for ***breakthrough improvement*** that will make revolutionary change or step-function change. These breakthrough plans are a responsibility of executive functionality for "strategic" quality.

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GLOBAL PLATFORM FOR QUALITY

Organizing the quality function for competitiveness:

Managing for Quality encompasses all of the essential activities necessary for assuring a sustainable quality function that is able to endure across internal shifts in leadership or organizational structure, and external shifts due to technology environmental, or regulatory shifts in its industry. Managing for quality establishes strategic intent, identifies critical business needs and projects that will lead to breakthrough transformations, directs the change management process, and steers integrity in the organization' quality culture.

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GLOBAL PLATFORM FOR QUALITY

How quality energizes global trade performance:

Quality Strategy

- The starting place for energizing trade relations is with developing product and service quality that meets market minimal needs. In practical terms this means that wherever possible products must be tested to demonstrate their conformance to standards and that organizations must certify their quality management system to demonstrate that it meets minimal requirements.
- This is the reason why many companies start their quality journey by making investments in ISO9001 certification and buying required test equipment.

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GLOBAL PLATFORM FOR QUALITY

How quality energizes global trade performance:

- The next phase in developing a quality strategy is to deliver objective evidence of performance to requirements that is capable of demonstrating that products are equivalent to industry global norms.
- This step requires companies to invest in data management systems so they are able to monitor sales, complaints, field failures, etc. This enterprise-wide software does not need to be expensive or complex – it must provide business leaders with the necessary information to permit them to manage work and to improve performance.

Quality Strategy

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GLOBAL PLATFORM FOR QUALITY

How quality energizes global trade performance:

- After the internal quality competence of a company has been established, it is essential that the company demonstrate that it is competitive in those global markets where it chooses to complete. This aspect of quality yields differentiation of an organization so that customers accept the fact that its products and services are superior to competitive offerings and are "worth what they paid for it" with respect to their purchasing options.
- When quality differentiation in the marketplace becomes the competitive advantage of any company, then it creates a brand reputation that stands on its own and is identifiable as excellent. This ensures that a company's market position is sustainable.

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Quality as Strategy

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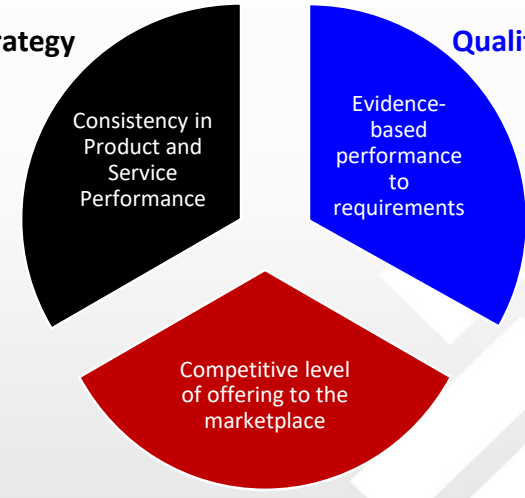
GLOBAL PLATFORM FOR QUALITY

How quality energizes global trade performance:



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Quality as Strategy

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GLOBAL PLATFORM FOR QUALITY

Transition from Quality Strategy to Strategic Quality:

Quality Strategy: An organization's quality strategy collects tasks, projects, and ideas to maintain its current state of customer-deliverable quality at its targeted performance levels and within acceptable tolerance limits. This activity defines an organization's routine quality work.

Quality Management: Quality management conducts planning, coordinating, scheduling, developing, implementing, and assurance functions that execute the organization's quality strategy. This management function engages mid-level managers in product, process, and service quality improvement activities.

Quality as Strategy: When quality is developed as a "strategy" in organizations, it prepares an organization for a future by pursuing sustainable competitiveness. The focus is on designing quality so it will be capable of delivering the long-term expectations of customers and defining an approach to meet these goals.

Quality Development: Strategic alignment of routine management resources for continual improvement combined with capital investment for breakthrough-type improvement as an integral part of the organization's strategic plan led by senior management and executives.

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GLOBAL PLATFORM FOR QUALITY

What is the distinction between "BIG Q" & "Little q"?

"BIG Q" – Strategic Quality	"Little q" – Operational Quality
Culture (Company) Vision, Mission and Values Policy and Philosophy **Competition (Business Learning)** Innovation Leverage Benchmarking **Change (Renewal)** Strategic Operational **Cascade (Alignment)** Improvement Projects Objectives and Targets Measures **Communication (Awareness)** Message Media	**Competence (People)** Individual and team development Training/development program **Capability (Process)** Daily process management Data bases and analytic software **Compliance (Product)** Quality management system Performance agreements **Certification (Standardization)** System certifications/standards Functional certifications/standards Industry certifications/standards **Conformity (Learning)** Business and operational reviews **Correction (Repair & Improvement)** Corrective / Preventive Actions

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GLOBAL PLATFORM FOR QUALITY

What is the distinction between "Big Q" & "little q"?

"BIG Q" develops the future state of products, services and processes.
"Little q" manages performance of current products, services and processes.

This IS NOT a job for executives!

"Little q" Quality

Emphasis: Operational

Focus: Managing the Quality Function

Positioning: **A Quality Strategy**

"BIG Q" Quality

Emphasis: Strategic

Focus: Managing for Quality Results

Positioning: **Quality as Strategy**

This IS a job for the executive function!

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GLOBAL PLATFORM FOR QUALITY

Elements of a "Big Q" strategic quality system:

- **Purpose, mission, vision, environment & values**
- **Management guiding principles & assumptions**
- **Top-level structural design & accountability**
- **Business system, core processes & ownership**
- **Business measures, benchmarks & targets**
- **Compensation structure**
- **Communication and education**
- **Deploying strategy, objectives, and strategic projects**
- **Development of Products and Markets**
- **Strategic resource allocation and alignment**

'BIG Q' PROCESS OF MANAGING FOR QUALITY

STRATEGIC CONTENT

Collectively these activities should be referred to as "***Strategic Quality***."

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GLOBAL PLATFORM FOR QUALITY

What does "Managing for Quality" actually include?

Quality Management: a process of identifying and administering the activities needed to achieve the quality objectives of an organization.
Quality Planning: an activity of developing products and processes required to meet customers' needs through continual improvements or breakthroughs.
Breakthrough Improvement: improvement projects making step-function changes in major, cross-functional activities that are formally designated by management and assigned a full-time project manager to implement new generation technology in products or processes or systems.
Quality by Design: the process of designing for higher levels of performance than current capability by engineering the future products and processes of an organization to achieve "stretch" quality performance goals. The concurrent design and development of product and process capabilities to deliver market advantage over competitive offerings.
Collectively these components are described as "Quality Development."

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GLOBAL PLATFORM FOR QUALITY

Forging a pathway toward the future of quality:

Quality Management +

Quality Planning +

Breakthrough Improvement +

Quality by Design =

Quality Development

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GLOBAL PLATFORM FOR QUALITY

EDUCATIONAL PROGRAM – MANAGING FOR QUALITY:

- Lecture 1: Understanding the Maturity of Quality Development
- Lecture 2: Quality by Design
- Lecture 3: Quality Culture
- Lecture 4: Leadership through Quality

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Global Platform for Quality

Managing for Quality

Lecture 1: Understanding the Maturity of Quality Development

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EDUCATIONAL PROGRAM – MANAGING FOR QUALITY:

- **Lecture 1: Understanding the Maturity of Quality Development**
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What does "process immaturity" look like?

If improvement is not driven by senior managers then the natural law of entropy will prevail and systemic degradation will occur.

No.	Level	Definition	Characteristics
0	Neglect	Management uses functions to organize; pays no attention to process management or using a systems approach to change. There is no will or enthusiasm to do things differently from the normal legacy way of working.	Management uses business restructuring to drive change mostly by changing managers. "Fire fighting" teams "fix" chronic issues or problems; however, these errors are so repeatable that changes in the "top-ten" problem list are of order and not content.
– 1	Resist	Management process behavior is passive-aggressive and whenever process change is tried, resources are shifted or the task is covertly diluted.	Productivity levels and compliance to standards measure success. Product quality and process efficiency are mostly ignored. Cost is dominant in all performance measures.
– 2	Obstruct	Processes that exist are regularly ignored by the employees and control is considered a deterrent to individualism. Workers detest control and insist on doing things their own way as their natural right.	Measurements are simplified, distorted, or falsified so results appear to be acceptable. If quality is produced, it is random and there is no way to verify the actual performance of the work product.
– 3	Disrupt	Workers collude to degrade, sabotage, or damage any change effort. Introducing the process thinking mentality is denigrated by failure stories from other business units.	Internal competition for resources occurs and all resources dedicated to fire-fighting or given to a manager who shouts the loudest. Customers are not considered in developing any requirements

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CONTINUAL IMPROVEMENT BEGINS WITH A FOUNDATION:

Organizations that are "managing by process" will have developed their capability through a series of actions – how far is your organization on this pathway to process management maturity? [Note: the requirements for each level must be satisfied before a higher level ranking on this measurement scale can be assigned.]

Maturity Level		Performance Description
1	Process Foundation Phase	Processes are identified
2		Process informally mapped
3		Processes managed by functional managers
4		Process owner assigned to cross-functional process
5	Process Analysis Phase	Process defined and mapped formally
6		Process measured and related to business results metrics
7		Work processes are linked to business processes
8	System Integration Phase	Process improvement projects charted by management
9		Business processes improvements are aligned to strategy
10		Process improvement projects identified in strategic plan

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Business Excellence

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WHAT OCCURS AT PROCESS LEVEL 1?

The first question that an organization must ask is: **do we really know what a process is?** Process is a word that is used in many different ways, but in the context of modeling processes, we must first understand what does it require to be a process and what are the ingredients of a process. After a characterization of process attributes is done, then we can identify what we mean by a process.

To identify a process means that we believe that **we can specify it using an agreed upon set of attributes**: input and output flows of information or material, resources provided to make it operate, competence required for people to perform it correctly and the control requirements that describe what and when it must operate.

To complete this initial step there must be agreed-upon theoretical basis of knowledge for process thinking.

KEY STEPS:

1. Develop awareness of process thinking and system integration.
2. Distinguish between process work flows and functional tasks.

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WHAT OCCURS AT PROCESS LEVEL 2?

The maturity index is cumulative, that means that the prior steps must be accomplished in order to advance to the next level. The second question that must be asked is **how are these processes understood?** To pass the second level of maturity an organization must have informally mapped its processes. What does this mean?

Informal process maps are characterized by having identified and named the individual steps and decisions in a process, boundary conditions of the process, flow or sequence of the process activities, and overall objectives that describe the process performance requirements.

Informal maps do not follow a specific format for conventions in assigning process names, symbol types, hierarchy levels, or types of flows. Informal maps communicate uniquely and each map may have its own distinctive format and structure. **Process maps do not integrate across functions, business units or geographical organizations.**

KEY STEP:

1. Create process maps to define ISO9000 procedures or information data flow.

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WHAT OCCURS AT PROCESS LEVEL 3?

Once processes have been identified and informally mapped, it usually will become clear to business leaders that **these processes must be managed or else cross-functional collaboration will not occur.** The dilemma that hits an organization at this point is that management responsibility has already been assigned according to the functional areas (e.g., production, service, sales, etc.).

Most organizations resolve this dilemma by assigning process responsibility to current functional managers. In a matrix organization this creates complications: process owners may not have authority to assure compliance to process standards across geographic or business unit boundaries, so process management becomes limited to 'suggesting' good practice, rather than 'assuring' common practice across the organization. Thus, **process "ownership" occurs more in name than in practice**, even if informal cross-functional networks are established for sharing best practice, compliance cannot be required.

KEY STEPS:

1. Assign managers to 'own' responsibility for cross-functional processes.
2. Review and evaluate the process components of work throughput.

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WHAT OCCURS AT PROCESS LEVEL 4?

Frustration from working at level 3 leads to progress to the fourth level: assignment of process ownership where cross-functional managers assume broader authority to assure design, development, implementation and improvement of common processes.

This step requires a transitional phase as functional managers are typically reluctant to surrender their delegated authority. Business leaders often **assign their experienced functional managers as process owners** to signal the importance and superior authority of this role. Authority is typically transferred in steps to the process owner: starting with **cross-functional definition** of the common processes including responsibility for: **process measurement systems**, information systems definition, **competence development**, **facility standardization,** and **budget control**. Local operations managers are responsible for process execution and participate in networks of shared practice to improve and coordinate activities across the business.

KEY STEP:

1. Delegate fiduciary managerial responsibility to process owners and align performance measurement systems to process organization.

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WHAT OCCURS AT PROCESS LEVEL 5?

The initial focus of newly assigned process owners is to develop a common definition and understanding for their process, so projects are initiated that will produce, test, and approve formal process model descriptions. Activities accomplished at this phase include: **definition of a standard for process models so that completed models are usable for communication across all functional and business boundaries**; study of the current processes and mapping the "as is" state of activity; sharing the publication of draft models for review by operations managers who act as local process managers so they can define their activities that are divergent from the model; and approval of the final model with all the divergent actions noted for resolution in future performance improvement projects. Closure of this step will not result in having common processes, but define a standard process with deviations from that process identified across the entire organization.

KEY STEPS:

1. Develop graphical standards to define processes and map integrated flow of work performance across functional areas.
2. Review processes to the standard model to discover discrepancies.

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WHAT OCCURS AT PROCESS LEVEL 6?

Performance measurement of processes uses four dimensions of work that must be measured: **quality** (level of work accomplished that meets the criteria for acceptable results: an indicator of productivity or yield); **cost** (or the direct activity cost of the transaction accomplished by the process); **time** (or the cycle time that is required to complete one unit through a full process from beginning to end); and **risk** (identification of the potential failure modes in the process – due to performance, decision, hazard, or fragility of the equipment or process action). Process measures must be linked to key business performance metrics and business decisions must identify critical components of the decision process: who is involved in the decision, what role do they have in the decision; what is their measure for a successful decision; and the performance target for that measure upon which is a criteria to judge an effective decision.

KEY STEP:

1. Develop a systemic performance measurement system that maps the flow of activities using a family of measures for quality, cost and cycle time performance.

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WHAT OCCURS AT PROCESS LEVEL 7?

After these actions work results can be **effectively linked to business results** and the performance of daily process activities can be used to determine progress toward achieving key business performance targets. At this stage in process maturity there will be a comprehensive process model of the key business functions and core processes. Management must be capable of viewing the model based on different perspectives in order to learn: **where improvement should be made**; how to track process activity across functions and determine which functions are involved in each process; and **what difference in performance would occur if a specific process change is made?** When this level of maturity is achieved management has a new tool to control and direct the organization and simulation is possible to assess work flows using process measures.

KEY STEPS:

1. Connections between processes are made using data-driven facts to identify waste, losses, and opportunities for improvement.
2. Use of 'what if' analyses is applied to estimate potential results from making process performance improvements.

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WHAT OCCURS AT PROCESS LEVEL 8?

A major management change occurs with **establishment of projects chartered to address specific dysfunctional areas identified in the business process model.** Improvement projects are launched based on deficiencies in processes as identified by excessive cycle time, quality waste, or excessive cost or risk. **Target-setting is based on advancement of process performance** from the current state of historical results toward the ideal level of performance against requirements as determined by statistical analysis of its capability for reliable performance. Target-setting is systemic and assures that there are no "local optimum performance silos" which deliver sub-optimal system-wide results. Management decision-processes are characterized by a combination of management by process and management by facts. Business analytics are used to distinguish opportunities and challenges which must be addressed.

KEY STEPS:

1. Improvement projects are specifically chartered by management to address systemic opportunities for improvement (hoshin projects)
2. Process capability analysis is used for target-setting.

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WHAT OCCURS AT PROCESS LEVEL 9?

Process modeling is advanced as tool for strategic planning to assure rationalization, harmonization, and alignment of organization-wide process improvement activities so they serve the business strategy. This is done as part of the implementation planning for deployment of strategy through strategic change projects. **Continual refinement of the performance model** results in a statistically valid model of the process capabilities and delivers management an ability to define performance objectives using profound knowledge of the process performance. **An adaptive feedback cycle uses the observed real-world performance data to fine-tune the model and test its critical assumptions regarding process behavior** – highlighting those areas where management's decision rules need to be evaluated due to changes in the work circumstances.

KEY STEPS:

1. Cycles of process improvement result in continual refinement of work and business processes as measurement points teams to adaptively improve work results and systematically drive out waste and enhance throughput.
2. Performance results are linked by line-of-sight measures using work processes to increase strategic capability of business level processes.

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WHAT OCCURS AT PROCESS LEVEL 10?

This activity is embedded into strategic planning and becomes **embedded in the annual cycle for developing strategic plans**. Management may use a set of 'what if' analyses to define alternative performance scenarios that could become outcomes of optional change management projects. Management distinguishes between the business fundamental measures of the organization and the Key Performance Indicators that are used to drive the strategic change projects which have been "war-gamed" using the business simulation model.

KEY STEPS:

1. Scenario planning and options analysis use the organization's process model for conducting 'what if' analyses as part of its strategic planning process.
2. The annual strategy management process results in identification of the key cross-organizational improvement projects.

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CLASS DISCUSSION:

Conducting an honest self-assessment is the best first step toward making effective change in any organization. For your project company – how does your culture fit a process way of working? How receptive is your organization to change? What are the key helping forces that encourage change? What hinders change? What is your organization's current maturity level? What should be your goal? By when?

Current Maturity Level	Targeted Maturity Level	Scheduled Goal Date
Key Opportunities for Improvement – Projects to Initiate for Maturity Growth: • • • •		

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Managing for Quality

Lecture 2: Quality by Design

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- **Lecture 2: Quality by Design**
- Lecture 3: Quality Culture
- Lecture 4: Leadership through Quality

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What do we mean by the phrase "Quality by Design"?

Quality by Design is the systematic approach to development that begins with predefined objectives and emphasizes product and process understanding and process control, based on sound science and quality risk management. Quality by Design includes:

- Target product profile that provides a quantitative objective for design.
- Collect relevant prior knowledge and use risk assessment to prioritize knowledge gaps for further investigation.
- Design the product and production processes to meet the most critical of customer requirements.
- Test products in their ultimate environment to the point of failure so that the product's weaknesses may be revealed and corrected before release.
- Establish a control strategy and plans for the entire process to anticipate increases in scale and market breadth and is guided by a risk assessment.

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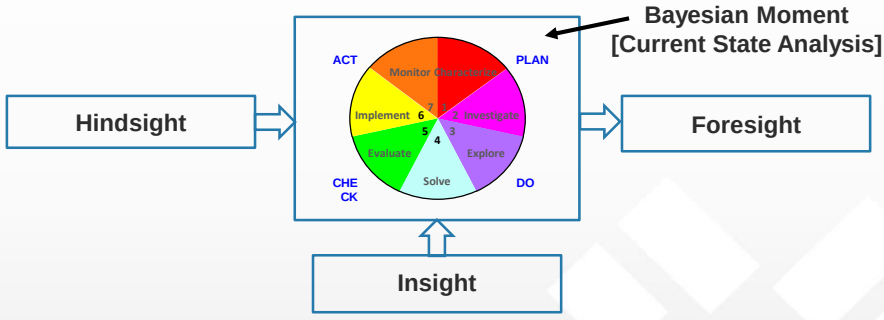
Bayesian moment is the time to define transformation:



Develop an intimate understanding of customer-related performance to discover:

(1) How well have we performed in the past relative to customers (hindsight);
(2) How well are we currently doing in customer performance (insight); and
(3) How well must we perform for customers in the future (foresight)?

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When is redesign needed for quality improvement?

Whenever the actual process capability of a customer requirement begins to approach its design capability **AND** customers are requesting increased levels of performance, **THEN** it is mandatory to design the specific product, process or service, in a way that assures customers that their performance needs and requirements will be kept consistently and delivered in the future.

Whenever competition advances performance beyond the level that your own products or services deliver **AND** customers therefore reward them with their business so you are losing sales, **THEN** it is mandatory to redesign deliverables to regain competitive advantage.

An operational definition of a ***Customer Requirement*** requires three things:

(1) Identify the feature or function that must be engineered (noun-phrase);

(2) Identify the action that must be designed (verb); and a

(3) Description of the benefit or value obtained by making this investment.

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CLASS DISCUSSION:

- Establishing quality by design requirements is a logical exercise in the definition of three elements of the requirement: the action, the subject, and the reason.
- Here is an example for a requirement to reduce the breaking strength of the seal on a water bottle so older people can open it more easily.
- What examples can your team develop?

Verb	Noun-Phrase	Value or Benefit
Decrease	Bottle seal tearing strength	Open more easily

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GLOBAL PLATFORM FOR QUALITY

Products should be profitable and environmentally sound:

Sustainable Products:

- Products that last a long time – enduring value
- Products that have persistent market success – sustainable sales
- Products that contribute to the planet's environmental goodness
- Products that "do no harm" to ecosystems that sustain society

Qualify the Product

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Processes must be both Lean and Clean:

Sustainable processes:

- Processes that operate with no waste, loss, or inefficiency
- Processes that deliver continued profitable growth
- Processes that adapt to new environments and are portable

Certify the Process

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Searching for business sustainability:

Two components of sustainability need to be achieved:

- Sustainability of the global environment
- Sustainability of organizations that operate with quality

Long-term sustainability requires management and development:

- Creating and implementing the standard is quality management
- Enhancing and advancing performance is quality development

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GLOBAL PLATFORM FOR QUALITY

What should be done about this?

Design organizations as productive systems for quality products:

Technical System

Knowledge System

Human System

Productive System

Certify the System

Qualify Deliverables

Design Quality into all Processes

Design Quality into all Products

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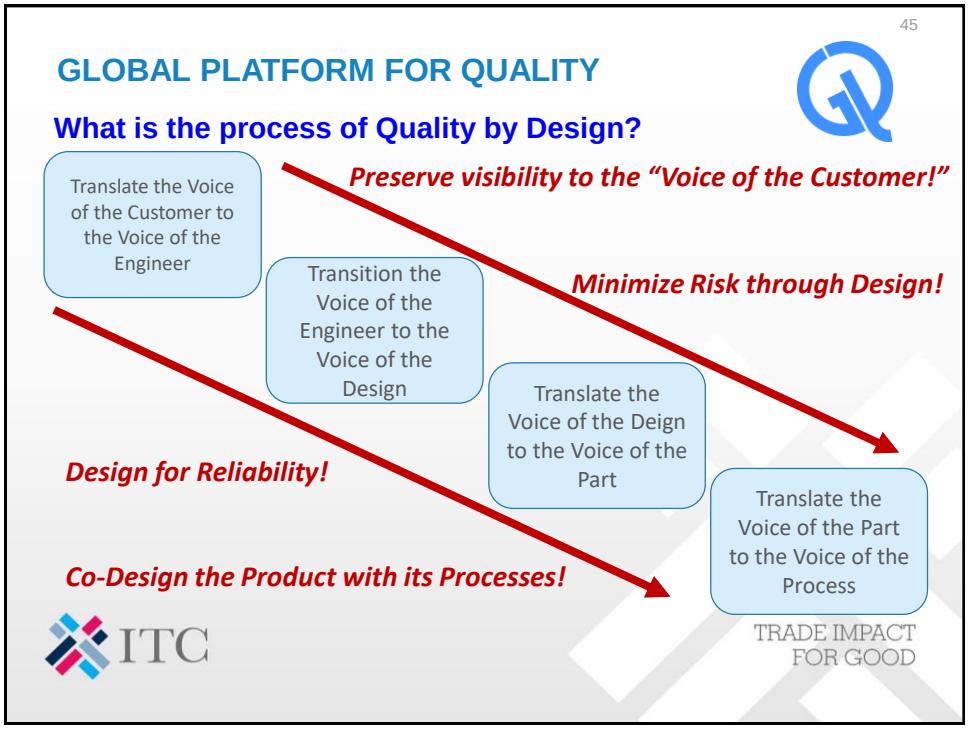
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GLOBAL PLATFORM FOR QUALITY
What is the process of Quality by Design?
Translate the Voice of the Customer to the Voice of the Engineer
Preserve visibility to the "Voice of the Customer!"
Transition the Voice of the Engineer to the Voice of the Design
Minimize Risk through Design!
Translate the Voice of the Deign to the Voice of the Part
Design for Reliability!
Translate the Voice of the Part to the Voice of the Process
Co-Design the Product with its Processes!
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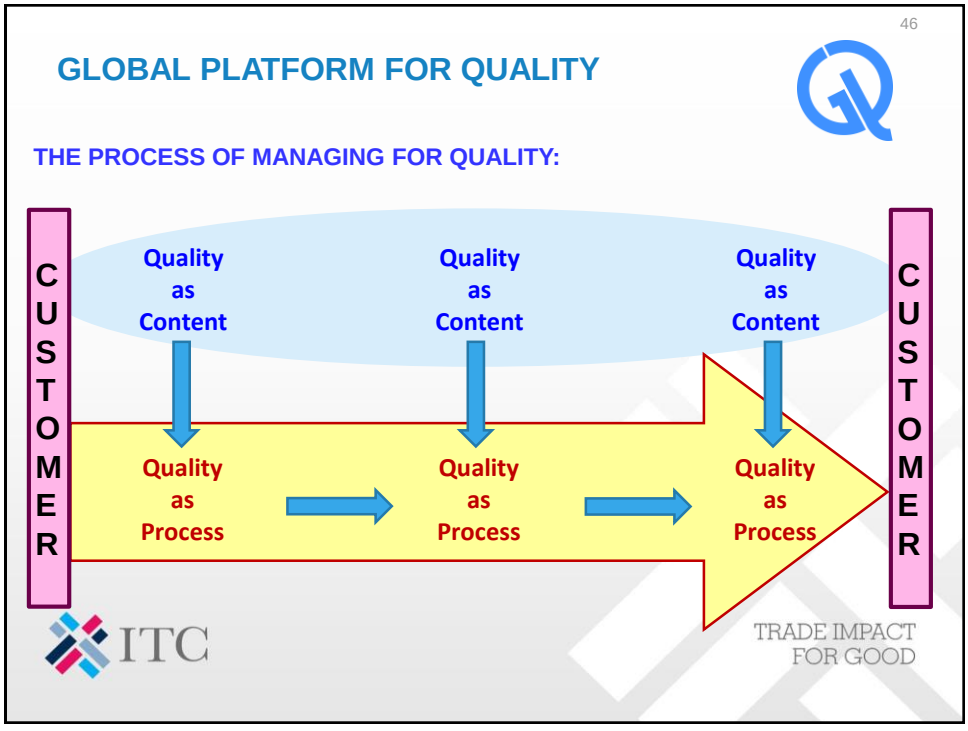
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GLOBAL PLATFORM FOR QUALITY
THE PROCESS OF MANAGING FOR QUALITY:
CUSTOMER
Quality as Content
Quality as Content
Quality as Content
Quality as Process
Quality as Process
Quality as Process
CUSTOMER
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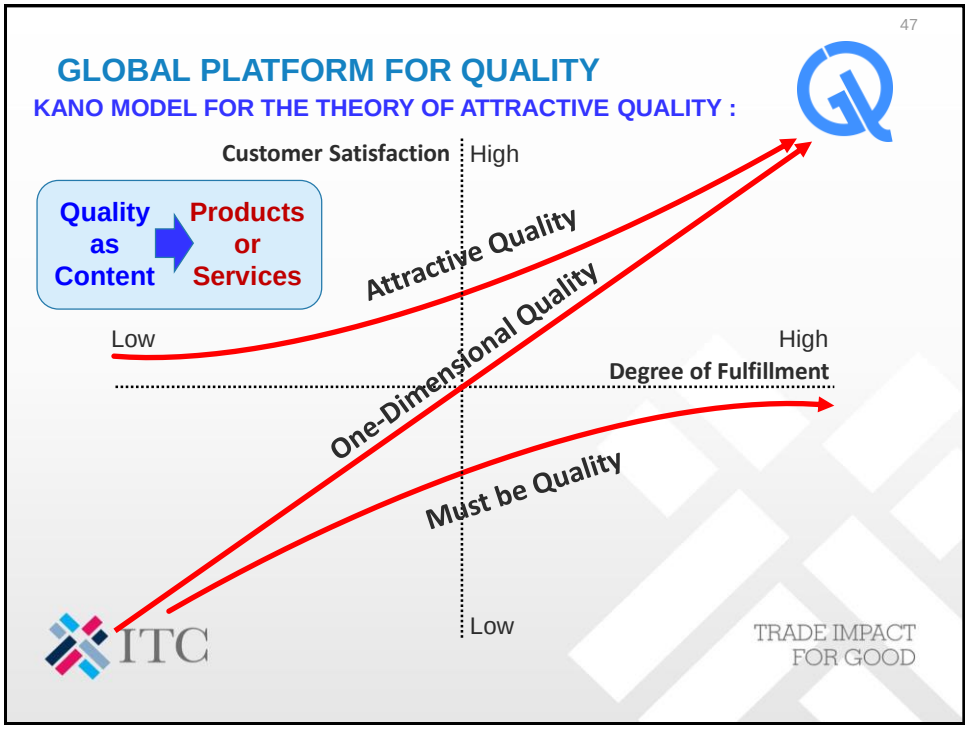
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GLOBAL PLATFORM FOR QUALITY
KANO MODEL FOR THE THEORY OF ATTRACTIVE QUALITY :
Customer Satisfaction
High
Quality as Content
Products or Services
Attractive Quality
One-Dimensional Quality
Must be Quality
Low
High
Degree of Fulfillment
Low
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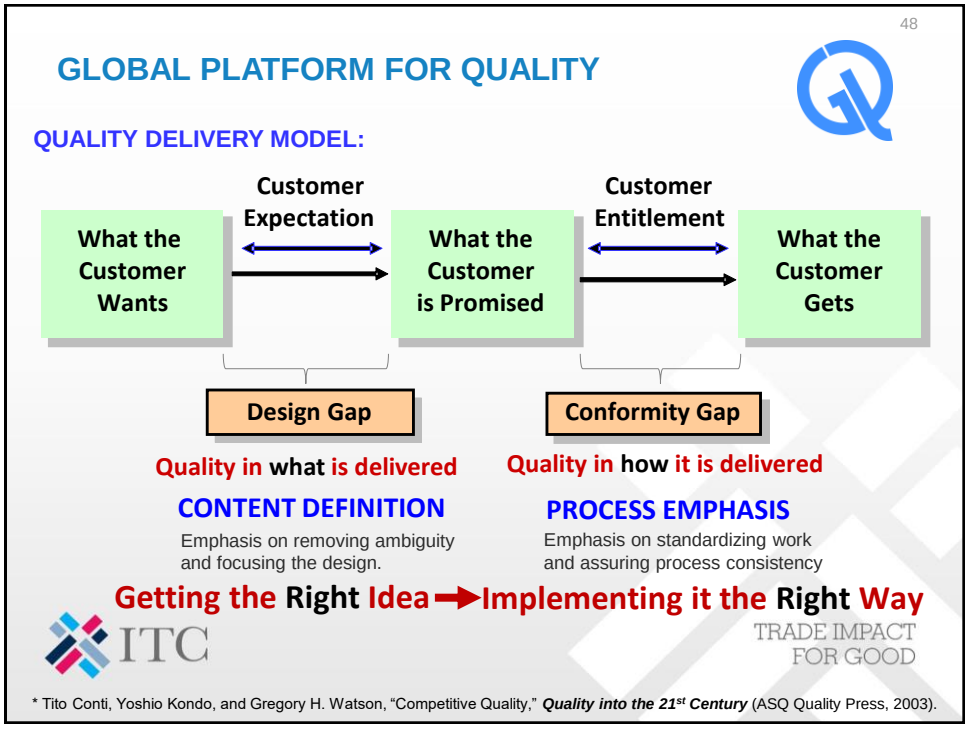
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QUALITY DELIVERY MODEL:
What the Customer Wants
Customer Expectation
What the Customer is Promised
Customer Entitlement
What the Customer Gets
Design Gap
Conformity Gap
Quality in what is delivered
Quality in how it is delivered
CONTENT DEFINITION
Emphasis on removing ambiguity and focusing the design.
PROCESS EMPHASIS
Emphasis on standardizing work and assuring process consistency
Getting the Right Idea → Implementing it the Right Way
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* Tito Conti, Yoshio Kondo, and Gregory H. Watson, "Competitive Quality," Quality into the 21st Century (ASQ Quality Press, 2003).

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The Process of Managing for Quality:

Theory of Attractive Quality: Defines Dynamic Content

CUSTOMER

Attractive Quality — DESIGNED INTO → What the Customer Wants

One-Dimensional Quality — DESIGNED INTO → What the Customer Is promised

Must-be Quality — DESIGNED INTO → What the Customer Gets

CUSTOMER

Quality Delivery Model: Defines Process Activities

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KANO MODEL FOR THE THEORY OF ATTRACTIVE QUALITY:

What must be done to become quality?

Customer Satisfaction: High

Low

High

Degree of Fulfillment

Low

Attractive Quality

One-Dimensional Quality

Must-be Quality

Design innovative quality systems and methods

Increase customer insight to build brand reputation

Strengthen the organization's quality competence

"Inclusive quality involves and engages all people at every level to fulfill their unique responsibility for delivering critical quality outcomes!" ~ Gregory H. Watson

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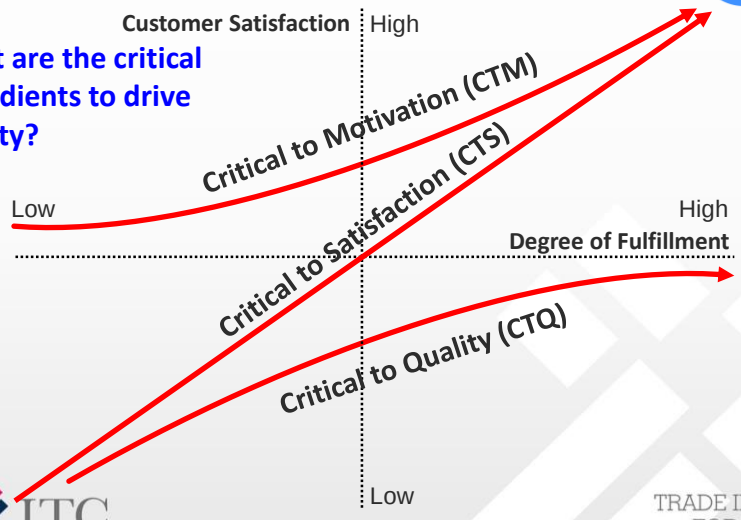
KANO MODEL FOR THE THEORY OF ATTRACTIVE QUALITY :

What are the critical ingredients to drive quality?



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QUALITY DRIVES CUSTOMER REQUIREMENTS:

- **Critical to Quality (CTQ)** – In order to under stand the requirements of the "must-be" quality dimension with its requirements for delivering a disciplined approach to feature and function characteristic compliance, an organization must pay particular attention to the drivers of both product quality as well as the process by which its deliverables are created. Failure to meet expectations and requirements in the CTQ domain undermines customer confidence in the deliverables and results in loss of business over the long term.
- **Critical to Satisfaction (CTS)** – CTS requirements deliver a competitive edge to the features and functions of an organization's deliverables. The objective for a CTS quality characteristic is to take advantage of the intimate customer insight and to improve performance relative to competitive market offerings so that the CTS performance requirements are clearly superior to alternatives and will deliver higher perceivable value to customers.
- **Critical to Motivation (CTM)** – The CTM requirements create the "charm of a product" through differentiated innovation that triggers emotional responses to latent customer desires and thereby creates customer delight that results in a "killer product" or "hot application" which disrupts the marketplace.

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Quality by Design – Organizational maturity levels:

Organizations "managing quality by design" have developed innovative capability and creative competence through a series of actions: how far advanced is your organization on this pathway toward design maturity? [Note: requirements for each level must be satisfied before a higher level ranking is assigned.]

Maturity Level		Performance Description
1	Artisan Stage	Products are one-off, based on artistic whims of one designer.
2	Craftsman Stage	Standardized design components reduce repetitive teamwork.
3		Project post-mortems are used to determine how to improve.
4	Engineer Stage	Project-to-project performance is tracked using measures.
5		Design rules are put into place for all critical design functions.
6		Technology categories and product platforms are managed.
7		Product portfolio is managed using the technology life cycle.
8	Designer Stage	Multi-generational product plans are used for risk leveling.
9		Product development programs are aligned to strategy.
10		Technology forecasts drive the business strategic plans.

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CLASS DISCUSSION:

- Quality by Design merges two parallel processes into a synergistic alignment as a concurrent engineering process where the product and process are engineered simultaneously. What are the major challenges that you face in your project with an approach like this?
- Can you identify examples where the approach of co-designing products with their processes can be applied?
- List three opportunities that this co-design approach could be applied in your value chain of end-to-end processes:

Product Development Process	Process Development Process

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Managing for Quality

Lecture 3: Quality Culture

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- Lecture 4: Leadership through Quality

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Develop consistency in knowledge, attitude & norms:

Quality Culture: The cultural awareness of quality and its importance to the business and its customer's must be led and reinforced by senior management who also has the duty to set an environment which fosters strong customer-oriented values that are demonstrated in the quality of the daily routine of its business and work operations.

Culture refers to beliefs, opinions, traditions, and practices which embody a code of behavior or set of mores or system of ethical values. It is possible that each individual may be influenced by multiples such codes of conduct and that some of these may be stronger or weaker – and consequently problematic. It is possible that an individual is influenced by codes with conflicting principles.

Quality cultures can be negative (e.g., "hide-the-scrap-and-waste") or positive (e.g., "let's work together to delight our customers").

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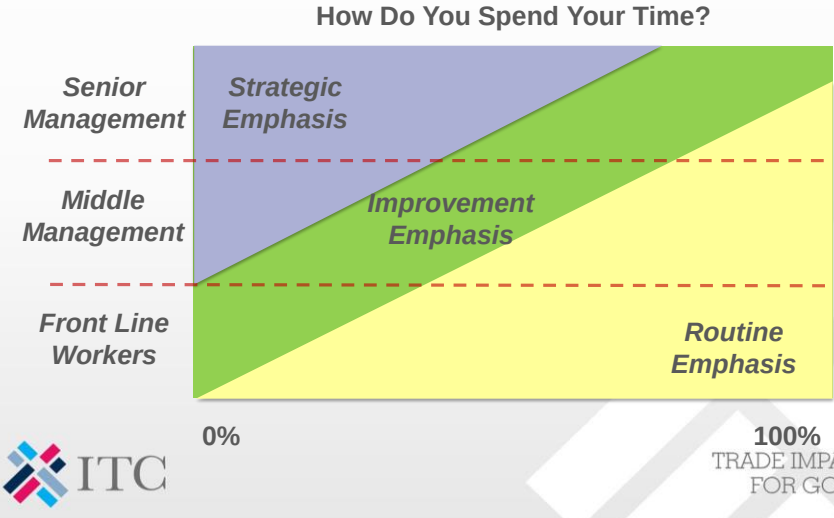
Cultural Signs: How we spend time and what we do:



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Questions regarding a "quality culture" assessment:

One way to assess an organization's quality culture is to conduct an employee survey. Seven questions determine the strength of a quality culture (each question has one of four answers: to a great extent, moderately, minimally, or not at all):

1. Do you feel that you understand what good quality is?
2. To what degree are you familiar with the company's emphasis on quality?
3. To what degree do you agree with the following statement: "My manager's actions and attitude convince me that quality is important"?
4. To what degree to you understand the quality measurements in your own department?
5. Everything considered, how do you rate your department on providing high-quality service and outputs?
6. To what degree do you think your achievement of quality standard affects your performance evaluation?
7. Have you worked in a quality circle, quality improvement team, or on a quality project in the past year?

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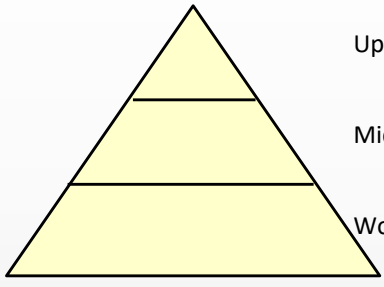
Organizations talk using many different languages:



Upper management talks the language of money.

Middle management must become bilingual.

Workers talk the language of products and processes.

Cross-functionally there are also different disciplines (e.g., finance, marketing, operations, research) that possess their own languages and cultures. In order to assure clear communication across all of these vertical and horizontal types of boundaries, organizations must develop a common culture as a way to gain clarity which encourages cooperation and collaboration.

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COMPARING CORE RIGIDITY TO CORE FLEXIBILITY:

How much flexibility is designed into your business system?

Core Rigidity Characteristics	Core Flexibility Characteristics
• Inhibitive	• Innovative
• Mechanistic	• Adaptive
• Mindless	• Mindful
• Static	• Dynamic
• Risk-avoiding	• Risk-embracing
• Closed	• Open
• Collusive	• Accountable
• Opaque	• Transparent

How to transition from a rigid, traditional way of working to a more flexible way of managing work by flow? What do you do?

* Leonard-Barton, D. A. (1992), "Core Capabilities and Core Rigidities," ***Strategic Management Journal***, 13, pp. 111-125.

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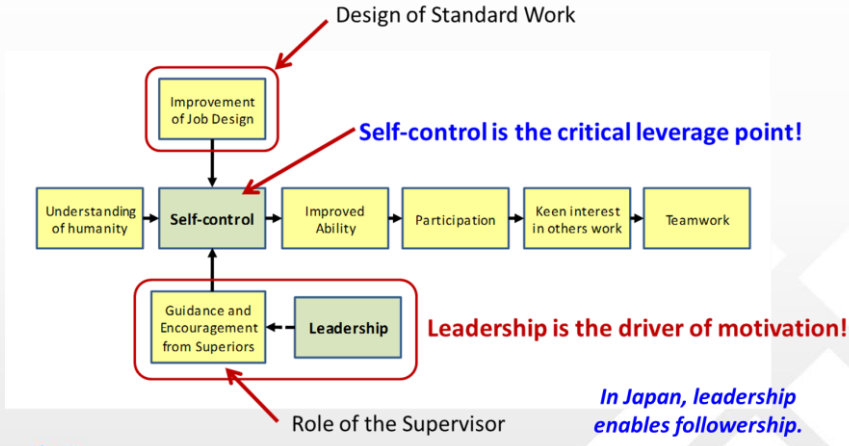
INDIVIDUAL MOTIVATION FOR PARTICIPATION IN TEAMWORK:



In Japan, leadership enables followership.

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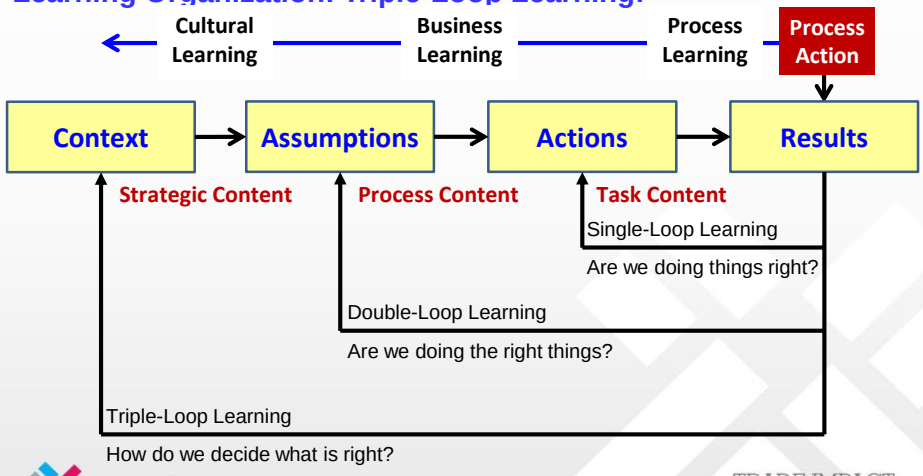
Learning Organization: Triple-Loop Learning:



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CLASS DISCUSSION:

- Often the overall culture of an organization is established so that it encompasses a value system that is compatible with the local culture of its organizational entities.
- For the set of cultural values that are specified in as a working value system in the table below, what challenges could happen in a local culture?

Working Value System	Local Organizational Culture
Putting the customer first	
Managing by Fact	
Consensus Decision- making	
Focus on Achievement	
Applying Common Sense	

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Global Platform for Quality

Managing for Quality

Lecture 4: Leadership through Quality

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EDUCATIONAL PROGRAM – MANAGING FOR QUALITY:

- Lecture 1: Understanding the Maturity of Quality Development
- Lecture 2: Quality by Design
- Lecture 3: Quality Culture
- **Lecture 4: Leadership through Quality**

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GLOBAL PLATFORM FOR QUALITY

CONTINUAL IMPROVEMENT SHOULD BE AN OBJECTIVE OF LEADERS:

Henri Fayol (1841-1925)

Henri Fayol: "The process of management is planning, organizing, coordinating, commanding, and controlling." Managing requires "a **constant search for improvements** that can be introduced into every sphere of activity… The search for improvement should be pursued unceasingly at all levels and throughout all parts of the business. **The executive in charge should have an active, unrelenting intention to effect improvement**."

"The most critical obligation of the executive function is to deliver both profit in the short-term and strength in the long-term."

~ John Francis "Jack" Welch (1935-)

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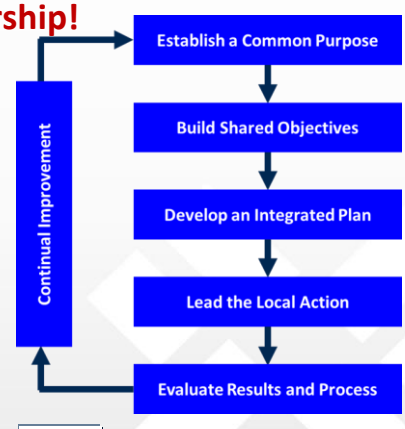
GLOBAL PLATFORM FOR QUALITY

PROCESS MANAGEMENT REQUIRES PROCESS OWNERSHIP!

Leadership!

Process of Management

The **Process of Management (POM)** is ***distinct*** from ***content*** (or strategy and tactics) and the ***analytical tools*** (statistics and graphs) that enable it. POM can be exercised at all levels of an organization and is based upon a Plan-Do-Check-Act (PDCA) model of process improvement. Exercising the "Check" step is a final step in POM and creates a stimulus for future continual improvement. Self-assessment is a critical event in driving process improvement. Such an effort must focus on actions that local management can take that will enhance the quality of their output.



Adapted from Hewlett-Packard, circa1987

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The world needs scientific leadership not just scientific management!

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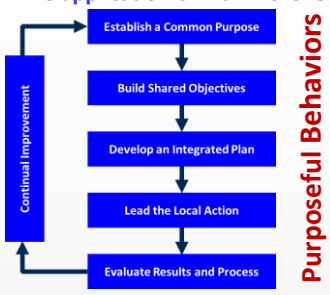
PROCESS OF MANAGEMENT – 1:

The application of Plan-Do-Check-Act to the Process of Daily Management



Establish a Common Purpose *

- Communicate with Customers
- Study the Environment
- Align with Organizational Objectives
- Be Willing to Innovate
- Analyze and integrate Data

The common purpose establishes relationships to customers and competitors and identifies the contribution of the process team as aligned to the organization's goals and objectives. It ***challenges the legacy or "same old way" of working by asking "what if" about the positives for innovation and any negatives that create unreliable conditions***. Experiments with technology, processes services are intended to improve standard work based on the willingness to adjust process activities based on observations of the environment combined with sensemaking to improve that will create significant changes in performance.

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* Reference: Hewlett-Packard Training Course, "The Process of Management" (1987).

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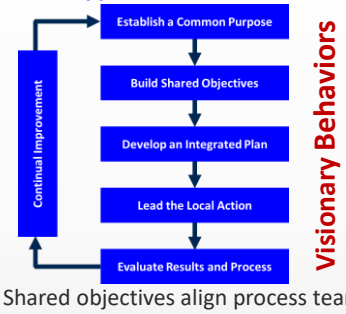
GLOBAL PLATFORM FOR QUALITY

PROCESS OF MANAGEMENT – 2:

The application of Plan-Do-Check-Act to the Process of Daily Management



Build Shared Objectives *

- Build Common Values
- Communicate the Vision
- Involve People in Building the Vision
- Maintain Alignment to the Vision
- Measure Performance Against the Vision

Shared objectives align process teams in a mutually respectful way of working in a coherent group and define its mode of functioning with others external to the work unit to build a shared commitment in delivering excellence to customers while respecting values others bring to the team. Encouraging team discussion and agreeing on working philosophies, practices and processes establish ground rules for operation. Explaining the vision for how changes benefit all team members and communicating that purpose and its rationale will enable everyone to understand their role and how they contribute to the results.

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* Reference: Hewlett-Packard Training Course, "The Process of Management" (1987).

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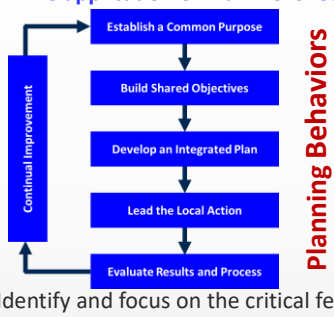
GLOBAL PLATFORM FOR QUALITY

PROCESS OF MANAGEMENT – 3:

The application of Plan-Do-Check-Act to the Process of Daily Management



Planning Behaviors

Develop an Integrated Plan *

- Use Effective Planning Techniques
- Manage the Resource Flow
- Identify Appropriate Resources
- Develop a Spirit of Shared Responsibility
- Assess Risk and Evaluate Progress

Identify and focus on the critical few priority changes that need to be completed. Define the critical performance indicators, data collection plan, implementation plan, and contingency plans based on foreseeable, potential risk. Identify resources necessary to accomplish the project plans, including the people to be involved by competence area and ability. Involve the team in planning to ensure ownership of all activities. Communicate the importance of cooperation and interdependency. Negotiate agreement on objectives and set challenging but achievable targets. Allow people to contribute within the context of the overall plan.

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* Reference: Hewlett-Packard Training Course, "The Process of Management" (1987).

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GLOBAL PLATFORM FOR QUALITY

PROCESS OF MANAGEMENT – 4:

The application of Plan-Do-Check-Act to the Process of Daily Management

Leadership Behaviors

Lead the Local Action *

- Facilitate the Action
- Review Progress toward Targets
- Gain and Solicit Feedback
- Support and Develop People
- Lead by Example
- Recognize and Reward Contributions

Provide resources and prevent disruptions to work by resolving all conflicts using a win-win approach. Practice "Management by Wandering Around." Provide specific and timely feedback to team members which is both reinforcing and corrective. Confront performance problems in a direct, constructive manner. Delegate responsibility and give people freedom to act in a self-regulating way. Allow people to learn from their mistakes and stay in close touch with team members and stakeholders. Communicate in an open and honest manner demonstrating the same behavior that you expect from others.

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* Reference: Hewlett-Packard Training Course, "The Process of Management" (1987).

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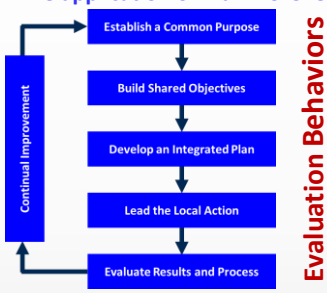
GLOBAL PLATFORM FOR QUALITY

PROCESS OF MANAGEMENT – 5:

The application of Plan-Do-Check-Act to the Process of Daily Management



Review Results and Process *

- Determine Customer Satisfaction
- Determine Company Satisfaction
- Review the Process and Results
- Identify Opportunities for Improvement
- Celebrate Success

Collect data and feedback communications from external and internal customers to assess how well their expectations have been met and determine performance against quality standards. Determine progress toward company objectives and results against the vision and goals and also for critical strategic change projects. Conduct post-project reviews to critique the process and gain knowledge to improve the way of working. Assess the team satisfaction with the process and improvement ideas. Ask team members about how you can improve your own effectiveness. Document the findings of this post-mortem analysis.

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* Reference: Hewlett-Packard Training Course, "The Process of Management" (1987).

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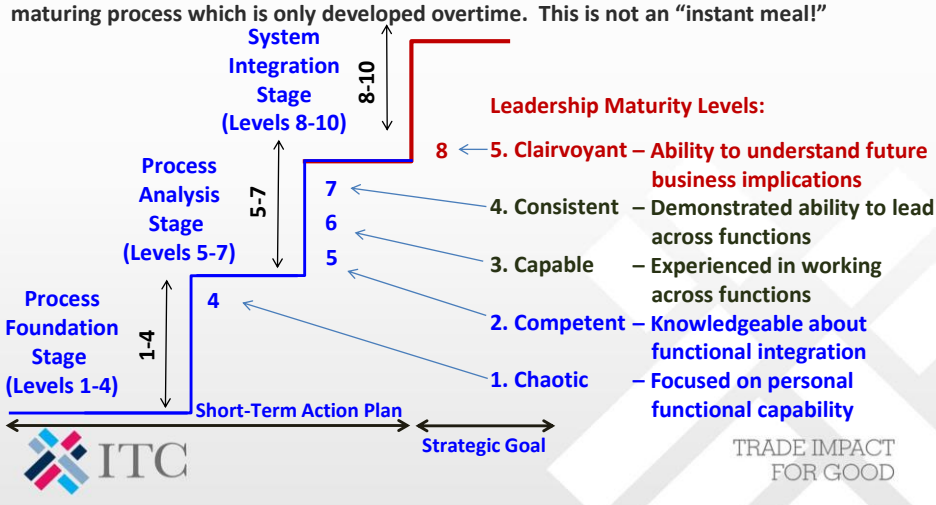
RESPONSIBLE OWNERSHIP BUILDS LEADERSHIP CAPACITY:

Developing "capacity to lead" is more than competence-building. It requires a personal maturing process which is only developed overtime. This is not an "instant meal!"



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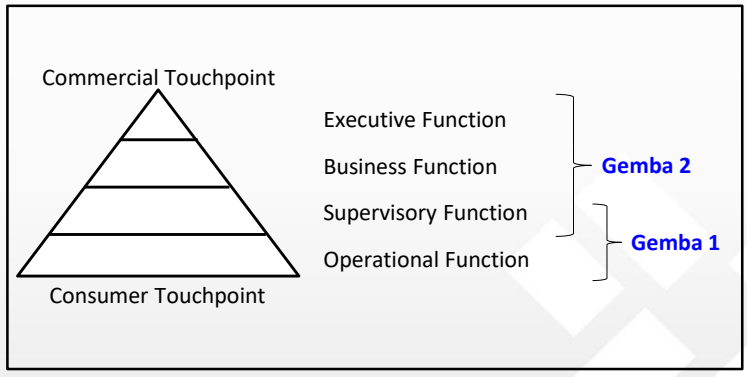
THERE ARE TWO DISTINCT WAYS OF UNDERSTANDING WORK:

Understanding the two gemba: one is visible and the other is invisible!



- Gemba #1: ***Tangible activities producing value for customers.***
- Gemba #2: ***Thought processes defining and coordinating work.***

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Managing the visible gemba – leading in the invisible:

- What innovation is needed to improve quality of the workplace?
- Quality in organizations – delivering performance consistently in the workplace requires managing both the visible as well as the invisible activities of the organization.
- **Gemba #1:** ***Tangible activities producing value for customers – it is focused on managing the flow of work and observational data.***
- **Gemba #2:** ***Thought processes defining and coordinating work – it is focused on managing the flow of resources and information.***
- Management decisions establish limits of quality and reliability in both of these gemba!

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Quality Characteristics of the two Gemba:

Quality Characteristic	Gemba 1	Gemba 2
Dominant Entity Type	Tangible Work	Intangible Work
Measurement Type	Physical (Time)	Financial (Money)
Management Objective for Performance	Productivity Growth– Unit Volume Delivered	Economic Growth– Profitability
Efficiency Leverage	Flow Efficiency	Resource Efficiency
Quality Emphasis	Product Quality	Financial Quality
Leadership Initiative	Worker Decisions	Manager Decisions
Constructive Focus	Internalities	Externalities
Dominant Thinking Style	Logic-based Decisions	Emotion-based Decisions
Improvement Emphasis	Continual/Incremental	Breakthrough/Change
Desired State	Stability/Regularity	Flexibility/Adaptability
Dominant Work Style	Operational Function	Executive Function
Dominant Learning Mode	Kinesthetic/Oral	Oral/Written
Communication Style	Informal/Conversational	Formal/Commanding
Communication Details	Crisply Specific	Abstractly Vague

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GLOBAL PLATFORM FOR QUALITY

Probing questions drive direction in scientific inquiry:

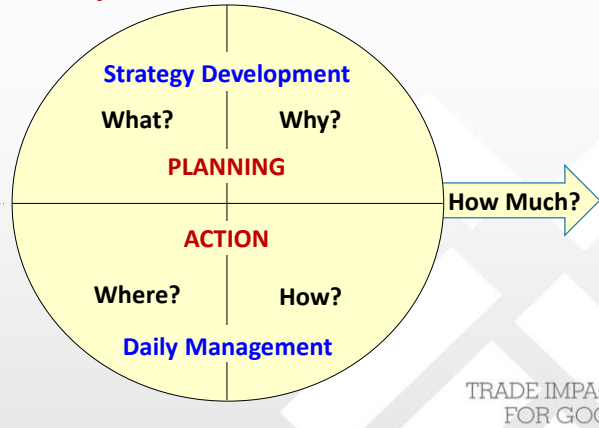
What are the questions that you should be asking to achieve the results that are desired for your current objectives?

Leadership System

Gemba 2

Gemba 1

Management System



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Leadership-Management dialog discovers strategy:

Strategic Dialog: While ***vision*** provides motivating encouragement that will set long-term intention for achievement of excellence in performance; the ***mission*** describes the purpose or objective for which an organization exists. While vision is motivated by competitive environmental factors as well as internal values and culture, mission is enabled by breakthrough technologies in a context of values and culture. Coupled together – they produce results.

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Should we manage a function or own a process?

Distinctions in responsibilities and accountabilities of process owners and functional managers:

Functional Manager:

- Manages resource flow
- Develops competence
- Focus on people
- Skills development
- Education and training
- Career planning for people
- Manages budget and cost
- KPI measure: cost
- Responds to shareholders

Process Owner:

- Manages process flow
- Develops capability
- Focus on system
- Performance outcomes
- Standardized work
- Continual Process improvement
- Manages process and quality
- KPI measure: throughput
- Responds to customer demand

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How do management and leadership differ?

What do Managers focus on doing?	What do Leaders focus on doing?
Exercises "know-how"	Exercises "know-why"
Administers a process	Innovates a solution
Accomplishes transaction that define tasks	Influences transformation of an organization
Maintains performance	Develops competence and capability
Focuses on system and structure	Focuses on People
Relies on command and control	Communicates direction and inspires trust
Asks what and when	Asks why and how
Takes a short-range view	Takes a long-range view
Delivers the bottom line	Achieves a vision of the future
Imitates prior successful managers	Originates new definitions of success
Accepts status quo	Challenges the status quo
Acts like a good soldier	Acts as their own person
Does things right	Does the right thing

Adapted from: Hewlett-Packard Corporate Quality, ***The Process of Management***, 1987.

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Leadership: Constructive or destructive?

What type of leader are you?

Constructive: share maximum information with workers; use power carefully, mindfully and vigilantly; create conditions that motivate; are obsessed with performance and results; eliminate poor behavior among workers: review wins and looses with equal passion and discipline; adjust goals to ensure they motivate employees; and regularly discuss culture and responsibility.

Destructive: keep information secret and compartmented; abuse power so it makes themselves appear "better" and others "lesser;" takes credit for work of others; apply pressure, fear, and authority to "motivate;" myopically focus on financial results; tolerate poor personal behavior in workers if the results is acceptable; fail to celebrate wins but torturously interrogate failures; the only way to change goals is to make them harder; focus talks on accountability; and are frightened about losing their power.

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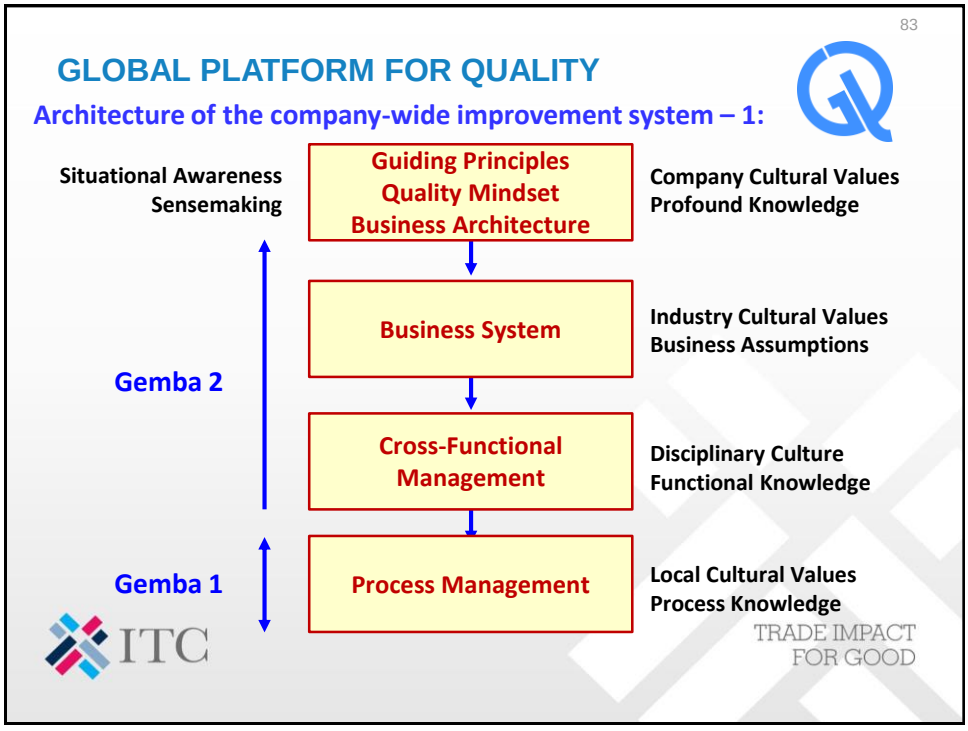
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GLOBAL PLATFORM FOR QUALITY
Architecture of the company-wide improvement system – 1:
Situational Awareness
Sensemaking
Guiding Principles
Quality Mindset
Business Architecture
Company Cultural Values
Profound Knowledge
Business System
Industry Cultural Values
Business Assumptions
Gemba 2
Cross-Functional Management
Disciplinary Culture
Functional Knowledge
Gemba 1
Process Management
Local Cultural Values
Process Knowledge
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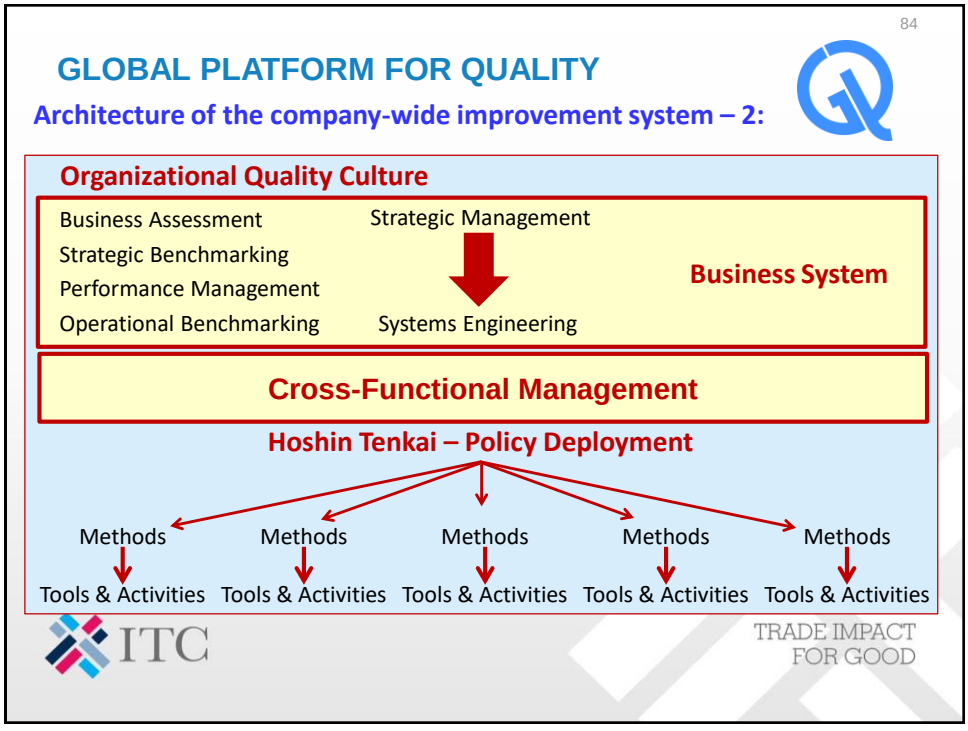
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Architecture of the company-wide improvement system – 2:
Organizational Quality Culture
Business Assessment
Strategic Benchmarking
Performance Management
Operational Benchmarking
Strategic Management
Systems Engineering
Business System
Cross-Functional Management
Hoshin Tenkai – Policy Deployment
Methods
Methods
Methods
Methods
Methods
Tools & Activities
Tools & Activities
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Managerial engineering of business as a system:

How will quality continue to mature in the future?

Quality Management +

Quality Development +

Quality Culture =

Leadership through Quality

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Successful trade requires competitive quality:

"Attractive quality encourages trade and leads to a potential for creating profitable growth for those enterprises that develop a quality strategy which differentiates them from their competition."

~ Gregory H. Watson

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GLOBAL PLATFORM FOR QUALITY

CLASS DISCUSSION:

- The quality journey of organizations begins by establishing a quality management system and then pursues two directions for competitive gains: ***Managing for Quality*** to focus on customer benefits which should be followed by ***Leadership through Quality*** to achieve sustainable competitiveness. What actions are needed in these areas for your project company?

Managing for Quality	Leadership through Quality

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