



International
Trade
Centre

Developing Quality Competence

Certified Quality Professional

Advanced Level Program

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29 November 2029

**Trade Impact
For Good**



Table of Contents

Table of Contents

Preface

Certified Quality Professional – Advanced Level Curriculum Program

- 1 Q201 – Introduction to Quality
- 2 Q202 – Standardizing Work
- 3 Q203 – Service Quality
- 4 Q204 – Quality Management System Design
- 5 Q205 – Basic Problem Solving
- 6 Q206 – Personal Quality and Career Development



Preface



INTERNATIONAL
ACADEMY for
QUALITY



The Global Voice of Quality

EUROPEAN
ORGANIZATION
FOR
QUALITY



This electronic book represents the third 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 advanced program contains six courses that enhance the core program content of the basic quality management programs. This information lays a advanced specialization in quality-related subject matter such as quality audit, quality engineering, or quality management system implementation..

Upon completing these six courses, a practical project the Lean Six Sigma Green Belt program, and the certification examination, quality practitioners are designed by WAQ as a Certified Quality Professional at the Advanced Level.



Certified Quality Professional Advanced Level Curriculum Program



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Global Platform for Quality

Bringing together leading quality service providers
for development



1

2

GLOBAL PLATFORM FOR QUALITY

World Alliance for Quality



INTERNATIONAL
ACADEMY
for
QUALITY



ASQ
The Global Voice of Quality



EUROPEAN
ORGANIZATION
FOR
QUALITY



JUSE
Union of Japanese Scientists and Engineers



Basic and Advanced Quality Professional Certifications:

The ITC Global Platform for Quality (GQP) will include a series of quality development programs that prepare individuals to support the design and development of quality management systems targeted to Small-to-Medium Enterprises (SMEs). Completion of the basic and advanced programs of study will qualify individuals to sit for a certification examination that will be proctored by representatives of the Global Platform for Quality and, upon successful completion of the examination, will result in the award of a professional credential; that is internationally recognized by our partner organizations as career qualifications in the practice of quality.



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2

3

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BASIC QUALITY PROFESSIONAL DEVELOPMENT CURRICULUM:

- **Quality 201: Introduction to Quality**
- **Quality 202: Standardizing Work**
- **Quality 101: Quality Assurance**
- **Quality 102: Quality Control**
- **Quality 103: Quality Improvement**
- **Quality 104: Quality Planning**
- **Quality 105: Quality Management**
- **Quality 106: Managing for Quality**

} Courses to be offered in 2019
Introductory courses in the Advanced Quality Professional Certification Program

} Courses to be offered in 2019
Final Examination for qualification as Basic Quality Professional Certificate



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3

4

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ADVANCED QUALITY PROFESSIONAL DEVELOPMENT CURRICULUM:

- **Quality 201: Introduction to Quality**
- **Quality 202: Standardizing Work**
- **Quality 203: Service Quality**
- **Quality 204: Quality Management System Design**
- **Quality 205: Basic Problem Solving**
- **Quality 206: Personal Quality**
- **Experiential Learning Program**

} Courses to be offered in the first session of 2019
Introductory courses in the Advanced Quality Professional Certification Program

} Remainder of courses to be offered in 2019

} The final examination for the Advanced Quality Professional Certificate follows completion of the experiential learning program.



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4

5

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ADVANCED QUALITY PROFESSIONAL EXPERIENTIAL LEARNING PROGRAM:

- Structured Problem-Solving – ESTIEM Green Belt Certification Program
- Green Belt Improvement Project
- ISO 9001 Lead Auditor Training [Recommended]
- National Quality Award Assessor Training
- SME Coaching Experiential Project
- Design, Development, and Delivery of the Quality Maturity Program for SME's

Courses Quality Champions will Deliver:

- **Q1: Introducing Quality Concepts**
- **Q2: Focusing on the Customer**
- **Q3: Managing by Process**
- **Q4: Assuring Product Quality**
- **Q5: Assuring Process Quality**
- **Q6: Assuring Service Quality**
- **Q7: Solving Work Problems**



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5



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Global Platform for Quality

Introduction to Quality

Instructor: Gregory H. Watson, PhD, EURIng



6

7

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QUALITY 201: INTRODUCTION TO QUALITY

This course defines the meaning of quality and its role in improvement of organized human activity. A comprehensive definition of quality is given and quality is decomposed into its essential characteristics. A distinction is made between the need to develop a quality system that assures customers of regular performance according to a defined standard for deliverable output (for either quality products or quality services) and the application of quality as a strategy for organizational improvement and leadership in the competitive marketplace. These two aspects of quality may be referred to as developing an operating plan for quality and applying quality as a strategic advantage in the marketplace.



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7

Global Platform for Quality

Introduction to Quality

Lecture 1: Investigating the Meaning of Quality



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8

9

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EDUCATIONAL PROGRAM – INTRODUCTION TO QUALITY:

- **Lecture 1: Investigating the Meaning of Quality** ←
- Lecture 2: Understanding the Content of Quality Products and Services
- Lecture 3: Describing the Process of Delivering Quality Outcomes
- Lecture 4: Defining the Competence Areas of Quality Professionals
- Lecture 5: Introducing the Concepts of Statistical Thinking
- Lecture 6: Analyzing Work to Identify Quality Activities
- Lecture 7: Designing Productive Systems for Working
- Lecture 8: Developing a Quality Mindset



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9

10

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WHAT IS THE MEANING OF “QUALITY”?

- We all make judgements about what is “good” or “bad” in our daily lives based on our understanding of our needs or requirements. We do this with confidence.
- We also understand what we mean when we make a judgment that one choice is “better” than another choice based on the relative “value” or “merit” of the item or service. We also do this with confidence.
- Finally, we understand that if we work harder and smarter that we can “improve” the way others make their judgements about “goodness” and “badness”.
- This means that each of us possesses an internal ability to discriminate what we mean by “quality” on a personal level. But, how do we develop a communicable meaning about quality that can become an objective standard as a basis for trade?



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10

11

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DOES A DICTIONARY DEFINITION HELP US UNDERSTAND QUALITY?

According to the entry in the *Oxford Dictionary*, Quality is:

“The standard of something as measured against other things of a similar kind; the degree of excellence of something.”

The term’s origin reverts back to earlier Western civilizations:

“Originated from the Middle English (in the senses ‘character, disposition’ and ‘particular property or feature’): adapted from Old French *qualite*, which came from Latin *qualitas* (translating the Greek *ποιότης*), from *qualis* ‘of what kind, of such a kind’.”



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11

12

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WHAT IS NOT ADEQUATE IN THIS DICTIONARY DEFINITION?

- We use the term quality in many different ways. We speak of things possessing quality, of people being quality, of quality as a methodology, of quality being the outcome of work effort, and of quality as a level of performance. Thus, we use this term as in various ways as a noun, adverb and adjective. So, what is quality?
- Clearly, it is more than what the Oxford Dictionary defines as a standard or degree of excellence. The ancient meanings relate to the characteristics of an entity or its particular feature. But, is this specific enough for us to have meaningful discussion about setting customer expectations for the quality of commercial deliverables?
- A key question we must address is: what does quality mean in a commercial type of transaction for both the selling party and the purchasing party? How can quality be assured from both of their perspectives?



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12

13

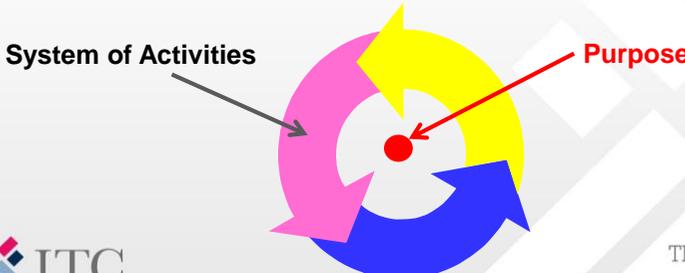
GLOBAL PLATFORM FOR QUALITY



HOW DOES QUALITY ARISE IN ORGANIZATIONS?

- Organizations are composed of a series of activities that have been designed to fulfil a purpose. The fulfillment of that purpose gives meaning to the organization and allows it to operate in relationship to other organizations.

This implies that work conforms to the laws of physics where work is purposeful movement – a transfer of energy from one body to another.





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13

14

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QUALITY ASSURES “FITNESS FOR USE” OF OUR WORK PRODUCT:

- Since organizations are “purposeful” they should be designed with that purpose in mind. A successful organization is one that demonstrates “**fitness for purpose**” or a capability to consistently deliver performance within limits which its customers not only **tolerate** (e.g., a state of barely acceptable performance) but will actually **desire** (e.g., the state of performance where attraction which draws customers by its intuitive appeal that creates infatuation or a natural craving for that result).
- Designing an organization so that it achieves this state in consumers of the work product of an organization requires organizations to creatively gain an “**imaginative understanding**” of the customer needs as well as “**comprehensive insight**” into the nature of alternatives available to customers for their choice of work product from competing sources.
- Under these circumstances an organization can be successful in its commercial ventures and enter into profitable trade relationships.



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14

15

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HOW TO “OPERATIONALIZE” QUALITY SO IT IS USEFUL IN TRADE?

- The definition should be clearly objective so it may be communicated to all parties that are involved in the commercial agreement.
- The definition should be capable of third party verification and consumer validation to assure that the purchaser’s need or requirement is met.
- The definition should be testable so that it may be evaluated to fulfill all contractual conditions for assessment of the “goodness” of the delivery.
- The definition should establish both the targeted performance level and boundary conditions for evaluation which separate acceptable “quality” from unacceptable.
- The definition should be useful as a basis for comparison between alternatives for purchase based on relative performance and value of the alternatives.



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15

16

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HOW DOES QUALITY OPERATE IN AN ORGANIZATION?

- Quality is observed in the characteristics of the goods or services delivered in any commercial transaction and the customer is the judge for acceptability of quality.
- Quality is designed into goods and services by the provider based upon their own understanding of the customer need or requirements.
- Quality must be designed into the deliverable that is offered to the customer (either goods or services) and in the way or method by which this deliverable is produced for the customer’s benefit either as a production or service delivery process.
- ***Thus, the quality activity of a producer must deliver: a persistent pursuit of goodness as defined by their customers, coupled tightly with a relentless avoidance of badness.***
- When this performance persists then a valuable brand reputation is built.



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16

17

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DESCRIBE YOUR EXPERIENCE IN APPLICATION OF THIS CONCEPT:

- Think of any commercial product or service that you have purchased.
- How do you define its inherent goodness?
- What would make you judge product or service badness?
- What could be done to improve the product?
- Would that improvement make it more commercially viable?
- How would you compare the product or service to competitive offerings?
- Can you summarize what is meant by quality in your example?



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17

18

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CLASS DISCUSSION SUMMARY:

- What were your observations about this discussion?

Quality as Goodness	Quality as Badness



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18

19

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WHAT DOES THIS PROPOSED QUALITY DISTINCTION IMPLY?

- Where should an organization target its operational performance?

Quality as the Pursuit of Goodness

		All Goodness	No Goodness
Quality as the Avoidance of Badness	No Badness		Under-Quality Over Reliability
	All Badness	Over-Quality Under Reliability	




19

20

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WHAT ARE THE POSSIBLE DIMENSIONS OF DELIVERABLE QUALITY?

- Performance:** the primary operating characteristics of a product or service
- Features:** secondary functions of a product or service that enhance its capability
- Reliability:** consistency of operational performance over an extended time period
- Conformance:** degree which operating characteristics meet established standards
- Durability:** the amount of use obtained before the product requires replacement
- Serviceability:** Speed, courtesy, competence, and ease of corrective action.
- Aesthetics:** how a customer perceives the tangible and intangible experience
- Perceived Quality:** indirect customer perception about quality image or reputation




David A. Garvin (1987), "Competing on the Eight Dimensions of Quality," *Harvard Business Review*, November-December, pp. 101-109.

20

21

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DISCUSSION: CRITIQUE GARVIN'S DIMENSIONS OF QUALITY

- Are these dimensions comprehensive or do they focus just on product quality?

Dimension	Application	Constraints
Performance		
Features		
Reliability		
Conformance		
Durability		
Serviceability		
Aesthetics		
Perceived Quality		



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21

22

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IS QUALITY “BACKWARD-LOOKING” OR “FORWARD-LOOKING”?

- What is “[backward-looking](#)” quality?
- Backward-looking quality aims at correcting problems that have occurred in the past which are observed as defects detected by customers, failures in products already in customer use, or complaints about the quality of deliverables. This is regressive quality as it is focused on eliminating dissatisfaction among customers rather than in delivering value to customers.
- What is “[forward-looking](#)” quality?
- The purpose of forward-looking quality is to create positive value in products and services that enhance features that cause customer to perceive the deliverables to be superior to other market choices due to these key selling features.



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22

23

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DOES QUALITY FOCUS ON DISSATISFACTION OR SATISFACTION?

- Backward-looking quality eliminates customer complaints which is a necessary condition for achieving customer satisfaction, but it is not sufficient – more must be delivered than “no complaints” to deliver value to customers.
- **Noriaki Kano** likened backward-looking quality to the *hygiene factors* that were in Frederick Herzberg’s theory of motivation – they were neutral or dissatisfiers, but never contributed to satisfaction. Kano identified Herzberg’s *motivators* as factors that contribute to forward-looking quality in the customer experience.
- Kano called those marketing features or engineering functions that the hygiene factors of backward-looking quality “must be” quality factors. He called forward-looking features “attractive quality.” It is the attractive quality features of a product or service that create a “deep affection” among customers for a product or service and which build strong brand reputation as the distinctions are delivered over time.



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23

24

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PRINCIPLE: CERTIFY THE PROCESS – QUALIFY THE PRODUCT:

- Commercial quality is typically assured by a process of certifications according to international standards for deliverable quality and the process of managing the way that quality is delivered.
- Deliverables are tested to assure conformance to standards and the organization’s quality system is certified by a third party to assure that it meets minimal needs for delivering quality.
- Certification of the product provides an objective basis for comparing the way that competing products or services are delivered.
- However, certification of the quality system does not permit comparison among the offerings as it only compares minimal performance requirements and it does not imply any conclusions about the relative competitiveness of the quality systems.



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24

25

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DESCRIBE DIFFERENT STANDARDS BY WHICH QUALITY IS JUDGED:

- How do you judge quality of eggs?
- How do you judge quality of hotels?
- How do you judge quality of mobile phones?
- How do you judge quality of clothes?
- How do you judge quality of coffee?
- How do you judge quality of automobiles?
- How do you judge quality of fish?

What is the standard?

- Is it measurable?
- Is it objective?
- Is it certifiable?



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25

26

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CLASS DISCUSSION SUMMARY:

- How well do we make quality judgments about deliverable quality?

Example of a deliverable product or service	Standard or Accepted Practice	Objective (not subjective)	Is this objective way of evaluating measurable?	Is it possible to possible to certify or to qualify this deliverable?



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26

Global Platform for Quality

Introduction to Quality

Lecture 2: Understanding the Content of Quality
Products and Services




27

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28


EDUCATIONAL PROGRAM – INTRODUCTION TO QUALITY:

- Lecture 1: Investigating the Meaning of Quality
- **Lecture 2: Understanding the Content of Quality Products and Services** ←
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- Lecture 7: Designing Productive Systems for Working
- Lecture 8: Developing a Quality Mindset




28

29

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RETHINKING THE CONCEPT OF QUALITY:

- **Quality delivers** the attribute or **set of attributes** that describe essential ingredients of an actual entity (e.g., a product or service) or the **circumstances** or **experiences** by which we judge its utility, value, or relative worth. **Quality is CONTENT.**
- **Quality also provides the means by which we assure these attributes and circumstances are capable** to satisfy our expectations for such value. **Quality is PROCESS.**
- So, quality can refer to the product attributes or the service experience, as well as the techniques by which the level of performance for these attributes or experiences are assured. **Quality is BOTH content AND process!**
- **Thus, quality describes both an end and the means to achieve that end.** In the first case, quality is an indicator of an achieved purposeful outcome, while in the second case it is a set of philosophies, methodologies, and engagement practices that have been proven capable to deliver quality outcomes.



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29

30

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PRINCIPLE: CONTENT QUALITY IS ASSURED BY PROCESS QUALITY

- The process of producing a deliverable quality or service may be used to evaluate the quality of the process by which that content is produced.
- A deliverable is prepared for the commercial market through a series of process steps or activities that make it acceptable for customers. Thus the quality of the deliverable is incrementally increased as it flows through that process.




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30

33

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WHAT ARE THE BASIC JAPANESE DEFINITIONS OF QUALITY?

Atarimae Hinshitsu (当たり前品質)

This means that a product is **“fit for function”** – it is capable of doing or performing its intended purpose – the idea that things will work as they are supposed to (e.g. a pen that will actually write).

Miryokuteki Hinshitsu (魅力的品質)

This refers to the **“charm of quality”** (i.e. measuring variables such as appearance, sound, and touch that give personality to a product). It satisfies what consumers are looking ... quality that fascinates ... it is quality that is “worthy of attraction” or “fit for love.” This idea has broadened management concern beyond the immediate product. It is an idea that things should have an aesthetic quality that is distinct from “*atarimae hinshitsu*” (e.g. a pen will write in a way that is pleasing to the writer, and leave behind ink that is pleasing to the reader). This concept has been translated as “attractive quality” by Noriaki Kano.



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33

34

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Noriaki Kano 狩野紀昭 (1940-)
Japanese Quality Professor

“The Theory of Attractive Quality” (1984)*

“Quality activity can only begin if top management is conscious of the critical need for organization wide commitment to quality and its own responsibility for introducing such activity.”

“Improving all attributes of quality will not lead to satisfied customers as not all attributes are equal in their eyes. Some quality attributes will increase the value to customers because they are attractive and do not detract even when their physical fulfillment is not strong.”

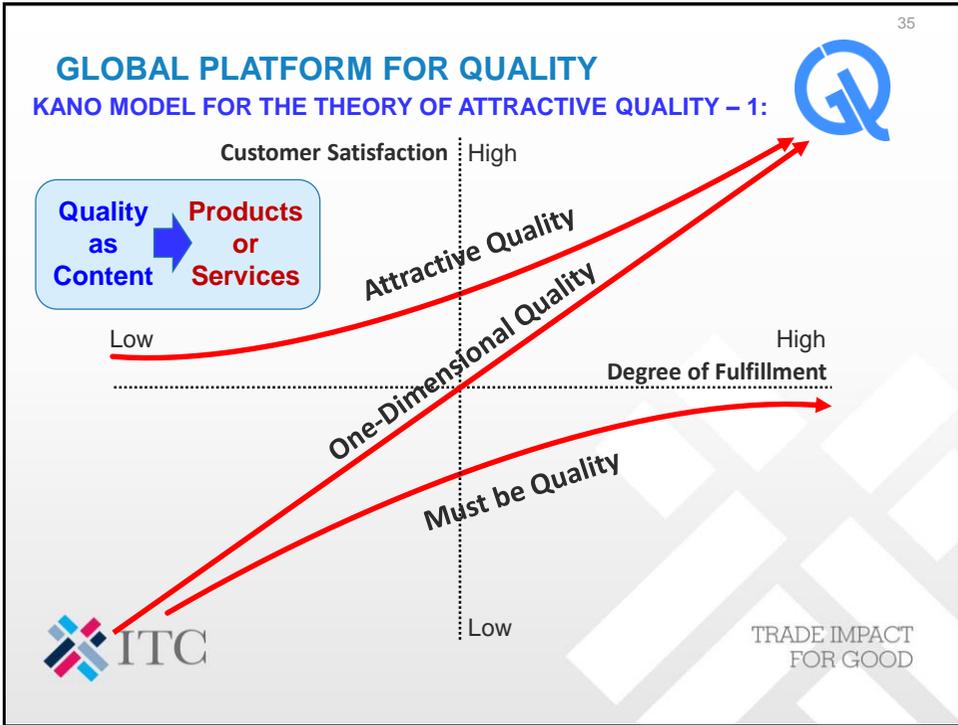
Attractive quality anticipates the needs of customers!



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* Kano, N.; Seraku, N.; Takahashi, F.; and Tsuji S. (1984), Attractive quality and must-be quality, *Quality, Journal of Japanese Society for Quality Control*, 14:2, pp. 39–48.

34



35

36

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DIMENSIONS OF QUALITY PERFORMANCE

Must-Be Quality: (expected, implicit, basic requirements). Customers expect requirements to be consistently met by a product. Dissatisfaction is increased if the requirement is not met, but satisfaction is not increased if a requirement is met. These requirements are “dissatisfiers” (not delivering customer satisfaction) or “satisficers” (delivering compromises in performance that do not fully meet promises leading to satisfaction); desired is minimum cost and no extra capability in these areas as they do not influence purchasing decisions of buyers. Poor performance creates negative customer response.

One-Dimensional Quality: (normal, competitive, explicit requirements). Such checklist items will deliver either satisfaction or dissatisfaction, based on degree of fulfillment of requirements as compared to competitive offerings. Called ‘one-dimensional’ as they focus on specific quality attributes or features.

Attractive Quality: (undiscovered or latent quality requirements that anticipate consumer needs). The customer is not aware of them; so if the requirement is met, then the customer is excited by the surprise in the design. But, if the requirement is not met, the customer will not be dissatisfied because they were not aware of the need in their first place. This quality function builds competitive value and ‘exciters’ in a customer’s purchasing process.

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36

37

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CLASS DISCUSSION SUMMARY:

- How can you describe these quality characteristics for different examples?

Must-be Quality	One-dimensional Quality	Attractive Quality




37

38

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KANO MODEL FOR THE THEORY OF ATTRACTIVE QUALITY – 2:



Customer Satisfaction

High

Low

Degree of Fulfillment

High

Low






38

39

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CONSCIOUS VS. UNCONSCIOUS QUALITY CHARACTERISTICS:

Spoken Requirements: Sometimes customers can express what they want in a product or service. In such cases they define or specify requirements to be delivered and this will generate a performance specification or statement of work to constitute the content in a request for proposal. In such a document the degree to which the customer is aware of their own job or requirement will often determine how well-specified the request is made. However, not all needs are understood by customers.

Unspoken Requirements: Often customer requirements remain unspoken as they are unable or lack knowledge to describe such needs. Two general cases can be identified of such “unspoken requirements” that occur. In the first case a requirement is unspoken because it is so well known that customers expect that it will be naturally included in the product or service (e.g., the ability of a car to start, stop or steer probably does not need to be defined in procuring a new automobile). A second case also occurs when customers do not know of the need or are unable to understand how a new technology will change their way of working. In the case of a latent need, the customer cannot anticipate the nature of a new requirement.

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39

40

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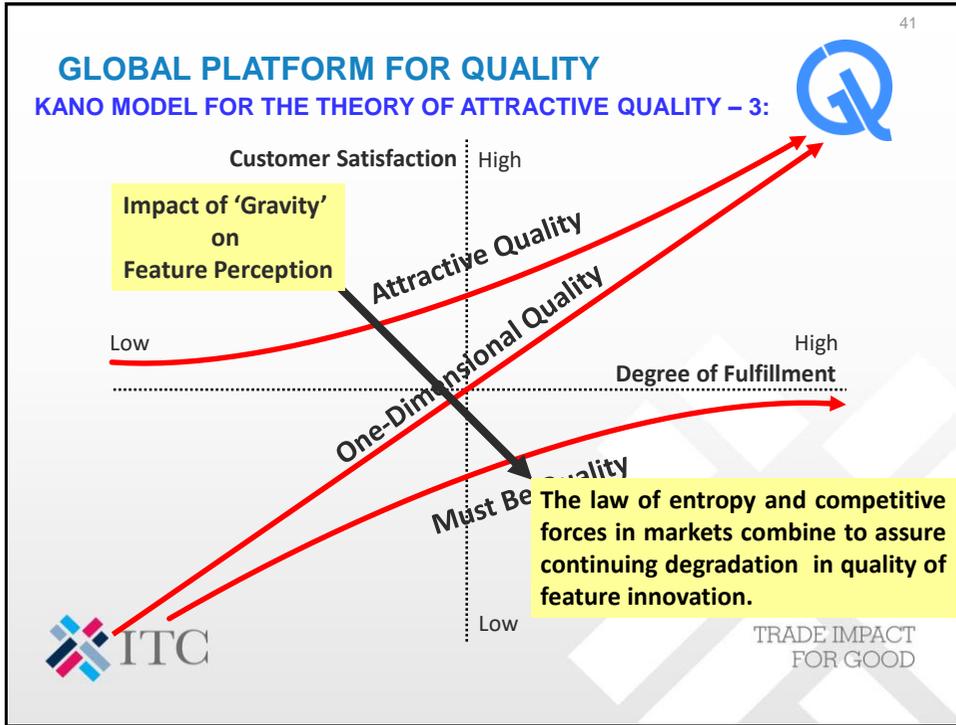
CLASS DISCUSSION SUMMARY:

- How can you describe these quality characteristics for different examples?

Spoken Quality Characteristics	Unspoken Quality Characteristics

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40



41

42

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WHAT CREATES “ATTRACTIVENESS” FOR CUSTOMERS?

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42

43

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DISCUSSION: CRITIQUE OF DIMENSIONS OF ATTRACTIVE QUALITY

- Are these dimensions comprehensive or do they focus just on product quality?

Dimension	Application	Constraints
Utility		
Capability		
Aesthetics		
Innovation		
Accessibility		
Portability		
Esteem		
Reliability		




43

44

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PERFORMANCE STRATEGIES THAT CREATE CUSTOMER VALUE:

- Discipline in managing daily work produces for customers.

Organizations must fulfill a purpose if they are to develop a system for delivery of value to customers. The value proposition of an organization is a statement of the means by which that value will be delivered to customers. For an organization to be effective in delivering value through this means it must cultivate or design their performance in a way that will create a “core competence” in its chosen proposition for delivery of value. The design of this approach needs to emphasize at least one of three value disciplines in pursuit of a core organizational competence. The three organizational disciplines are: *

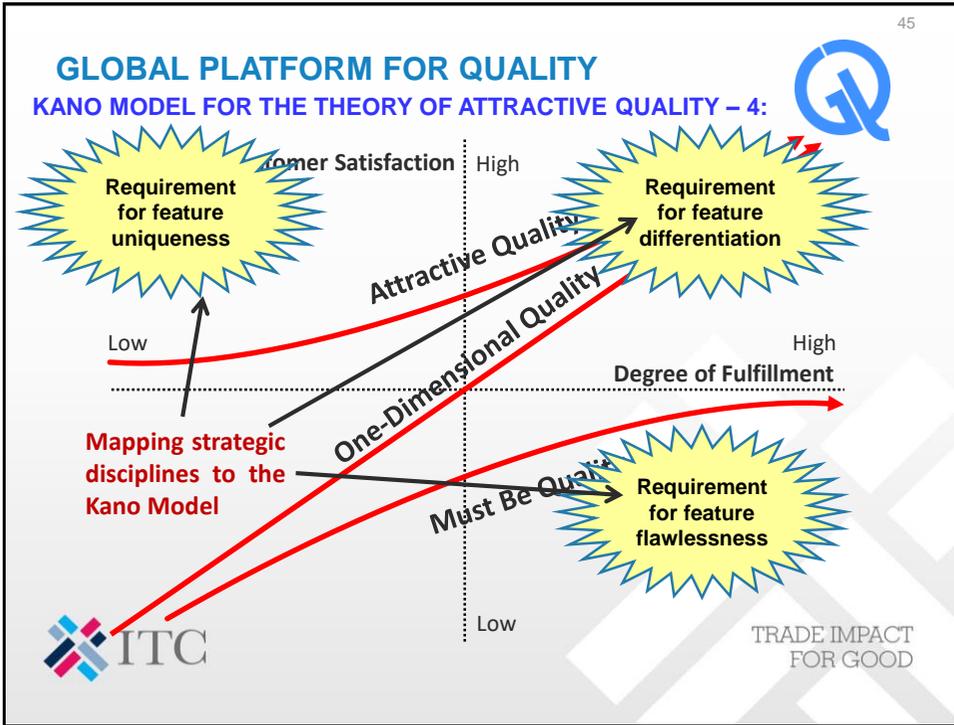
- **Product Leadership:** Development of uniquely innovative product features by master of technology transfer from research to applications.
- **Customer Intimacy:** Development of customized solutions that differentiate alignment to the customer’s requirements for performance capability.
- **Operations Excellence:** Consistently low-cost and highly efficient production of goods and services delivered to customers without perceivable flaws.

How do these value disciplines relate to quality performance?




* Michael Treacy and Fred Wiersema (1995). *The Discipline of Market Leaders*. Reading, MA: Perseus Books.

44



45

46

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ALTERNATIVE STRATEGIC DISCIPLINES OF ORGANIZATIONS:

Product Leadership: A discipline of delivering technology innovation to customers by introducing technologies that facilitate performance of the customer's job. This discipline constantly seeks new technologies that are available for exploitation by incorporating them in products as engineering functions that create new marketable features to improve the way customers perceive quality of products or services.

Customer Intimacy: A discipline of adjusting products and services to allow them to better fulfill the customer requirements and supporting customers in the way that they need to get their job done. This discipline focuses on building agility in markets to flexibly adjust the positioning of products and services in ways that increase the satisfaction of customers through their own performance gains.

Operations Excellence: A discipline of applying quality methods to drive cost out of products, services, and processes by eliminating all forms of waste. This discipline focuses on total life cycle cost, not only cost applying to acquisition. An organization that is operationally excellent is typically a strong price competitor, but it achieves this capability through flawless execution of its work.

Logos: ITC (bottom left) and TRADE IMPACT FOR GOOD (bottom right).

46

47

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CLASS DISCUSSION SUMMARY:

- What strategy can you take to drive “distinctive” quality performance?

Product Leadership	Customer Intimacy	Operational Excellence




47

48

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KANO MODEL FOR THE THEORY OF ATTRACTIVE QUALITY – 5:



Customer Satisfaction

High

Low

Degree of Fulfillment

High

Low




48

49

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THREE DIMENSIONS OF BUSINESS PERFORMANCE:



Compliance Quality: 'Must be' quality requirements define compliance quality – it delivers a minimal level of requirement that is deemed essential by customers. People do not make purchasing decisions based on compliance quality items – it is only a threshold consideration for purchasing – when features are focused at this level of competition then choice is price-driven and quality of such commodity-like products must be without fault so it does not detract from the consideration.

Improvement Quality: 'One-dimensional' quality requirements are an indicator of competitive market-based quality – comparative performance in delivering these requirements results in marketing success. People make purchasing decisions based on relative choices between offerings as differentiated on these features. This requires head-to-head comparisons among alternatives to differentiate value.

Excellence Quality: 'Attractive' quality requirements results from innovative quality. Imaginative consideration of customer needs and customer environment leads to design of new product/process features or reformulation of features in a way that is appeals to customers and provides a unique design. Innovative design applies new technology to anticipate needs that customers cannot express.



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49

50

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KANO MODEL FOR THE THEORY OF ATTRACTIVE QUALITY – 6:



The diagram illustrates the Kano Model for the Theory of Attractive Quality. It features a 2x2 grid defined by two axes: **Customer Satisfaction** (vertical axis, ranging from Low at the bottom to High at the top) and **Degree of Fulfillment** (horizontal axis, ranging from Low on the left to High on the right). Three red curves represent different quality dimensions:

- Differentiated Quality:** A concave-up curve that starts at a low level of fulfillment and satisfaction and rises steeply as fulfillment increases, reaching high satisfaction at high fulfillment.
- Competitive Quality:** A straight diagonal line representing a linear relationship between fulfillment and satisfaction.
- Commodity Quality:** A concave-down curve that starts at a low level of fulfillment and satisfaction and levels off as fulfillment increases, indicating that high fulfillment does not lead to high satisfaction for these features.



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50

51

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THE PURPOSE OF QUALITY DIFFERS IN EACH KANO DIMENSION:



Differentiated Quality: Attractive quality delivers differentiated capability to organizations, one that competitors cannot easily replicate – often this is called a “core competence” of the organization. Such capabilities must have a dynamic characteristic that allows itself to refresh and sustain the competitive advantage in the face of changing conditions in the business environment and shift technical capabilities available for exploitation through innovation.

Competitive Quality: One-dimensional quality delivers competitiveness to an organization by keeping the customer’s perception of own firm performance at a level that is considered superior in terms of the value proposition when it compared “head-to-head” with alternative value propositions from industrial competitors. Consumer choice is not based on innovation but relative value of the market offering.

Commodity Quality: Must-be quality delivers commodity-like performance to the market where the customer perceives no difference in the features or functions of the product, but makes choices based on the reliability of quality performance and either the lowest total cost or acquisition price depending on the degree of consumer interest and sophistication.



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51

52

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CLASS DISCUSSION SUMMARY:

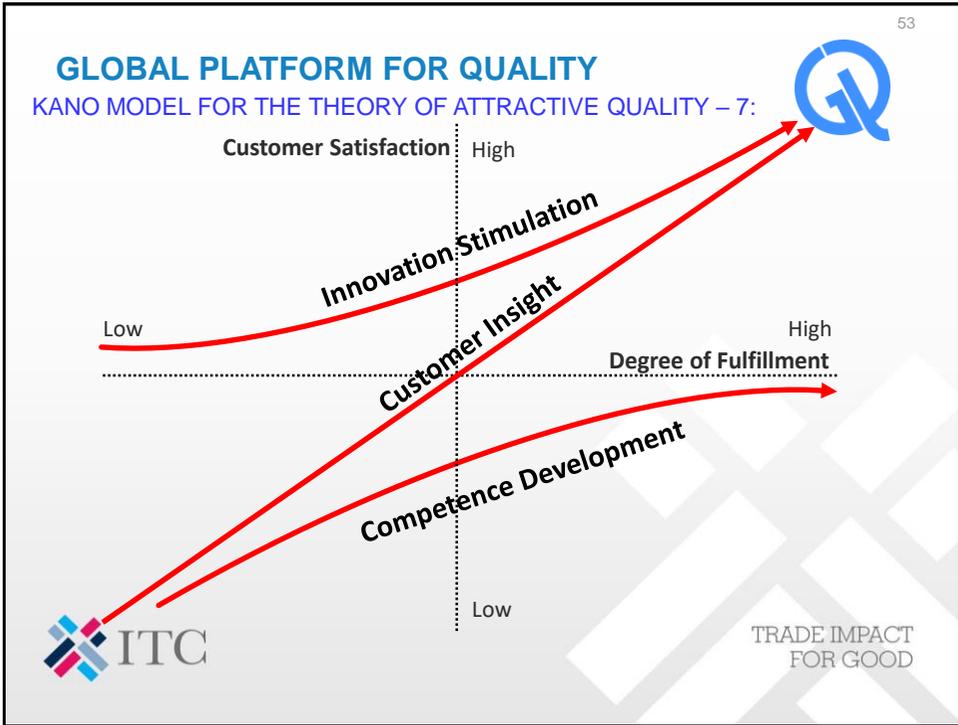
- What are the similarities and distinctions between these concepts?

Excellence Differentiated	Improvement Competitive	Compliance Commodity



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52



53

54

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WHAT ARE THE DRIVING FORCES BEHIND QUALITY BY DESIGN?

Competence Development: Organizations can only be as good as the synergy created by the people that occupy them. The competence of an organization is the resultant of the individual skills and experience that is contributed by all members of the organization as they collaboratively share their abilities in the pursuit of the common purpose. When individuals are motivated to participate in this pursuit, then core competence may be developed as a combined effect of their interactions, knowledge, and capabilities.

Customer Insight: Organizations that can perceive emerging requirements of their targeted customers and anticipate new directions for development possess a true and enduring competitive advantage. Knowledge comes from intimacy with a customer’s application and an imaginative understanding of their needs. Development of insight requires a dedicated pursuit of customer relationships.

Innovation Stimulation: The ability to innovate is too important to be left to chance. Management must stimulate new ideas and encourage experiments that apply appreciative inquiry to understand the “hidden knowledge” that is not yet known but capable of being exploited to improve performance in the “job the customer needs to get done” – creating exceptional customer value.

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PERSPECTIVES FOR UNDERSTANDING THE KANO MODEL:



This table summarizes the relationships that define the three levels of quality included in the Kano model.

Dimensions of Original Kano Model	Transparency of Customer Requirements	Strategic Value Disciplines	Relevant Quality Strategy	Resulting Quality Performance	Emphasis for Action Plans
Attractive Quality	Unspoken Quality Characteristics	Product Leadership	Excellence Quality	Differentiated Quality	Innovation Stimulation
One-Dimensional Quality	Spoken Quality Characteristics	Customer Intimacy	Improvement Quality	Competitive Quality	Customer Insight
Must-be Quality	Unspoken Quality Characteristics	Operations Excellence	Compliance Quality	Commodity Quality	Competence Development



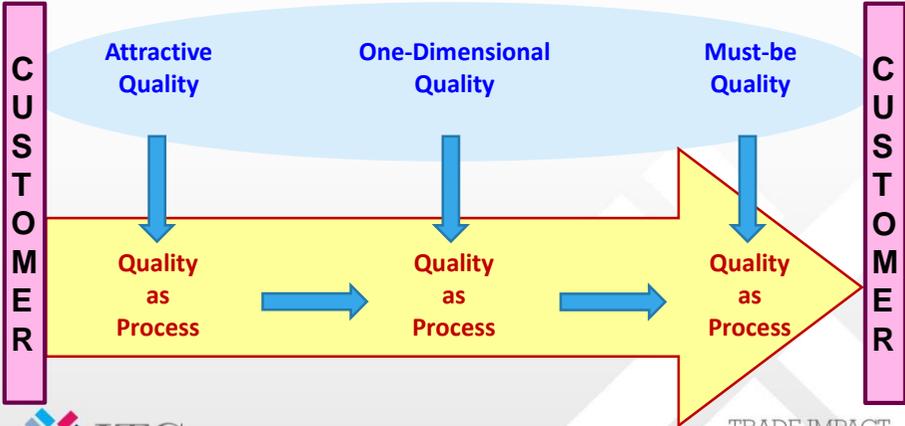
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56

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THE PROCESS OF MANAGING FOR QUALITY:

CUSTOMER (left vertical bar) | **CUSTOMER** (right vertical bar)

Attractive Quality | One-Dimensional Quality | Must-be Quality

Quality as Process → Quality as Process → Quality as Process



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56

57

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CLASS DISCUSSION SUMMARY:

- Where should you begin to focus when first developing a quality strategy? Why?

Attractive Quality	One-dimensional Quality	Must-be Quality




57



Global Platform for Quality

Introduction to Quality

Lecture 3: Describing the Process of Delivering Quality Outcomes




58

59

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EDUCATIONAL PROGRAM – INTRODUCTION TO QUALITY:

- Lecture 1: Investigating the Meaning of Quality
- Lecture 2: Understanding the Content of Quality Products and Services
- **Lecture 3: Describing the Process of Delivering Quality Outcomes** ←
- Lecture 4: Defining the Competence Areas of Quality Professionals
- Lecture 5: Introducing the Concepts of Statistical Thinking
- Lecture 6: Analyzing Work to Identify Quality Activities
- Lecture 7: Designing Productive Systems for Working
- Lecture 8: Developing a Quality Mindset



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WHAT IS THE MEANING OF “QUALITY AS PROCESS”?

- Quality describes an end-to-end process: it begins with the customer and it also ends with the customer. The beginning requires development of customer intimacy and “deep empathy” to understand the nature of the job a customer wants to get done, determine the level of performance necessary to achieve that result, and develop an “imaginative understanding” of customer needs and expectations so that work processes may be designed to flawlessly deliver outcomes to customers that both meet customer needs and are commercially viable for the organization.
- There are three stages that an organization must arrange into the process design for developing successfully marketable deliverables: investigating and identifying customer needs; determining requirements to address and developing products or services that will meet this specified performance; and implementing or delivering the outcomes to customers in a manner to assure the highest level of quality in the customer experience.



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60

61

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QUALITY AS PROCESS: INTEGRATED FLOW OF WORK AND METHODS

- Quality is delivered to products and services by the way processes are designed, organized and operated.
- Processes are supplemented by methods and techniques that enable the flawless operation from their beginning with customer requirements to their completion with delivery of results as a customer experience.
- Process performance is measurable for dimensions of quality of outcomes, timing of throughput, and cost of the transactions. These measures may be analyzed by statistical techniques to assure effectiveness, efficiency and economy of operation.
- When processes are stabilized in performance at minimal cost, acceptable quality, and capable throughput, and the productive system operates consistently (e.g., people are working competently and collaboratively), then it has been improved to achieve its designed performance result.



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62

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QUALITY DELIVERY MODEL – 1:

What the Customer Wants

Customer Expectation

↔

What the Customer is Promised

Customer Entitlement

↔

What the Customer Gets

Step 1: Learning what it is that a customer needs to accomplish or achieve with a product or service: that is of value or benefit to them.

Step 2: Defining the level of performance quality to be delivered by a product or service which will also be commercially viable in a competitive market.

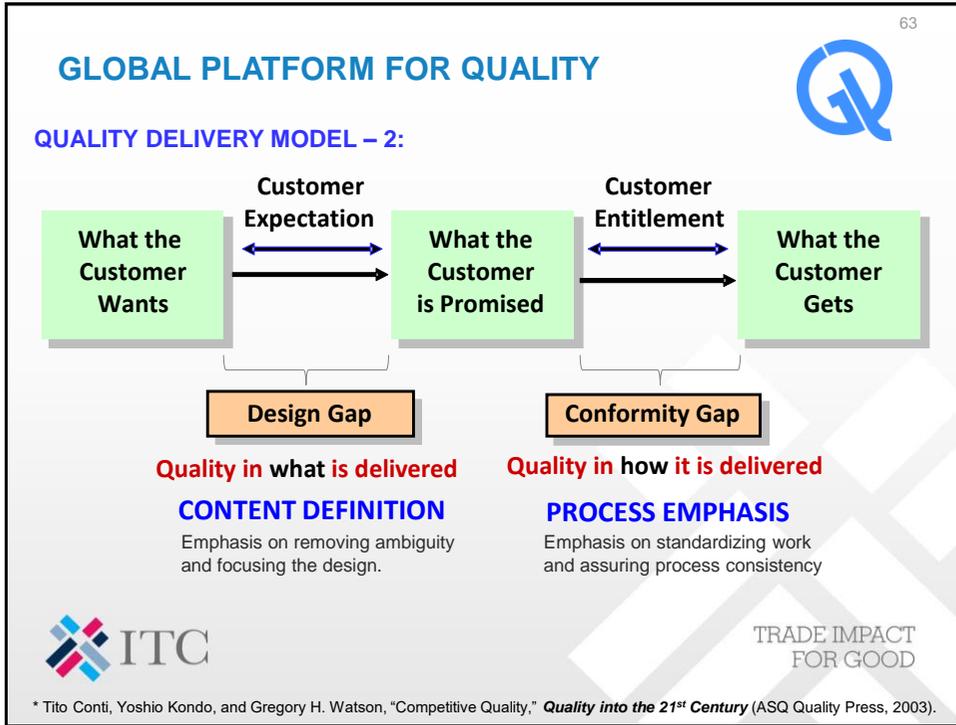
Step 3: Assuring that the deliverables of product or service meets the level of performance expectation of the customer and that it will achieve satisfaction.



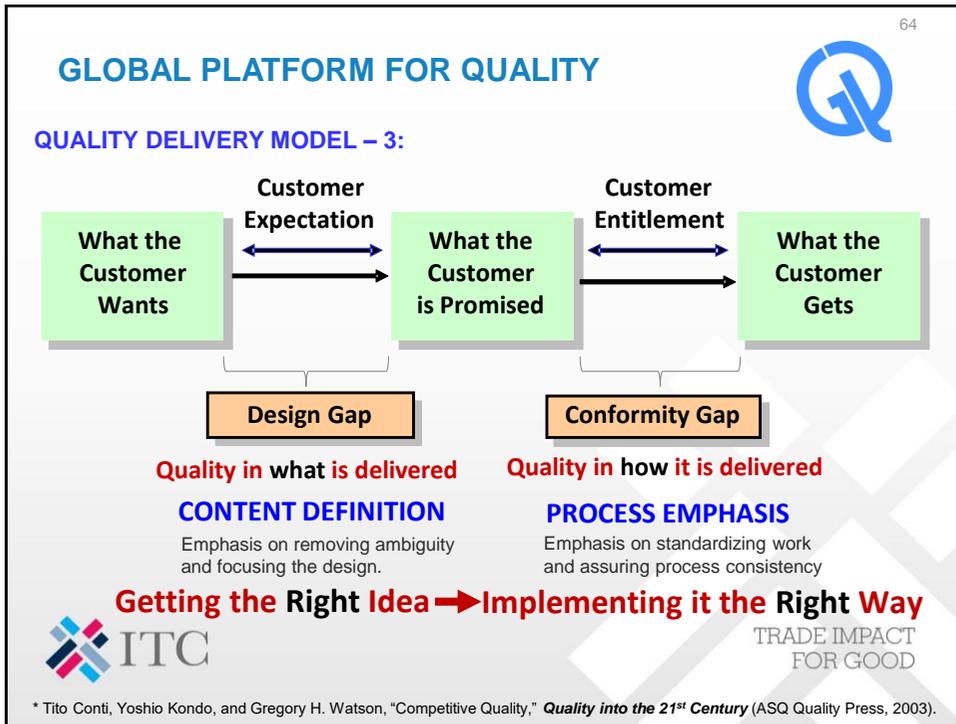
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* Tito Conti, Yoshio Kondo, and Gregory H. Watson, "Competitive Quality," *Quality into the 21st Century* (ASQ Quality Press, 2003).

62



63



64

65

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QUALITY DELIVERY MODEL – 4:

What the Customer Wants: Customer desires contain explicit and latent requirements, both spoken and unspoken, that change based on the point-of-view (POV) of individual customers who express their ideas with varying degrees of clarity in the voice of the customer (VOC). Learning true customer needs requires an imaginative understanding of the potential application of new technologies to the customer environment.

What the Customer is Promised: Not all potential customer requirements will be found economically viable to organizations and decisions must be made that will respect the performance expectations of a second customer category (owners or shareholders of the organization who require profit). Promises include explicit features described in marketing materials and implied capability that may be expressed by secondary parties (product reviewers, industry performance, and claims made during the selling process).

What the Customer Gets: Understanding the performance of deliverables to the customer environment requires highly capable operational work processes and closed-loop systems to feedback results, combined with responsive corrective and preventive action processes that detect and eliminate problems and act to assure performance promised to customers is consistently delivered.



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66

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IN SEARCH OF EXCELLENCE – WHAT DOES IT REALLY MEAN?

- Excellence is a moving milestone in the quality improvement journey. ***The target for excellence shifts because customers have ever-increasing expectations for delivery of performance and processes have an ever-increasing erosion in capability to perform while technology has an ever-intensifying ability to invent.*** These counter-trends create dynamic shifts in ability to consistently deliver exceptional results.
- it is management's job to assure that inadvertent errors do not reach customers. The process control system in the continual improvement activity must assure that work is checked against standards and that quality is assured in deliverables. If an "escape" of bad quality occurs, then the system must act to rapidly detect that flaw and respond with corrective action to fix the situation and return it to normal while also working to prevent any recurrence of the issue.
- ***Excellence is the result of habitually flawless design followed by disciplined work that delivers consistent outcomes in the customer's experience so that attractive quality dominates the customer's perception.***



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67

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HOW DOES “QUALITY” DIFFER FROM “EXCELLENCE”?

- **Excellence is result of habit** – the habit comes from doing the right things in the right way at the right time which is a consequence of thinking and doing quality at every step in the process by which the content is delivered.
- Quality matures into a shared mindset that prevails in organizations, individuals, and teams. A pervasive organization-wide quality mindset motivates action to apply concepts, principles, methods and tools of quality sciences to deliver the “right work outcomes” as judged by the customers of the organization.
- Excellence is a relative level of performance for a quality characteristic that has been compared with its market alternatives and considered to be superior in an objective judgment
- **Responsibility for realizing quality to achieve excellence includes everyone!**



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68

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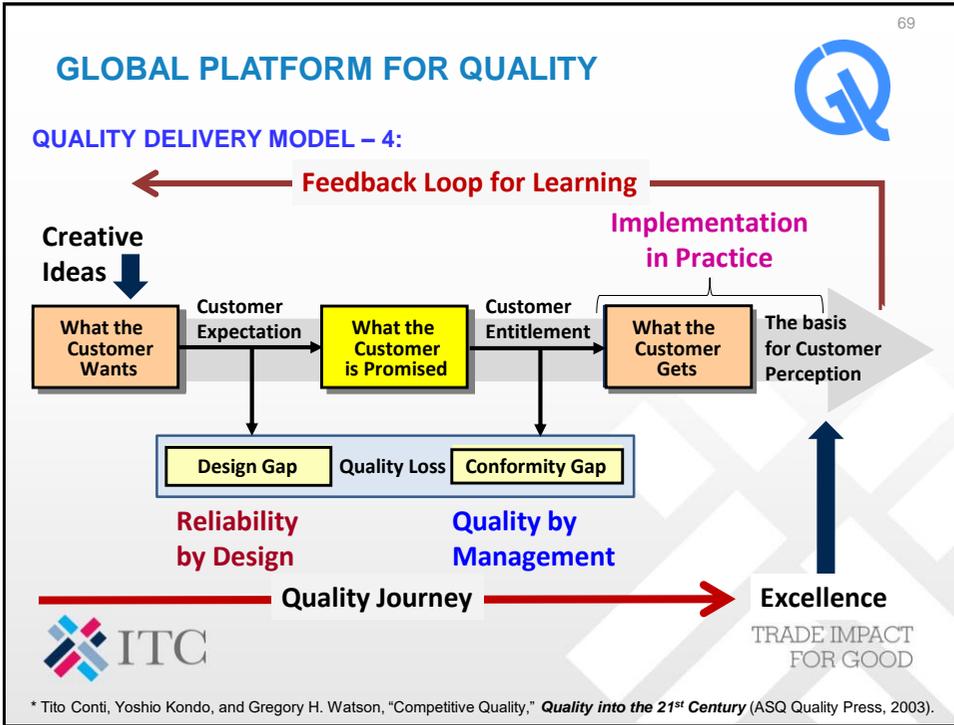
HOW DOES “QUALITY” DIFFER FROM “RELIABILITY”?

- Reliability is an ability to consistently deliver a useful level of excellence in quality of performance over a sustained period of time in the operational environment of the customer – it helps customers to get their jobs done. It is reliability, not over-exaggerated promises of great performance, that matters most for generating long-term customer confidence.
- When a product or service is reliable it means that customers can have confidence in to and count on it to perform as expected during its full, advertised useful life.
- **Reliability is sustainable, quality that lasts – designed with the capacity to endure over time – constancy of performance.**



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68



69

70

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A SYSTEMS APPROACH IS NEEDED FOR CONSISTENT QUALITY:

- **Reliability through Content Design:** The process of managing for reliability is essential to assure the long-term performance consistency of a deliverable in the new product or service development process. All aspects of the content in a product or service must be intensively examined to assure that all potential failure modes are known and that the user is protected against performance surprises due to degradation of their operating system in its intended working environment.
- **Management for Process Quality:** The process of managing for quality must be applied at all stages in the quality delivery process to assure that potential mistakes do not escalate into defects that impact the customer. Methods and techniques of the quality sciences must be appropriately engaged "dissolve" problems before they reach the stage of customer discovery or impact.
- **Excellence by Disciplined Execution:** Achievement of excellence occurs with the mindful, diligent coordination of the full product delivery team, inclusive of designers, operators, installers, and service operators who share a common bond of commitment to excellence in the service of the organizations targeted customers. As Aristotle said: *"excellence is the result of habit."*

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70

71

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SUSTAINABLE PERFORMANCE RESULTS FROM RELIABLE CONTROL:

- Achievement of a state of control requires management to adjust the process performance so that it maintains the required level of content quality.
- Thus, ***the act of achieving control is dynamic*** and changes as a function of deviation in process externalities and natural process variation.
- Sustainable excellence occurs when a process obtains the level of quality that delivers competitive advantage and maintains it despite the effects of variation.
- The ***effect of sustainable performance on the customer experience*** is to create ***a consistency in performance capability that customers expect and associate with the brand of the product or service.***
- Thus, when management develops a program to persist in delivery of attractive quality over the long-term, it must design a system to assure reliable control over process variables that contemplates the impact of sources of variation, both controllable and uncontrollable, and is able to maintain a consistent, robust quality of deliverable despite changes in the process variables.



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71

72

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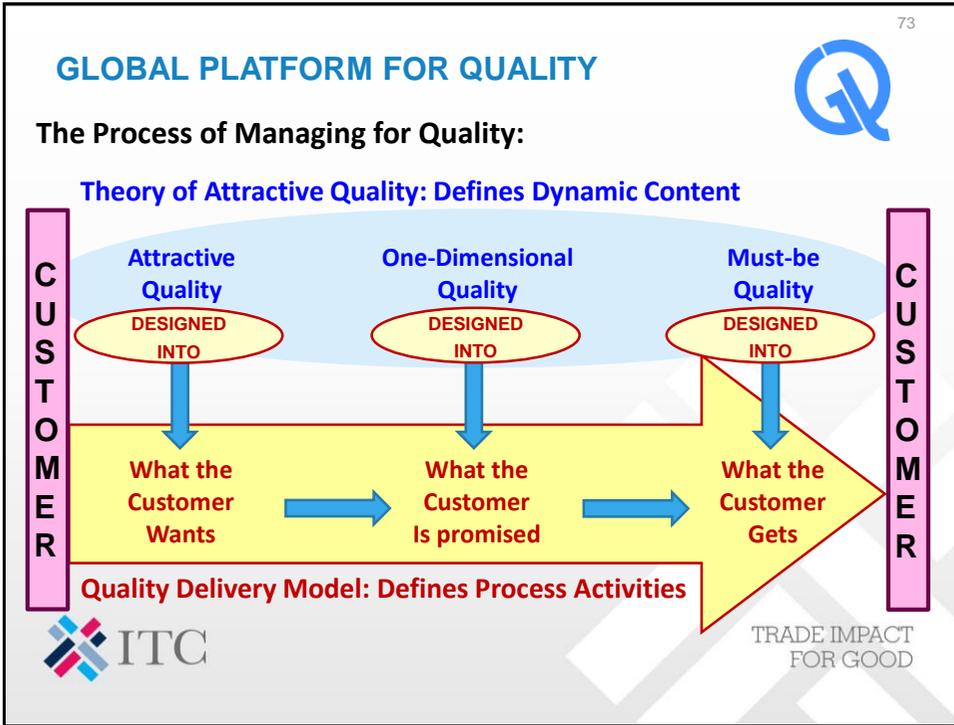
STRATEGIC AND OPERATIONAL QUALITY MUST BE ASSURED:

- An objective of ***Strategic Quality Management*** is to deliver breakthrough transformation by conducting projects that will significantly advance the process performance capability of the daily management practices or provide a significant leap in the capability of the product or its service performance. To conduct these projects revolutionary thinking is required as is innovative insight into the customer's application.
- The objective of a ***Daily Management System*** is to maintain a control discipline for performance of routine work so that the standard work outcomes achieve continual improvement by the conduct of a planned sequence of small experiments that increase the reliability of process performance and quality of the process content or reduce the cost of transactions in the process, thereby permitting more fiduciary freedom in setting prices and obtaining profitability through evolutionary change.



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72



73

74

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CLASS DISCUSSION SUMMARY:

- Where and how should you commence your process of customer engagement?

What the customer wants	What the customer is promised	What the customer gets



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74

75

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APPLYING THE “TRANSCENDENTAL DEFINITION OF QUALITY”

- **Transcendental Quality Definition:** “A persistent pursuit of goodness, coupled tightly with a relentless avoidance of badness.”
- How does this transcendental definition apply as organizational outputs change or differ? There are three outputs of the productive systems of organizations:
 - **Product Content** delivered by operational processes.
 - Service as **Experience Content** delivered by operational processes.
 - Process or **Method Content** delivered by internal organizations.
- Each of these organizational will reduce their deliverable definition of the term “quality” to meet its own focus area for improvement or control.



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75

76

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HOW DOES A PRODUCTIVE SYSTEM OPERATE?

TECHNICAL COMPONENT – Hardware, Software, and Support

SYSTEM COMPONENT – Process Flow, Data, and Analytics

HUMAN COMPONENT – Philosophy, Psychology, and Methods

Productive System

WHAT ARE THE QUALITY ELEMENTS IN A PRODUCTIVE SYSTEM?

- **Quality as Content:** The output or deliverable to organizational customers.
- **Quality as Experience:** The experience of customers with quality output.
- **Quality as Methods:** The tools and techniques applied to create quality.



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76

77

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DEFINING QUALITY AS CONTENT:

Many traditional definitions of quality refer to this type of quality – focusing on the content of the results:

- Quality as “fitness for use”
- Quality as “conformance to requirements”
- Quality as “parts to print”
- Quality as “zero defects”
- Quality as the “cost of non-conformance”
- Quality as the “price of poor performance”
- Quality as “adherence to standards”
- Quality as “customer satisfaction with deliverables”



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77

78

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DEFINING QUALITY AS EXPERIENCE:

Other definitions of quality are focused upon the experience of customers as users of products or services:

- Quality is the difference between delivered experiences and the expected experiences – it is measured as customer satisfaction with respect to this gap.
- Quality as perceived courtesy, civility or politeness of service agents.
- Quality is subjectively interpreted by each customer based on their own standards or needs – “customer knows it when they see it.”
- Quality is the esteem value of the experience or elevation of value for the customer through participation (intrinsic value).



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78

79

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DEFINING QUALITY AS METHOD OR PROCESS:

Many people who work in the quality function or who manage the quality function perceive quality as the art or science of their work – substituting methods, tools and techniques for the outcome of quality or deliverable to customers of quality. In this way, quality becomes “mechanistic” and it is reduced to some specific toolkit, approach or combination of methods:

- Quality as Japanese “Total Quality Management” of Q-7 Toolkit
- Quality as “ISO 9001 Certification” or RADAR method
- Quality as “Plan-Do-Check-Act” and “Standardize-Do-Check-Act”
- Quality as “Lean Enterprise” of Value Stream Mapping and 5-S
- Quality as “Six Sigma” as DMAIC statistical problem-solving
- Quality as “Lean Six Sigma” as DMAIC + DMADV + Lean toolkits



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79

80

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CLASS DISCUSSION SUMMARY:

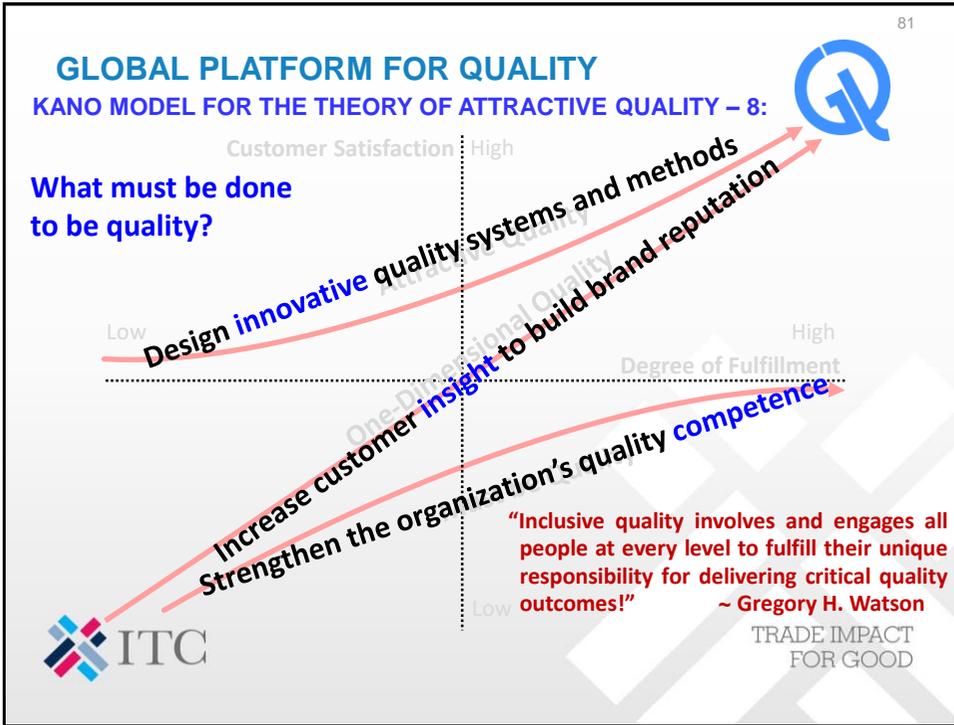
- How have you thought about quality in the past? Does it follow one of these three applications? Please provide examples of how organizations have focused upon a quality approach and has this somehow limited its utility as a management method?

Quality as Content	Quality as Experience	Quality as Method / Process



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80



81

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Introduction to Quality

Lecture 4: Defining the Competence Areas of Quality Professionals

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82

83

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EDUCATIONAL PROGRAM – INTRODUCTION TO QUALITY:

- Lecture 1: Investigating the Meaning of Quality
- Lecture 2: Understanding the Content of Quality Products and Services
- Lecture 3: Describing the Process of Delivering Quality Outcomes
- **Lecture 4: Defining the Competence Areas of Quality Professionals** ←
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- Lecture 6: Analyzing Work to Identify Quality Activities
- Lecture 7: Designing Productive Systems for Working
- Lecture 8: Developing a Quality Mindset



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83

84

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COMPETENCE REQUIREMENTS OF QUALITY PROFESSIONALS:

- Quality professionals of the future will require both managerial competence as well as technological competence. Managerial competence deals with three categories subject areas: (1) organizational processes; (2) the process of management and capacity for leadership; and (3) psychology and motivation for managing teams effectively. These are the subjects of this training module.
- Technological competence areas will include: statistical thinking, process analytics, and quality management systems. These subjects will be covered in future training modules.
- In addition to these areas of competence, it is essential to include training in areas like entrepreneurship, interpersonal relationships, and finance be included in the development program of a quality professionals. These competence areas will not be included within the scope of this Quality Professional Development Program.



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84

85

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Organizational Processes



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85

86

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HOW ARE RISK AND POTENTIAL TO FAIL RELATED TO WORK?

The probability of a loss based on occurrence of a failure. Risk occurs when a force can hinder achievement of the purposeful intent of work. Inherent elements in realization of risk:

- **Flaw:** An error or mistake that has been designed into the way that a product can perform (usually by inadvertent action). This type of error is unknown unless it is specifically searched for in the process of design or follow-up reviews.
- **Fault:** The flaw (error) has occurred in the design but is not detectable or observable as the function has not been activated in an operating mode so its potential failure is not yet realized. This type of error is unknown until such time as the function is activated and it becomes an observable failure event.
- **Failure:** The fault (error) becomes observable as it is activated in an operating mode or triggered incident which causes the failure event to occur and be observed. This type of failure is knowable and can be characterized for corrective action.

When risk is realized as failure it creates waste and loss!



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86

87

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WHAT IS THE DIFFERENCE BETWEEN PROCESS AND FUNCTION?



- In a process organization work is organized across the end-to-end sequence that builds from the establishment of the requirement for work to the delivery of results that meet these requirements. This workflow concentrates on the delivery of value that customers appreciate and excellence is measured in terms of the ability of the output to meet customer value points and performance needs. Process change are made by cross-functional project teams to improve the end-to-end flow and to increase the performance as judged by the external customer.
- In a functional organization work is organized within the disciplinary functions that provide the competence in all task-performing activities required to accomplish the job done that is required for customers. Emphasis in this organizational form is on delivering excellence in the performance of individual functions which operate as individual efforts coordinated in a project form. Improvements are also made using project teams but these teams have two conflicting objectives: improving overall results while increasing the performance of each functional discipline. Excellence is defined primarily from a functional perspective.




87

88

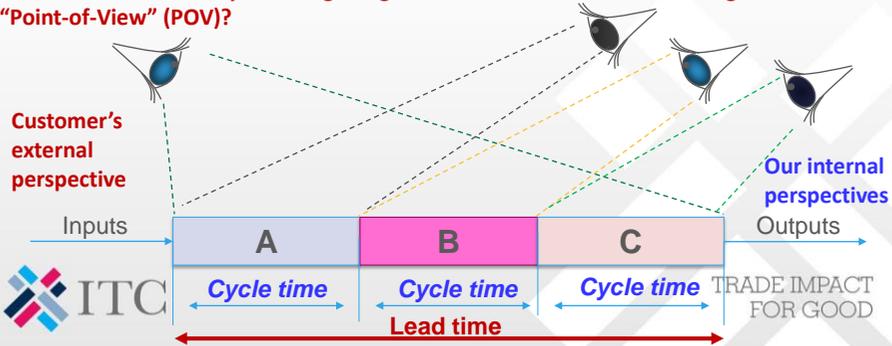
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WHAT DO WE MEAN BY A “PROCESS”? WHAT IS OUR “POINT OF VIEW”?



A **process** is a series of activities that transform inputs into outputs, using resources, in response to a request. Requests originate from the customers of a process and inputs are provided by process suppliers. All work may be illustrated as a process. When processes are measured, their variation may be analyzed and the process improved and controlled using statistical methods to assure right consumption of resources.

Process: A common way of seeing things that builds mutual understanding from whose “Point-of-View” (POV)?



The diagram illustrates a process flow with three steps: A (blue), B (pink), and C (orange). Inputs enter from the left and outputs exit to the right. Below the steps, 'Cycle time' is indicated for each step, and 'Lead time' is shown as a red arrow spanning the entire process. Above the process, four eyes represent different perspectives: one eye on the left labeled 'Customer's external perspective' and three eyes on the right labeled 'Our internal perspectives'. Dashed lines connect these eyes to the process steps, showing how different viewpoints observe the process.




88

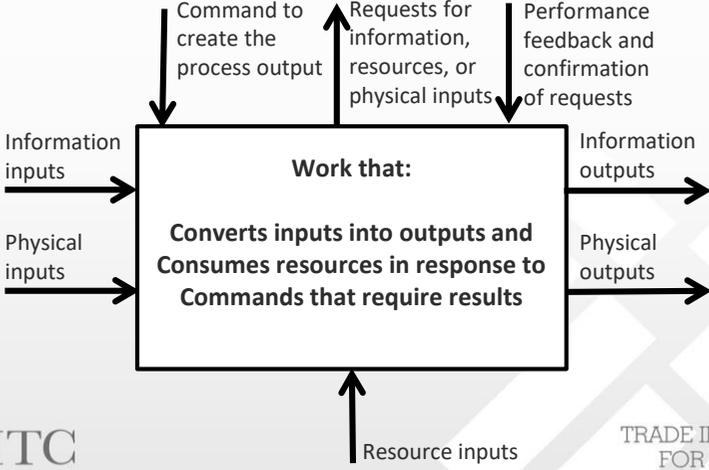
89

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WHAT MAKES UP THE COMPOSITION OF A PROCESS?

Visualizing a work process as a single step:





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All processes have similar types of components.

89

90

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WHAT DO WE MEAN BY "PROCESS FLOW"?



Consider a "human system" and what flows? What happens if a "human system" does not flow?

- If blood does not flow then we have a cardiology problem.
- If oxygen does not flow then we have a pulmonary problem.
- If nutrients do not flow then we have a digestive problem.

One thing we know for sure is that when things flow better, then the human body is a healthier system!



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90

91

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WHAT "FLOWS" IN AN ORGANIZATION?

What flows in an organization?

- People flow – developing competence and skills as they mature
- Work flows – work progresses sequentially from start to finish
- Information flows – data is captured and it answers questions
- Equipment flows – resources are moved to meet process needs
- Inventory flows – materials move to accommodate work needs
- Decisions flow – choices are made to exercise alternative actions
- Money flows – to accommodate a need for resources and assets

If things don't flow as required, then organizations get stuck and do not make progress – things stagnate!

- Data becomes obsolete
- Inventory becomes outdated
- People become fossilized

Without flow things don't go!



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91

92

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WHAT MUST WE DO TO IMPROVE OUR WAY OF WORKING?

Current State
"As Is Process"

Current way of doing work

Current Results

→

Desired State
"Should Be Process"

New way of doing work

New Results

→

Target to be Achieved

↓ Improved Activities

↓ Improvement Results

- Everyone has two jobs – do the work AND improve way of working.
- Everyone must share a mutual understanding about what needs to get done.
- Identifying what must be improved is the first insight we need.
- We must make our way of working visible so everyone can see what we do.
- Making a work process visible allows us to discover the best way of working.
- Develop profound knowledge by examining measures (e.g., throughput time)
- Set intermediate goals to achieve long-term goal.



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92

93

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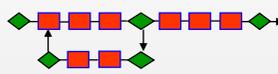
WHAT ACTUALLY HAPPENS IN A PROCESS?

Routine management of process work requires a focus on three components: efficiency (cycle time), effectiveness (productivity), and economics (cost). Productivity only counts if the results are produced meet all of the delivery requirements (quality).

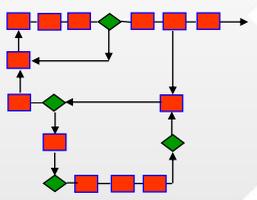
To achieve this requires an end-to-end (E2E) view of process activities.

How does your process really flow?

What you believe it is...



What it actually is...

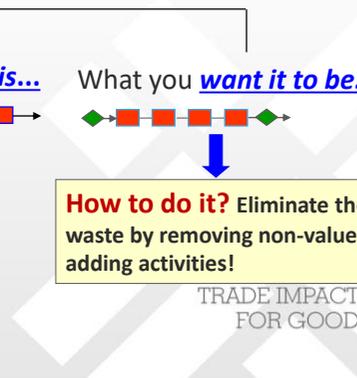


What you want it to be...



How to do it? Eliminate the waste by removing non-value-adding activities!

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94

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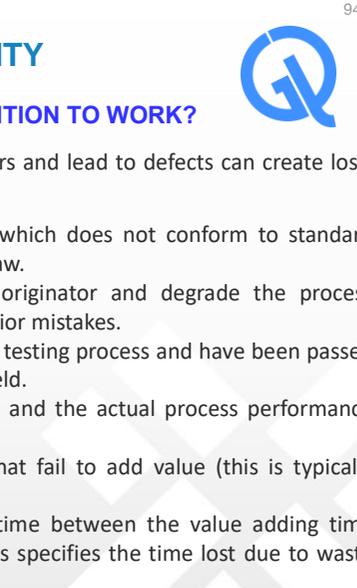
WHAT CAN HAPPEN IF WE DON'T PAY ATTENTION TO WORK?

Causal mechanisms due to mistakes that create errors and lead to defects can create loss, waste or inefficiency in our way of working:

- **Mistake:** an inadvertent performance of a task which does not conform to standard work and therefore creates a product or service flaw.
- **Error:** mistakes that have passed beyond the originator and degrade the process throughput as productive time is lost correcting prior mistakes.
- **Defect:** errors that have escaped the final internal testing process and have been passed to customers and can become detectable in the field.
- **Loss:** difference between capable process design and the actual process performance (categorized as seven losses in lean thinking).
- **Waste:** the use of valuable resources in ways that fail to add value (this is typically categorized as seven wastes in lean thinking).
- **Inefficiency:** the temporal loss in performance time between the value adding time component and the actual performance time (this specifies the time lost due to waste and systemic losses).



Work activities must be controlled to inhibit all of these mechanisms from occurring and to safeguard against failure!



94

95

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MANAGEMENT'S OBLIGATION FOR ASSESSMENT:

According to Henri Fayol (General and Industrial Management, 1916), the function of management is to plan, organize, command, coordinate and control work. According to Fayol all work is accomplished in a scalar chain that must be kept in good order through a disciplined process of following the rules that govern the organization. It is the responsibility of managers to set the rules (define the culture and determine the objectives) and also to review performance to determine if additional control is required for the organization to meet its plan.

When transitioning into a process organization, management must check to determine if progress is being made. In order to eliminate subjectivity in the assessment a fully anchored behavioral scale should be used by the management to make this judgment.

A process maturity self-assessment questionnaire can be used to check on progress in the development of an organization from a functional style of managing into a process way of working.



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95

96

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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.]

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



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96

97

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CLASS DISCUSSION SUMMARY:

- How many organizations do you know that fit into these three categories? Please identify the ones that come to mind!

Process Foundation	Process Analysis	System Integration




97

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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.




98

99

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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 throughout.



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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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102

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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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103

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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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103

104

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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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106

107

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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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108

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The Process of Management and Capacity for Leadership



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108

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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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109

110

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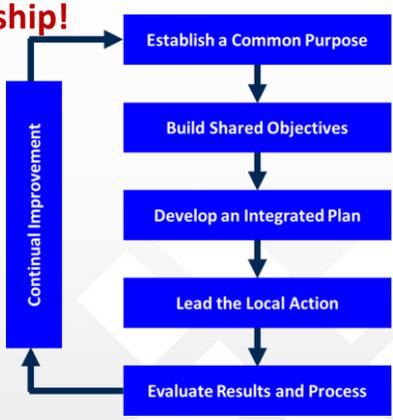
PROCESS MANAGEMENT REQUIRES PROCESS OWNERSHIP!



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.

Leadership!







Adapted from Hewlett-Packard, circa 1987

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The world needs scientific leadership not just scientific management!

110

111

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PROCESS OF MANAGEMENT – 1:

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

Purposeful Behaviors

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.

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

111

112

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PROCESS OF MANAGEMENT – 2:

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

Visionary Behaviors

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.

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

112

113

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PROCESS OF MANAGEMENT – 3:

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

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).

113

114

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PROCESS OF MANAGEMENT – 4:

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

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).

114

115

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PROCESS OF MANAGEMENT – 5:

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

Evaluation Behaviors

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.

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

115

116

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CLASS DISCUSSION SUMMARY:

- What actions does a leader need to do for a project to be successful in each of these stages?

Establish a common purpose	Build shared objectives	Develop an integrated plan	Lead the local action	Evaluate results and process	Continual improvement

116

117

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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!”

System Integration Stage (Levels 8-10)

8-10

Process Analysis Stage (Levels 5-7)

5-7

Process Foundation Stage (Levels 1-4)

1-4

← Short-Term Action Plan →

← Strategic Goal →



Leadership Maturity Levels:

8 ← **5. Clairvoyant** – Ability to understand future business implications

← **4. Consistent** – Demonstrated ability to lead across functions

← **3. Capable** – Experienced in working across functions

← **2. Competent** – Knowledgeable about functional integration

← **1. Chaotic** – Focused on personal functional capability



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118

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Psychology and Motivation for Managing Teams Effectively




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119

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WHAT DO WE MEAN BY “HUMAN-NESS” IN PEOPLE PROCESSES?

- What are the core characteristics the essence of being human?
- According to Elizaboro Nishibori, one of the original thinkers in the development of Japanese TQM, work involves three elements:
 - **First**, there is an activity that involves some form of physical action;
 - **Second**, this activity is stimulated by creativity that produces something of value as its outcome; and
 - **Third**, this work is conducted within a social context it is achieved by the effort of collaborative action by a coordinated effort of people and it is achieved so it delivers benefits to other people.



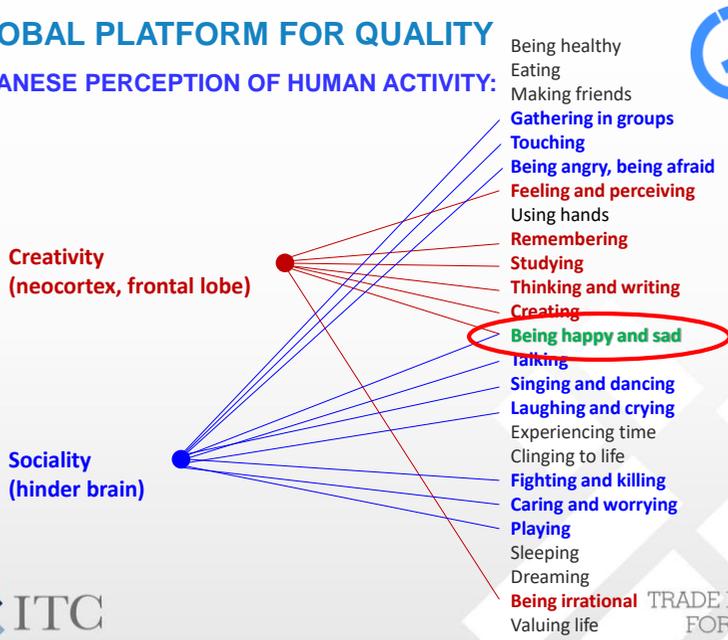
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119

120

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JAPANESE PERCEPTION OF HUMAN ACTIVITY:



- Being healthy
- Eating
- Making friends
- Gathering in groups
- Touching
- Being angry, being afraid
- Feeling and perceiving
- Using hands
- Remembering
- Studying
- Thinking and writing
- Creating
- Being happy and sad
- Talking
- Singing and dancing
- Laughing and crying
- Experiencing time
- Clinging to life
- Fighting and killing
- Caring and worrying
- Playing
- Sleeping
- Dreaming
- Being irrational
- Valuing life



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T. Tokizane, *Being Human* as referenced by Yoshio Kondo (1991 (English), 1989 (Japanese)), *Human Motivation* (Tokyo: 3A Publications).

120

121

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WHAT IS THE NATURE OF WORK?

- **Work** is the **purposeful expenditure of energy in order to achieve movement.**
- **Objects at rest are not working** as their energy is potential and not kinetic – it is not being acted upon.
- When energy is acted upon then movement occurs. **When this movement is achieving its objective or purpose then work is being achieved.**
- The quality of the achieved result of movement represents the effectiveness, efficiency and economy of the work that has been achieved. The means for the determination of quality is to answer the question: **Does the work fulfill its purposeful objective?**



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121

122

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WHAT ARE THE DISTINCTIONS BETWEEN CRAFT WORK AND PROCESS WORK?

- Today, throughout much of industry, a huge transformation is happening as the nature of work changes from a dominance of craft work to mostly process work.
- **Craft work:** the human being is calibrated to become the measurement system as well as the production equipment! By its nature all judgments made about production and quality were subjective and based on the authority of the Master Craftsman. People do this type of work.
- **Process work:** automated systems can perform repetitive work without getting tired or changing in quality level; their consistency and production rates stay constant. That is, as long as the process has been designed to do this! That's key to success! This type of work is done in systems that also will include people!



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122

123

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WHAT DOES IT TAKE TO ATTAIN PERSONAL SELF-CONTROL?

1. Knowledge of what the process is supposed to do.
2. Knowledge of what the process is currently doing.*
3. Ability to self-regulate the process:
 - The process must be capable of meeting its target.
 - The process must be responsive to actionable controls through a cause-and-effect relationship.
 - The workers must be trained in the proper way to operate the control mechanisms or procedures.
 - The act of adjustment should not be personally distasteful to the worker or require excessive exertion.
 - The worker should be delegated the authority to determine at what point the process adjustments should be made and also be given the authority to halt operations when process adjustment no longer operates effectively.

* All process measurements must have time history. A single measurement point provides no information about the process average or about its variance!



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123

124

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WHAT DOES DELEGATION OF QUALITY RESPONSIBILITY MEAN?

Typically, responsibility for quality is delegated as follows:

1. Workers are responsible for assuring the quality of their workmanship and working continually on projects to improve performance.
2. Supervisors are responsible for facilitating worker training and setting the conditions of work that provide for worker motivation.
3. Managers are responsible for organizing resources to accomplish the outcome and encouraging performance toward achievable goals.

However, management remains final responsibility for assurance of quality through its control of the process of review and always retains responsibility for systemic failures.



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124

125

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CONTINUAL IMPROVEMENT REQUIRES ACCOUNTABLE QUALITY:

Authority is delegated by an organization’s governing board to the senior management and from there to the operational level. This authority consists of decision-making rights and financial capacity.

Peter Drucker, Ed Deming and Joe Juran all agreed that responsibility for quality results is properly delegated to lower organization levels, if and only if, three conditions are met:

1. Clearly defined objectives and performance targets are mutually agreed.
2. Resources, training, and measurements required for action are provided.
3. Decision rights are delegated to permit self-regulation of work activities by the workers.



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125

126

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CLASS DISCUSSION SUMMARY:

- What does it take to delegate responsibility for quality to a specific worker?

Job Definition	Performance Measurement	Decision Rights



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126

127

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WHAT IS THE MEANING OF HUMAN MOTIVATION?




Yoshio Kondo
(1924-2010)

- “When talking about responsibility, we mean the strong feeling that one must somehow or other achieve the objectives of a job which one has been given. Provided the aims of the work have been clearly explained, **people’s sense of responsibility will increase in proportion to the freedom that they are allowed in the means and methods by which they can achieve those aims.**”
- “Stimulating people’s desire to work is motivation.”
- “Those in positions of authority should consider in connection with human motivation: teamwork and employee participation and **leadership which fosters this.**”




Yoshio Kondo, *Human Motivation: A Key Factor for Management* (Tokyo: 3A Corporation, 1991 (English), 1989 (Japanese)).

127

128

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THE LOGIC OF HUMAN MOTIVATION:



Design of Standard Work
Training Within Industry (TWI) Program



Self-control is the critical leverage point!

Leadership is the driver of motivation!

In Japan, leadership enables followership.

Role of the Supervisor




Yoshio Kondo, *Human Motivation: A Key Factor for Management* (Tokyo: 3A Corporation, 1991 (English), 1989 (Japanese)).

128

129

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REFLECTION IS A MEANS TO ACHIEVE HARMONY

- **Hansei (はんせい)** refers to mental acts that lead to increased self-awareness which is achieved by: self-reflection, reconsideration, introspection, meditation, or contemplation. *Hansei* occurs during the “Check” steps of the PDCA and SDCA cycles and it “**standardizes worrying!**” *Hansei* achieves “zen” in managing.
- *Hansei* features: recognition of a problem that is primarily related to the personal performance of an individual not failure of a process or overall system.
- **The person creating a problem must accept personal responsibility for the shortcoming.** Being reprimanded or scolded is not *hansei*.
- Instead, **taking personal ownership for the mistake is a critical part of hansei reflection along with individual acceptance that the act was committed wrongly.** The worker should possess a sense of shame (loss of pride in their work) for not having performed correctly, accept an obligation to make the task properly, and therefore commit to improvement in the future which is documented by taking affirmative action that corrects the standard work instructions.



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130

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CLASS DISCUSSION SUMMARY:

- Describe how each of these elements contributes to improvement in a project of which you are aware!

Adequacy of the job's definition	Encouragement by the work supervisor	Acceptance of personal responsibility for work



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130

Global Platform for Quality

Introduction to Quality

Lecture 5: Introducing the Concepts of Statistical Thinking




131

132

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EDUCATIONAL PROGRAM – INTRODUCTION TO QUALITY:

- Lecture 1: Investigating the Meaning of Quality
- Lecture 2: Understanding the Content of Quality Products and Services
- Lecture 3: Describing the Process of Delivering Quality Outcomes
- Lecture 4: Defining the Competence Areas of Quality Professionals
- **Lecture 5: Introducing the Concepts of Statistical Thinking** ←
- Lecture 6: Analyzing Work to Identify Quality Activities
- Lecture 7: Designing Productive Systems for Working
- Lecture 8: Developing a Quality Mindset




132

133

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WHAT IS THE DIFFERENCE BETWEEN MATHEMATICS AND STATISTICS?

- **Mathematics:**
 - The science of numbers and their operations, interrelations, combinations, generalizations and abstractions and of space configurations and their structure, measurement, transformations and generalization. Branches of pure mathematics include algebra, arithmetic, geometry, trigonometry and calculus.
- **Statistics:**
 - A branch of applied mathematics dealing with collection, analysis, interpretation, and presentation of numerical data (both quantitative and qualitative).
 - Mathematics deals with manipulation numbers for their own sake while statistics seeks to provide a quantitative answer to an applied question.




133

134

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EXAMPLES OF MATHEMATICS:

- **Pure Mathematics:**
 - Pure mathematics deals with the numerical relationships among abstract concepts like the formula for a geometric shape or the definition of the shape of a line.
- **Applied Mathematics:**
 - Applied mathematics describes something in the physical world using a numerical formula like the rate of acceleration of a car or the amount of inventory that is in a warehouse.
 - Applied mathematics is used in science (e.g., physics, chemistry. etc.) and also in business to define real-world situations (e.g., descriptive statistics) and to predict future events (e.g., inferential statistics and probability theory – which is also called predictive analytics).




134

135

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EXAMPLES OF STATISTICS:

- **Descriptive Statistics:**
 - A summary statistics that is used to quantitatively describes and summarizes the most salient features of a collective information and uses them to represent how a collection of data (population) behaves.
- **Inferential Statistics:**
 - Observations about a population of data from a coherent, rational sub-group that define the probability of its behavior based upon generalizations from a sample of data that is drawn from that population.
 - Descriptive statistics are used in both enumerative and analytic studies to define how a population performs and is useful for analysis of risk and determination of overall probability of performance. Inferential statistics takes a small sample to estimate how the overall population would most likely be expected to perform.



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136

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DATA COLLECTION METHODS – ENUMERATIVE VS. ANALYTIC

- **Enumerative Data Analysis:**
 - Analysis of a static population – summary data that has been collected over time. A “common sense” way to analyze data – gathering all the data and determining where an average of the population is located on the measurement scale. In this approach summary statistics (e.g., mean and standard deviation) are used to represent performance of all the data in a particular set (e.g., a universe, population, or sample of the variable of interest).
- **Analytic Data Analysis:**
 - Analysis of a real-time data series in its sequential order of occurrence. This way the relationships within a set of data can be found by examining the process-sequenced observations to seek out patterns in variation that describe data shifts caused by events in the process (e.g., special causes of variation that may be attributed to specific process actions). This method is superior as it examines the sources of variation within and between the sub-groups of interest to find causes.



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136

137

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TWO CHOICES FOR ANALYZING DATA:

ENUMERATIVE	ANALYTIC
Interest is in studying the group (material) the samples were taken from.	A prediction will be made about the process that produces the material.
No predictions are made about future materials.	A decision will be made to change or not change the process that will produce the material in the future
The sample was chosen randomly from the material.	Special members were chosen for the sample.
A decision will be made only on the material studied.	The process will be worked on.
Most statistical analyses are valid for inferences on the material under study.	Statistical methods of inferences (DOE, t-tests, etc.) are not meaningful for prediction. If the conditions of the study are repeatable in the future, then statistical inference may be valid.
No decision will be made based on the process that generated the material studied.	Document the statistical control of the variables.



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137

138

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DISTINCTIONS BETWEEN “BIG DATA” AND “LITTLE DATA” ANALYSIS

- **Big Data Analysis:**
 - This phrase refers to the massive amounts of data that is being produced due to the advances in technology that rapidly proliferate and capture data from a variety of sources. Analyses are conducted of these massive data sets to determine if there are any interesting correlations among the data items which provide indicators of a previously unknown relationship between the data items. Such a correlation is the starting point for a new focused study to define the nature of the observation. Analysis using these methods leads to correlations but not causation.
- **Little Data Analysis:**
 - This phrase describes the more detailed investigation of data that is required for a determination of causation among data items to verify physical interrelationships and the proper sequence of events that mark causation.



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138

139

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CLASS DISCUSSION SUMMARY:

What are the relative advantages and disadvantages of the approaches discussed? Is one approach more advantageous than the other? Why?

Choice	Advantage	Disadvantage
Mathematics or Statistics		
Descriptive or Inferential Statistics		
Enumerative vs. Analytic		
Big Data or Little Data		



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WHAT CAN BE LEARNED FROM STATISTICAL ANALYSIS OF DATA?

- **Central Tendency:**
 - The “middle” or “central” value that is considered typical of observed data. Usually it is measured as the arithmetic mean, median or the mode.
- **Dispersion:**
 - A characteristic of a data distribution which refers to variability, scatter, or spread of the data – the extent to which the data is stretched or squeezed on its scale of measurement. It is measured as the range, variance, or standard deviation.
 - Statistical distributions are primarily defined by measures of central tendency and dispersion of the data. In addition the shape of the distribution provides an insight into its behavior relative to the value of the measure that is described.



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Central tendency provides a 'statistical summary' of process trends!

Numerical indicators of the data's location in the scale of its measurement for either a sample or a population.

"The average almost never happens!"
~ Jack Welch, GE

OBSERVATION:
Process data tend to cluster around a central value in the data distribution.

Central tendency is one way to identify the location of the 'mass' of data.




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MEASURES OF CENTRAL TENDENCY

- **Mean:**
 - The average of a set of numerical values that is calculated by adding them together and dividing by the number of items in the data set.
- **Median:**
 - The middle number in a list of numbers that has been sorted in order from the smallest value to the largest value.
- **Mode:**
 - The most frequently occurring number in a set of numbers.
- When all three measures coincide then the statistical distribution is called a normal distribution of the data.



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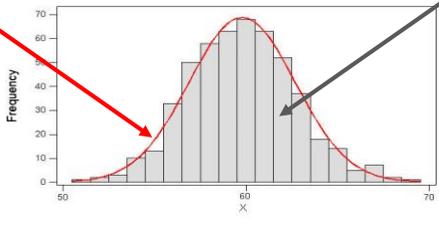


THE NORMAL DISTRIBUTION OF DATA:

The graph of the normal distribution depends on two factors - the mean and the standard deviation. The mean of the distribution determines the location of the center of the graph, and the standard deviation determines the height and width of the graph. When the standard deviation is large, the curve is short and wide; when the standard deviation is small, the curve is tall and narrow. All normal distributions look like a symmetric, bell-shaped curve, as shown below.

Probability Density Curve

Histogram Constructed from Data







143

144

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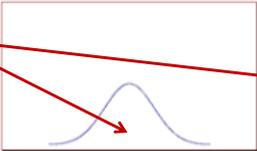
DEFINING THE COMPOSITION OF THE NORMAL DISTRIBUTION:

Normal equation. The value of the random variable Y is:

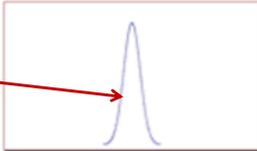
$$Y = \{ 1 / [\sigma * \text{sqrt}(2\pi)] \} * e^{-\{x - \mu\}^2 / 2\sigma^2}$$

where X is a normal random variable, μ is the mean, σ is the standard deviation, π is approximately 3.14159, and e is approximately 2.71828.

The normal distribution is symmetric in the shape of its probability density curve.



More deviation around the mean.



Less deviation around the mean.





144

145

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MEASURES OF CENTRAL TENDENCY

Average: a numerical indicator for the location of the central tendency in a set of data. It may be calculated as one of three statistics: mean, median or mode.

Average

- **Mean**
Arithmetic average
- **Median**
Mid-point on a distribution
- **Mode**
Most frequently occurring value

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Dispersion of the data indicates degree of performance consistency.

Numerical indicators in "spread" or distribution span of data across a sample or population.

"Truth is in the variation!"
~ Jack Welch, GE

OBSERVATION:
Process data tends to be spread around the central tendency as a function of its consistency.

Dispersion is one way to show how processes differ from each other.

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MEASURES OF DISPERSION:

- **Range:**
 - The difference between the lowest and highest value in a set of numbers.
- **Variance:**
 - The sum of the squared deviations of a set of data observations each of which is subtracted from the mean.
- **Standard Deviation:**
 - The square root of the variance which expresses the numerical dimension in the value scale of the original data.



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MEASURES OF DISPERSION

EXERCISE:

For this set of numbers: { 8, 2, 1, 3, 9, 5, 4, 0, 6, 7 }

Calculate the Mean, Median, Mode, Range, Variance and Standard Deviation

The **mean** of these numbers is $8+2+1+3+9+5+4+0+6+7 = 45 / 10 = 4.5$

The **median** of these numbers is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 = 4.5 (halfway between 4 and 5)

There is no **mode** in this set of numbers as all are individually-occurring data.

Since the **range** is the span between the lowest observed value and the highest observed value, it is the difference between 0 which is the lowest observed value and 9 which is highest observed value. Thus, the range of this set of numbers is therefore from 0 to 9.



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MEASURES OF DISPERSION

The SS_T is sum of the deviations of sample data from the sample average:

Total Sum of Squares (SS_T) = $\sum_{i=1}^N (X_i - \bar{X})^2$

N	X	$X - \bar{X}$	$(X - \bar{X})^2$
1	8	3.5	12.25
2	2	-2.5	6.25
3	1	-3.5	12.25
4	3	-1.5	2.25
5	9	4.5	20.25
6	5	0.5	0.25
7	4	-0.5	0.25
8	0	-4.5	20.25
9	6	1.5	2.25
10	7	2.5	6.25
Σ	45		82.50
Mean	4.5		
s-square			9.17
s			3.03

Sum of Squares
for each Factor

Total Sum of Squares (SS_T)

$$\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}$$

Formula for Variance

$$\sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}}$$

Formula for Standard Deviation

Degrees of Freedom \rightarrow **N - 1**



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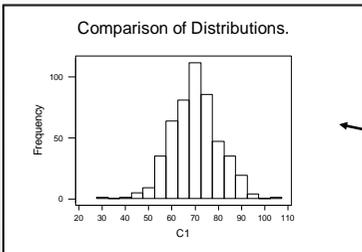
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UNDERSTANDING THE SHAPE OF DISTRIBUTED DATA

- **Symmetric Data – No Skewness:**
- Symmetric data tends toward a normal distribution – this characteristic is good when the measure is optimized at the center of the distribution – on-time delivery or physical measures centered within specification limits are good examples.



Symmetric Distribution



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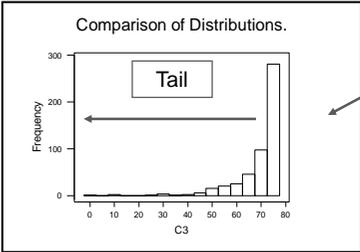
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UNDERSTANDING THE SHAPE OF DISTRIBUTED DATA

- **Asymmetric Data - Negative Skewness:**
- Negative skewness occurs when there is a performance boundary to the left or the right. When the boundary is to the right the function is maximizing – productivity or profitability are good examples.



Negative Skew



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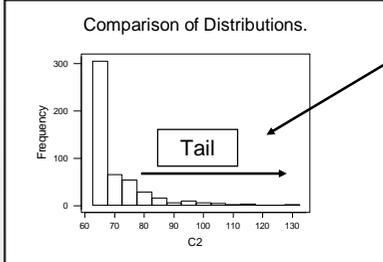
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UNDERSTANDING THE SHAPE OF DISTRIBUTED DATA

- **Asymmetric Data - Positive Skewness:**
- Positive skewness occurs when there is a boundary condition where the optimum or desired performance is minimized – cycle time, defects, costs, and waste are all good examples.



Positive Skew



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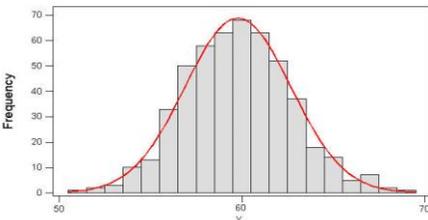
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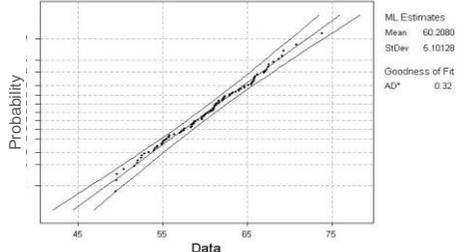
DATA VIEW VS. PROBABILITY VIEW

If the data is Normally distributed, then the data points will fall onto a “straight” line on a probability plot. “Straight” means that the regression line for this data falls within the 95% confidence interval boundary. This means that you can say the data is Normal if approximately 95% of the data points fall within these confidence bands.



The Data View

Normal Probability Plot for C3
ML Estimates - 95% CI



The Probability View



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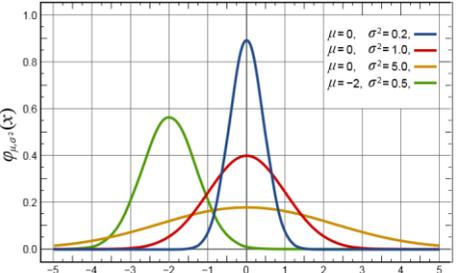
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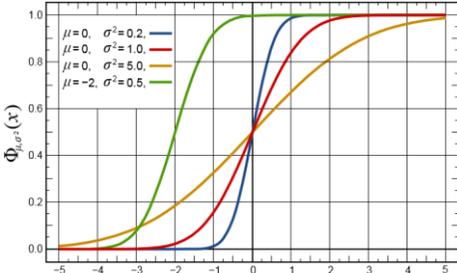


THE STANDARD NORMAL DISTRIBUTION:

The **standard normal distribution** is a distribution of random variable that has a mean of zero and a standard deviation of one. It is the probability distribution used for most statistical tests.



The **probability density function** illustrates the shape of the transformed distribution and will show the “rarely occurring observations in the tails of the distribution.



The **cumulative distribution function** illustrates the shape of the cumulative increase in value of the transformed distribution as it increases in magnitude from 0 to 1 to depict the tail.



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155

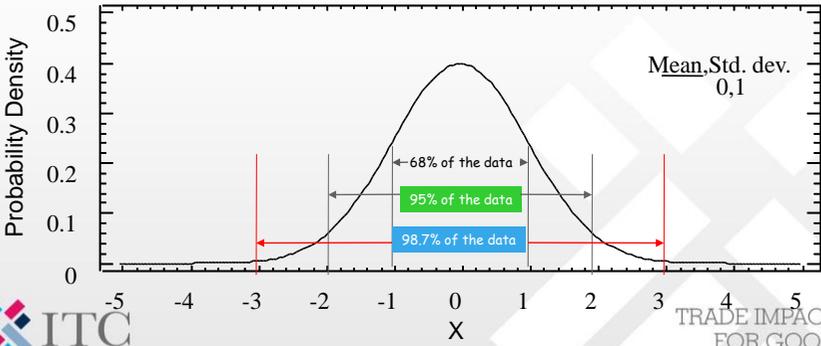
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THE EMPIRICAL RULE IN STATISTICS:

If observations behave like normal distributions then then:

- 68% of the observations fall within 1σ of μ
- 95% of the observations fall within 2σ of μ
- 98.7% of the observations fall within 3σ of μ



Mean, Std. dev.
0, 0.1

Probability Density

X

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156

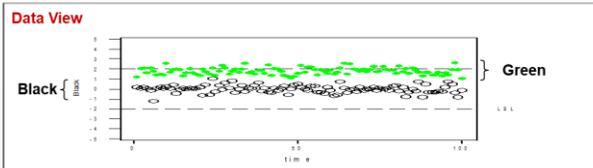
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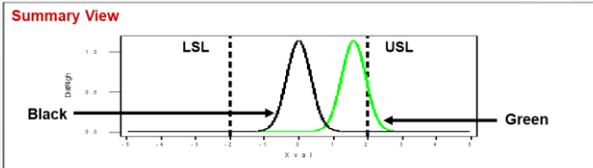
EXAMPLE OF PROCESS CENTRING – ACCURACY:

Example #1: Observing 'accuracy'

Data View



Summary View



The process center is indicated by the accuracy of the measured output of that process.

The statistical problem is to find the factors that shift the mean!



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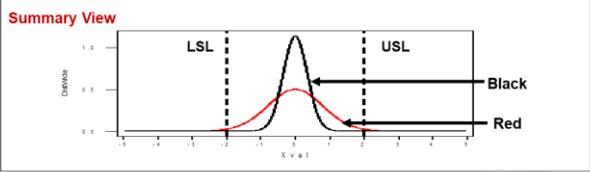
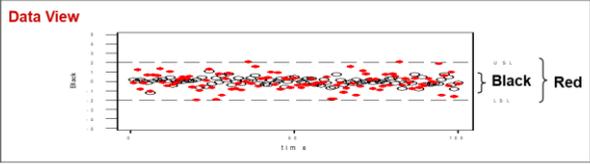
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157

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EXAMPLE OF PROCESS BREADTH – PRECISION:

Example #2: Observing 'precision'



The process breadth or spread is indicated by the *precision* of the measured process output.

The statistical problem is to find the factors that reduce variation!



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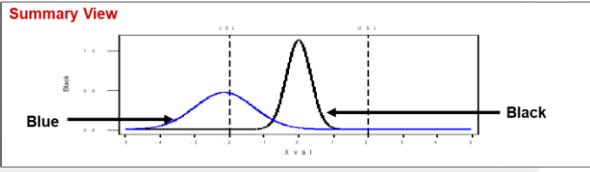
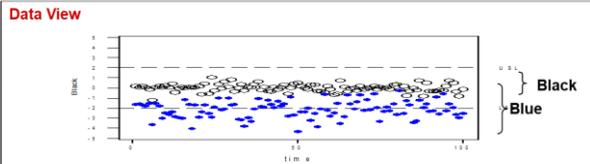
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EXAMPLE OF A TYPICAL PROCESS – BOTH DIMENSIONS OFF:

Example #3: What about now?



Example: blue process has a wider process breadth and different center relative to the black process.

The statistical problem is to find the factors that do both!



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THE CENTRAL LIMIT THEOREM:

The Central Limit Theorem (CLT) paraphrased:

- “The means of means are normally distributed.”

Why is this so important?

- Not all data is normally distributed; however, statistical methods are designed for normally distributed data! So, how do you get the analysis to work if your data isn't normal? Transforming the data into a normal distribution is messy and not always correct for the data set. A simpler and more reliable approach is to take sub-groups of the data in short time intervals and average the data across these sub-groups, creating a normal distribution of this averaged data! We do this all the time without thinking of what we're doing: we average hourly rates, monthly volumes, annual sales, etc. This way we use our regular data interpretation and nobody needs to worry!



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CLASS DISCUSSION SUMMARY:

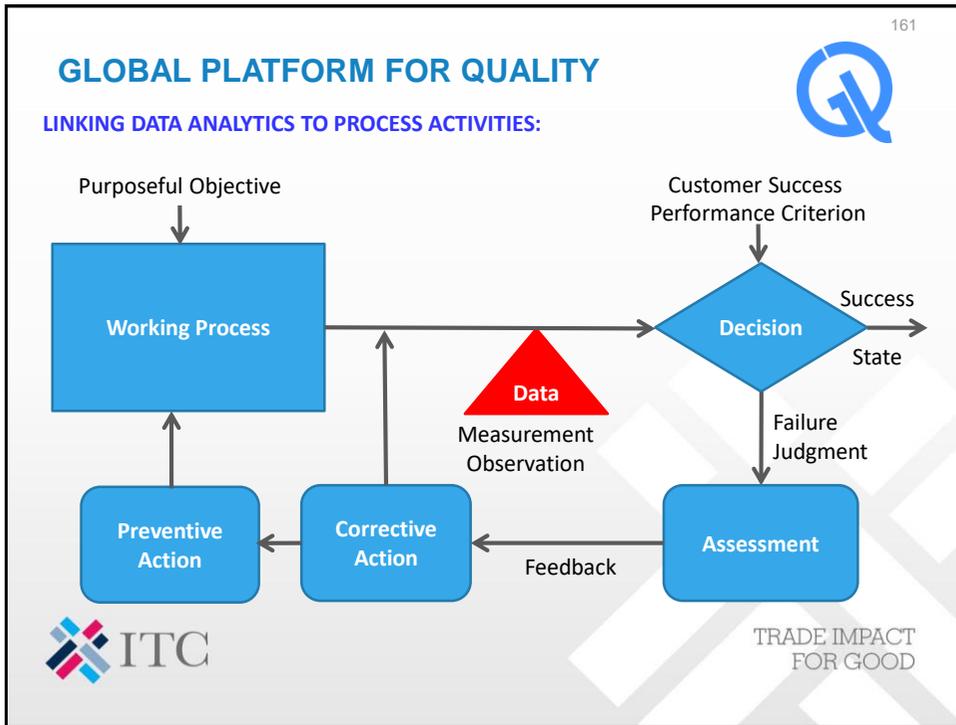
- What type of data analysis will be best to understand process performance?

Performance Measures for Your process	Analysis Data Type (Analytic or Enumerative)	Recommended Central Tendency Measure	Recommended Measure of Dispersion

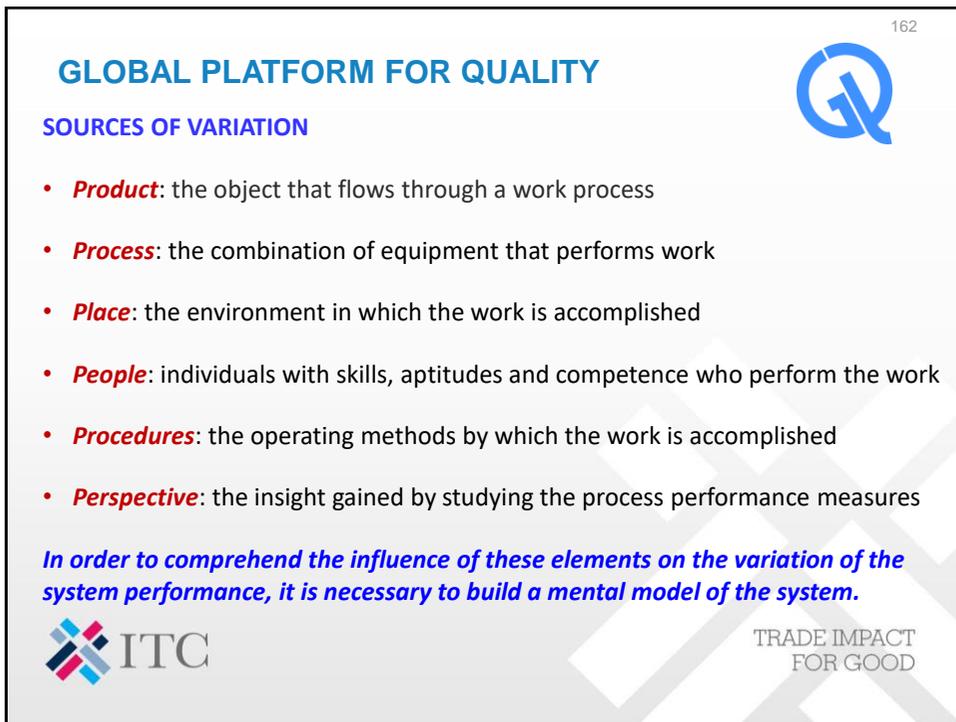


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161



162

163

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EDUCATION IN STATISTICS BEGINS WITH A NORMAL DISTRIBUTION

WE WILL TURN STATISTICS “UPSIDE-DOWN” – START WITH OUTPUT

- Should you start by formulating and testing individual hypotheses about the factors involved in a process? Should you transform a distribution to force it toward normality before doing any analysis? Should you compare process-level metrics before you understand the trends in the outcome indicators? These approaches are all included within common ways that “classical statistics” have been taught.
- We will turn this “upside down” and examine the outputs in the data that has been used to make decisions from an historical viewpoint – without any data transformations or fancy manipulations or elimination of data that does not fit our preconceptions – what does the data have to say about our process performance?



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163

164

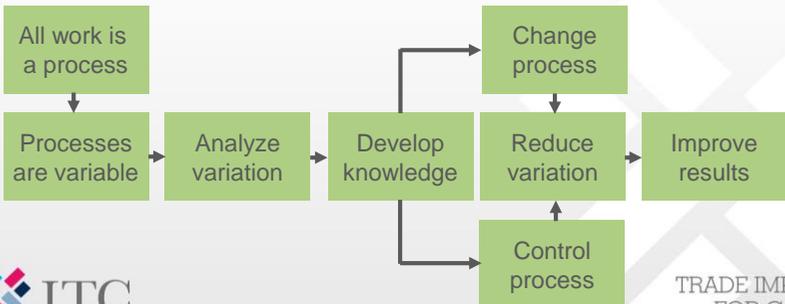
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STATISTICAL THINKING

A process of learning and then taking action based on three basic principles:

- All work occurs in a system of interconnected processes.
- Variation exists in all processes – use data to learn about processes.
- Understanding and reducing variation are the principal keys for performance management and business improvement.



```

    graph LR
      A[All work is a process] --> B[Processes are variable]
      B --> C[Analyze variation]
      C --> D[Develop knowledge]
      D --> E[Change process]
      D --> F[Control process]
      E --> G[Reduce variation]
      F --> G
      G --> H[Improve results]
  
```



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WHAT METHODS ARE HELPFUL FOR STATITICAL THINKING?

Process Methods:

- Fishbone diagram that identify categories of information for analysis
- Process map (high level) that defines the context of the work environment
- Process map (detailed) that identifies the specific activities in a process
- Value Stream Map that merges statistical measures into process activities

Statistical Methods:

- Knowledge of the measurement characteristics
- Indicators of central tendency
- Indicators of dispersion
- Indicators of distribution shape
- Predictability of performance to requirements
- Flow throughput and bottleneck analysis



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STABILITY AND PREDICTABILITY OF PERFORMANCE

Stability of Performance: Process performs consistently over time.

- The process is operating according to the procedures defined as standard work.
- Process has a high probability of operating within desired boundary conditions.
- Process has a high probability of operating within customer tolerance limits.

Predictability of Performance: Process is stable and within a state of control.

- There are no special causes of variation – only common causes of variation (those designed into the process).
- Process has a high probability of delivering targeted level of performance.
- Process has a high probability of delivering only random variation in activities.



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PATTERNS OR TRENDS IN PERFORMANCE VARIATION

Lack of Excessive Variation:

- Excessive variation occurs when data is greater than three standard deviations from the overall observed process performance mean.

Lack of a Process Shift:

- A process shift is signaled when a series of data observations (9 or more) occur on one side of the mean and then a similar run of observations occurs on the opposite side of the mean.



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CAPABILITY TO DELIVER CUSTOMER REQUIRED PERFORMANCE

Process capability means that there is low variation in the work output relative to the requirement for process performance.

- Natural process capability is defined as the spread in the requirement that occurs when it is equal to six standard deviations of the process variation. In most cases this is an excessive spread for required performance and an unacceptable result.

Process capability means that the standard for the requirement has been set with requirements from process customers for desired results or outcomes.

- Processes are considered capable when the variation of the process performance is much less than the requirements specified by customers and the process is now acting stably within these boundary conditions.



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169

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CLASS DISCUSSION SUMMARY:

- What characteristics define good and poor process performance results? Why?

Characteristic	Good Process Results	Poor Process Results
Process Stability		
Performance to the requirement limits		
Relationship of the requirement to the customer demand		
Performance to the targeted results		




169

Global Platform for Quality

Introduction to Quality

Lecture 6: Analyzing Work to Identify Quality Activities




170

171

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EDUCATIONAL PROGRAM – INTRODUCTION TO QUALITY:

- Lecture 1: Investigating the Meaning of Quality
- Lecture 2: Understanding the Content of Quality Products and Services
- Lecture 3: Describing the Process of Delivering Quality Outcomes
- Lecture 4: Defining the Competence Areas of Quality Professionals
- Lecture 5: Introducing the Concepts of Statistical Thinking
- **Lecture 6: Analyzing Work to Identify Quality Activities** ←
- Lecture 7: Designing Productive Systems for Working
- Lecture 8: Developing a Quality Mindset



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WHY DO WE USE PROCESS METHODS TO ANALYZE WORK?

DETERMINE THE FLOW OF ACTIVITIES:

- Develop a comprehensive end-to-end process map of the work flow activities.

IDENTIFY THE PARTICIPANTS IN PROCESS WORK:

- Analyze tasks and activities performed by the workers in the end-to-end process to distinguish between the system and human components of the work.

EVALUTE HOW TO MEASURE THE WORK PEOPLE PERFORM:

- Capture data about time, cost, quality, and safety that can be used to analyze the productivity and effectiveness of the end-to-end work process.

GATHER THE DATA AND ANALYZE THE PROCESS PERFORMANCE:

- Collect the data and conduct an Exploratory Data Analysis (EDA) of its throughput.



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PRINCIPLE: CONTENT QUALITY IS ASSURED BY PROCESS QUALITY

- The process of producing a deliverable quality or service may be used to evaluate the quality of the process by which that content is produced.
- A deliverable is prepared for the commercial market through a series of process steps or activities that make it acceptable for customers. Thus the quality of the deliverable is incrementally increased as it flows through that process.



- **What work is performed by the system and how do humans contribute to the way the process works? How can this activity be objectively measured?**



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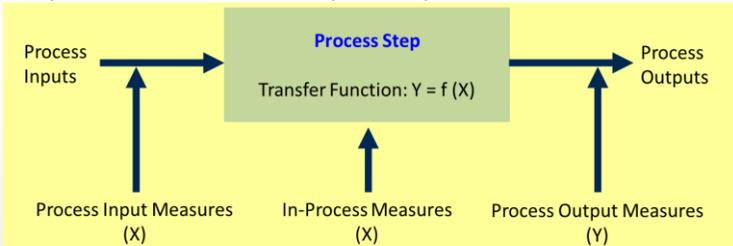
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PROCESS PERFORMANCE CREATES PROFOUND KNOWLEDGE

Profound Knowledge: knowledge about how a process changes over time, what factors influence both its level of process performance as well as its consistency. Ability to predict process outcomes using a statistical model of the process and measurements of process inputs.



To obtain this **profound knowledge** requires learning about the activities that occur in the physical process; measurements that describe the flows that will have an influence on the performance of the activity in terms of quality, cost and productivity; and knowledge of what can go wrong that could affect how well the process performs under differing operational conditions.



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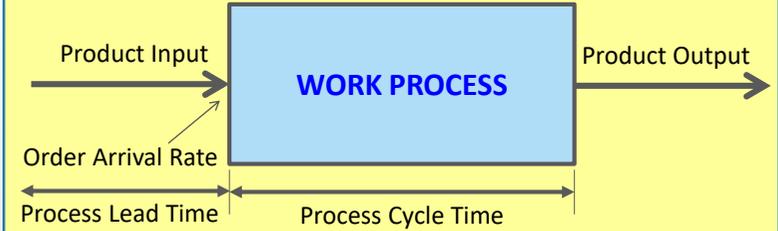
MERGING PROCESS THINKING WITH STATISTICAL METHODS:



Process Thinking:

- Process functions are identifiable as rational sub-groups of entities supporting work: people are divided by type of skill; equipment are identified by class of work performed; material are described as consumables, parts or assemblies, and packaging; and technology is sortable by degree of complexity.

Efficiency Requirement: Achieve balance between the production cycle time and the takt time (arrival rate of customer orders).





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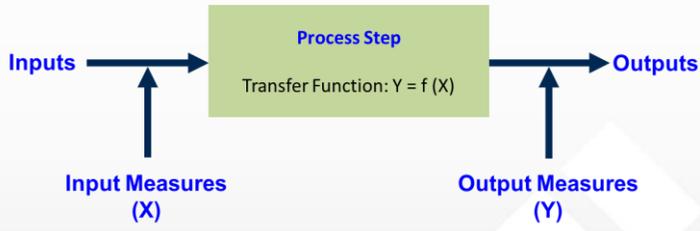
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MEASURING VALUE FLOW IN A PROCESS STEP



Process Thought Map – The “IPO” elements of a “S-IPO-C” map is a “kernel” from which process knowledge grows.



Input Measures (X) **Output Measures (Y)**

Performance Contribution:

- Effectiveness = RTY →
- Efficiency = AΔT →
- Economy = Cost/Unit →

Value Stream for X's

- What are the inputs to your process?
- What are the most critical in-process measures?
- What are the outputs from your process?



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DEFINING THE CRITICAL PROCESS PERFORMANCE QUALITY MEASURES

Fundamental Process Measures: Quality, Cost and Time (QCT)

Measures that should be analyzed in a process:

- **A Delta T (ΔT):** Actual vs. Theoretical Cycle Time – it shows the relative amount of value-adding time that is in a process. [Time measure]
- **Rolled Throughput Yield (RTY):** The result of multiplying “right the first time” yield of each process step in the series of activities that produces an overall result. [Quality measure]
- **Cost per Transaction:** The total variable cost in processing one transaction through a process step. When this is accumulated across all the steps in a process it represents the variable cost to produce the product. [Cost measure]

Note that **time** is a “**proxy measure**” for both **quality** and **cost**. It means that as **quality** is improved process cycle time is reduced as wasted rework is eliminated and that reductions in time can be translated into the reduction in process transaction cost.

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DISCOVER THE TIME SERIES OF ACTUAL WORK ACTIVITIES

Supplier Lead Time (SLT) is the turnaround time from ordering of parts, sub-assemblies, supplies and raw materials to the time of their delivery in the right quality and quantity for transformation into finished goods. Supplier On-Time-Delivery (OTD) refers to the ability of a supplier to deliver orders relative to the promise date.

The diagram illustrates the relationship between external and internal process times. It shows a horizontal timeline starting with 'Order Received' and ending with 'Order Shipped'. A double-headed arrow above this timeline is labeled 'Customer – Order Turnaround Time (OTAT)'. Below the timeline, a yellow rounded rectangle represents the 'Internal' process. It starts at 'Job Start' and ends at 'Job End'. Inside this rectangle, there is a yellow box for 'Setup / Changeover Time' followed by four blue boxes for 'Process Cycle Time₁'. A double-headed arrow below these boxes is labeled 'Throughput Time'. To the left of the yellow box, an arrow labeled 'External Supplier Lead Time' points from the 'Order Received' point to the start of the 'Setup / Changeover Time' box.

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TIME AS MEASURED FROM AN EQUIPMENT-CENTRIC VIEWPOINT:

In financial systems it is important to track the time capital equipment is operating to determine its economic benefit as a payback period. The total amount productive time available is divided into: (1) Uptime or the time that the equipment is available to work, and (2) Downtime or the time that equipment is not be available for work. Uptime used to transform inputs into process outputs is called productive time while time that the equipment is not producing output is called idle time (e.g., due to lack of availability of labor, scheduling conflicts, or unevenness in production (material flow or available operator level of competence). Downtime is either scheduled (e.g., planned maintenance or holidays) or unscheduled (e.g., due to either equipment failure (e.g., breakdown of the equipment) or labor shortage (e.g., strike)).

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Productivity is output divided by effort; effective production is:

Effectiveness = Availability × Efficiency × Yield

Availability = Operational Time = $\frac{\text{Productive Time}}{\text{Up Time} + \text{Down Time}} \times 100$

Note: This measure differs from availability in that it only includes productive time and excludes the idle time (the time equipment is available to work but is not actually being used).

What is the impact of quality on productivity?

Efficiency = $\frac{\text{Ideal Cycle Time} \times \text{Processed Amount}}{\text{Operating Time}} \times 100$

Yield = $\frac{\text{Processed Amount} - \text{Defect Amount}}{\text{Processed Amount}} \times 100$

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180

181

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CALCULATING TAKT TIME AND INTERPRETING AΔT



Sets pace of work to match customer demand.

$$\text{Takt Time} = \frac{\text{Time (Available time per working day)}}{\text{Volume (Daily demand requirement)}}$$

Ideality Ratio = AΔT = Actual Cycle Time ÷ Theoretical Cycle Time

- Analyze task processing time:
 - How close to ideal operation is your process (ideality converges when the AΔT ratio approaches 1.0)? Most organizations find the starting point is a ratio over 2.0!
 - Where to improve? Compare task processing times to Takt time, look for steps where the work time is closest to or longer than Takt time to streamline or simplify.
 - If the Takt time is greater than cycle time, it means you have capacity waste and process idle time (you can increase sales).
 - If the Takt time is less than cycle time, it means that there is not enough capacity, and you are creating a backlog of customer orders.



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181

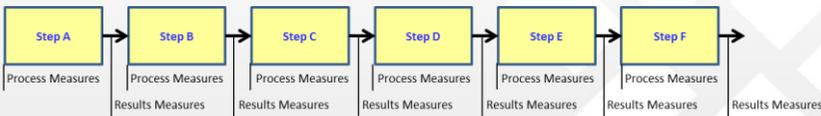
182

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INTEGRATE PERFORMANCE MEASURES WITH THE PROCESS FLOW

- The process thought map provides a detailed graphical illustration of the process steps and the measurement observation points that are involved in the production process. Performance measures within process steps (called “X” measures) are identifies as to degree of control for the factors as well as building the relationships for throughput measures (called “Y” measures) such as rolled throughput yield, accumulated transaction cost, and value-adding cycle time (as a percent of total cycle time).



```

            graph LR
            A[Step A] --> B[Step B]
            B --> C[Step C]
            C --> D[Step D]
            D --> E[Step E]
            E --> F[Step F]
            F --> End[...]
            
```

Hint: map both the process steps and the arrows between them!



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182

183

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WHY DO WE USE STATISTICAL METHODS TO ANALYZE WORK?

STANDARDIZE PERFORMANCE:

- Standardized performance is repeatable, predictable, and consistent. It occurs as the workers in the process apply the same methods and techniques in the use of the systems in the process. The result of this approach is achievement of process performance within the tolerance bands that define limits of process acceptability to the customer or recipient of the process outcome.

IMPROVE PERFORMANCE:

- Once performance is consistent then there is a baseline from which improvement may be measured and opportunities for improvement may be identified based on an objective analysis and a project for improvement may be initiated.

Operational Rule: Standardization activities must precede improvement activities.



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183

184

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THERE ARE TWO TYPES OF PERFORMANCE MEASURES

Processes create outcomes which may be measured as outcomes or results. A productive process creates more good results per unit time than a less productive process.

- Results Measures:** describe the level or rate of performance of a process as an outcome of the effort exerted in the work. Proper measurement of results will compare outcomes for the quality of the results, resource effectiveness of the results and productivity of the results (relative to process capacity and capability). Measures are used to assure capacity and capability obtain productivity and indicate that the organization is doing the job that is expected.
- Process Measures:** determine if a process is stable, or if the rate of change in performance indicates an “out-of-control” situation and if performance as observed is other-than-expected (as a result of special cause or common cause variation). Measures are used for the improvement of efficiency and effectiveness.



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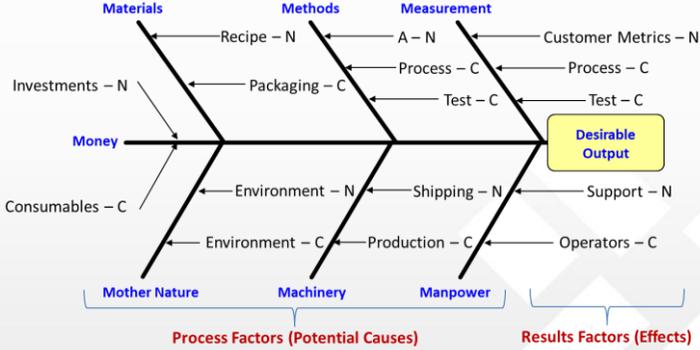
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PROCESSES MUST BE DISSECTED INTO ANALYSABLE ELEMENTS

Rational Sub-groups are Identified using a Fishbone Diagram:



C = Controllable factors that can be fixed in equipment, controlled by measure or managed during input
N = Noise: uncontrollable factor that cannot be changed without additional resources or process redesign



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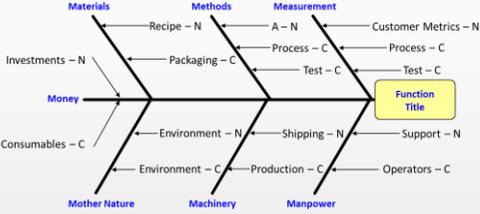
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HOW DOES A FISHBONE REPRESENT RATIONAL SUB-GROUPS?

Fishbone diagrams breakdown functions according to fixed process categories (the 7 M's) to identify logical sub-groups that may be categorized by the degree of control they exercise over the process.



- How can you convert a Fishbone Diagram into a structure to define rational sub-groups in a particular process?
- What relationship does this type of diagram to a tree diagram?
- How can you use this diagram in your search for causal system contributors?



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187

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CLASS DISCUSSION SUMMARY:

Thinking about work that you do, identify elements that describe waste in the way that you function:

Function	Example of waste	How could it be improved?
Method		
Machinery		
Measure		
Material		
Manpower		
Mother Nature		
Money		

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188

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RELATIONSHIP OF PDCA/SDCA CYCLES TO WORK PROCESS ANALYSIS:

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MERGING PROCESS THINKING WITH STATISTICAL METHODS:

Process Thinking describes the flow of work and resources:

- Processes are organized into a flow of activities, information, and resources. They define the way that work is performed.

Statistical Thinking identifies the quality of the work that is performed:

- Statistical thinking helps to focus on the way that processes can be improved so they perform better based on observations of waste, loss and inefficiency that can be overcome by taking positive actions to improve the flow by reducing variation, or shifting the mean, or changing the performance criteria – or all of these options!



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190

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CLASS DISCUSSION SUMMARY:

- What type of analysis will be most effective for improvement? Why?

Choice	Process Thinking	Statistical Thinking
Chaos in the way that work is done		
Determining where to focus improvements		
Understanding how much gain is possible		
Defining where to control a process		



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191

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WHAT FACTORS ALTER THE INTERPRETATION OF A SYSTEM OUTCOME?

- The nature of the actual entities that flow through a process.
- The physical state of the various process factors.
- The effect of random variation on process variables.
- The capability of the measurement system to detect changes.
- The scale of measurement used for recording observations.
- The selection of mathematical model used in the analysis.
- The analytical method used to process the data.
- The time constraints for making a judgment.
- The organization's cultural bias in interpreting events in data.
- The perceiver's past experience relative to the particular case.
- The competence or skill of the interpreter.



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BASIC MEASURES OF VALUE-ADDING WORK:

QCDSM = Measures of business fundamental performance.

Value-adding activity are those activities that convert raw material or information into a product or service that customers interpret as valuable to them – it is judged from the customer's perspective!

Value to the customers is measured on a daily basis using QCDSM:

Quality **C**ost **D**elivery **S**afety **M**otivation

The combination of processes and operations that is the "one best way" to make the product, deliver highest quality, at lowest cost, on time to the customer and safely for the operators – only this approach maximizes value in all dimensions of the customer's work environment!



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INTERPRETING THE VALUE OF PERFORMANCE MEASURES:

Genichi Taguchi developed rules for interpreting how a measure performs:

Bigger is Better: This means that a higher magnitude for the measure is the desired state (e.g., profit, productivity, revenue and satisfaction).

Nominal is Best: This means that a central tendency (e.g., the average) measure is desirable performance (e.g., dimensional tolerance or on-time delivery).

Smaller is Better: This means that a lower magnitude for the measure is the desired state (e.g., cost, defects, waste, loss, or operator errors).

Thus, a problem statement should indicate the desired direction for targeted performance (increase, control, or reduce) process behavior for the measure.



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194

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PERFORMANCE MEASUREMENT SYSTEMS HAVE DIFFERENT PROBLEMS:

- Problems due to the integrity of the data itself.
- Problems due to the definition of the performance measure.
- Problems due to the lack of objectivity of the observer.
- Problems due to the scale of measurement used for recording.
- Problems due to the averaging of raw data observations.
- Problems due to combination of factors in meaningless ways.
- Problems due to sampling and data management.
- Problems due to fidelity of reporting performance.
- Problems due to simplified reporting of performance results.



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CLASS DISCUSSION SUMMARY:

- How should these measures be defined in your business and how should each one of them be interpreted?

Performance Measure	Bigger is Better	Nominal is Best	Smaller is Better
Quality			
Cost			
Delivery			
Safety			
Motivation			



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Introduction to Quality

Lecture 7: Designing Productive Systems for Working



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196

197

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- Lecture 6: Analyzing Work to Identify Quality Activities
- **Lecture 7: Designing Productive Systems for Working** ←
- Lecture 8: Developing a Quality Mindset



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WHAT IS A PRODUCTIVE SYSTEM?

Productive work systems maximize the value delivered to customers

- Productive systems make an effective, efficient and economical use of the process resources that are allocated to them for developing outcome deliverables.

Productive work systems minimize operational waste, loss and inefficiency

- Productive systems also safeguard against conditions that create economical loss in the process outcomes through ineffective or inefficient activities.
- Excellent processes pursue quality performance: *persistent pursuit of goodness coupled tightly with the relentless avoidance of badness!*



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198

199

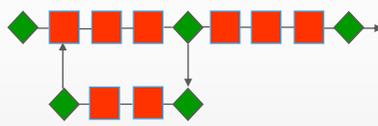
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TWO WAYS TO THINK ABOUT WORK:

Functional View:
 Takes the perspective of the worker performing the actual activities:

Focus on the detailed tasks at hand

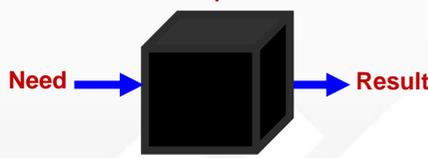


Analyzes the specific set of tasks separately, not as a system!

Internal Detail Emphasis:
 Seeks improvement by concentrating on the tasks people perform.

Process View:
 Takes the perspective of a customer receiving output of actual activities:

Focus on the total experience



Analyzes the deliverable output as a total result from beginning to end!

External Detail Emphasis:
 Seeks improvement by concentrating on an end-to-end experience flow:



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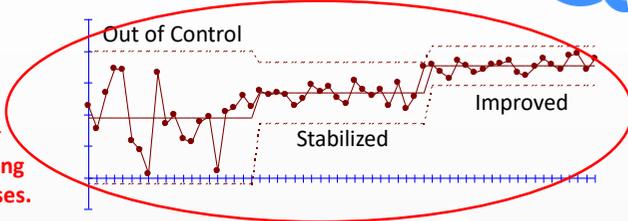
199

200

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THINKING PROCESS FOR CONTINUAL IMPROVEMENT:





Steps toward developing standard work processes.

Process Step

Good or Bad?

Value-Waste Flow –

- What is the ideal state?
- Where is the “Best-of-the-Best” result?
- What can be done to improve results?
- What can be done to make results stable?
- How can results be made consistent?

Non-Value-Waste Flow –

- What is the worst state of the process?
- Where is the “Worst-of-the-Worst” result?
- What can be done to eliminate waste?
- What can be done to reduce losses?
- What can be done to improve efficiency?



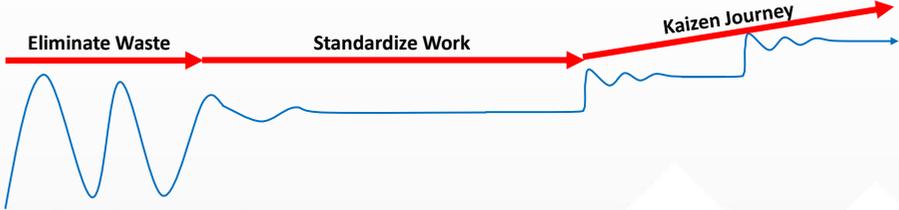
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START BY CREATING STANDARDIZED WORK:
Desired performance outcome from lean implementation:



- Transformation of an organization into a lean enterprise is a long-term objective. The first steps is to eliminate waste in all process areas and to develop a rational process in all operations.
- The second phase of the transformation is to standardize the work and to control the flow of work in response to customer demand.
- The third phase of the transformation focuses on continuing gains through incremental *kaizen* projects that step-by-step close the gap toward performance perfection.


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ELIMINATE WASTE – STANDARDIZE – THEN IMPROVE:

Toyota Rule #1: “All work shall be highly specified as to content, sequence, timing and outcome.” Standard work defines the activities of a Daily Management System.
 ~ Steven Spear and H. Kent Bowen, “Decoding the DNA of Toyota Production System,”
Harvard Business Review, September–October 1999.

Three steps toward assuring excellence in work flows:

- **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 within each of these process to simplify and streamline the work activities by eliminating all of the 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 the bad behaviors discovered in the past.


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HOW TO DISTINGUISH THE CONTRIBUTION OF PROCESS FACTORS?

- **Value adding activities** – work that increase the value of the product or service from the customer’s perspective: testing, diagnosis, treatment, etc.
- **Required non-value adding activities** – work that is necessary for the business, but the customer is not willing to pay extra for it (e.g. admissions, regulatory activities like certification, data entry and report production, invoicing, purchasing of supplies, inventory control, etc.)
- **Non-value adding activities** – work that adds no value to the and is not required for the business operational reasons either: waiting time, delays in service, rework of activities that did not get done right the first time.

All work that uses resources but does not produce value for customers is WASTE. Reducing or eliminating waste is the principal objective in lean improvement activities.



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203

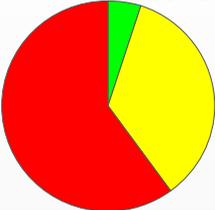
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HOW MUCH VALUE DOES OUR WORK TEND TO PRODUCE?

Typical value breakdown:



Category	Percentage
Value-added work	5%
Non-value-added work [required activities] Necessary waste	35%
Non-value-added work Unnecessary waste	60%

What can be done to manage or reduce the risk that is achieved in these areas of work?

Waste management strategies by type of waste

- Value-adding work – **optimize**
- Required Non-value-adding work – **minimize**
- Non-value-adding work – **eliminate**

How does your process create waste?



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WHAT CAN GO WRONG IN A PROCESS?

Things gone wrong make processes no longer “Lean” or able to operate at their highest level of performance capability.

- **Waste:** any thing that is worthless, defective or redundant; something that is used carelessly, squandered, or without an adequate return; or an item that is no longer of use or unwanted. Examples: wasted time, money, resources. Any excess that exists without providing value.
- **Loss:** a failure to maintain inherent or original value (i.e., costs that are in excess of planned cost).
- **Inefficiency:** an inability to do something with the desired economy of means (e.g., process throughput in excess of the planned time).



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206

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ELIMINATE WASTE FROM THE CUSTOMER'S PERSPECTIVE:

The primary focus of a lean enterprise is to identify and eliminate waste in all areas of its work.

<p><u>Basic categories of waste:</u></p> <ol style="list-style-type: none"> 1. Overproduction 2. Waiting or idle time 3. Transportation time 4. Over-processing 5. Inventory 6. Unnecessary motion 7. Defective parts/products 8. Underutilized people 	<p><u>Common concerns about waste:</u></p> <ul style="list-style-type: none"> • Wasted energy • Pollution • Wasted space • Delays in provision of service • Incorrect inventory • Data without integrity • Duplication of effort • Unnecessary meetings
--	---

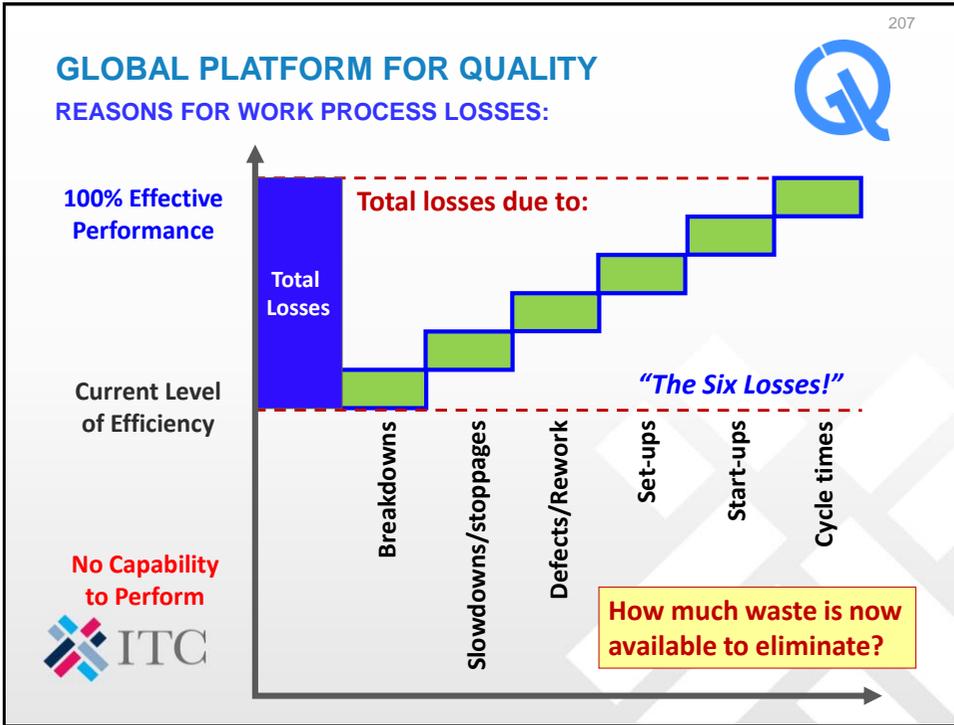
What other types of “muda” can you detect in your work place?

“The most dangerous kind of waste is the waste that you do not recognize.”
~ Japanese saying.



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207

208

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Term	Definition	Example
Breakdown	Equipment broken	Liquid filling machine clogged
Slowdown	Process not at right speed	Machine working slower than optimal
Stoppage	Process Work stops	Process stops for adjustments
Setup	Prepare machine to work	Time to arrange readiness to work
Startup	Assure right process output	Time to adjust work throughput
Defect	Wrong quality level of work	Work that is not done to specification
Rework	Time correcting poor quality	Correcting defective work
Cycle Time	Inefficient use of working time	Operating time of a work system

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208

209

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WASTE NAMING EXERCISE – IDENTIFY YOUR PROCESS WASTE:



Waste Category	Example 1	Example 2	Example 3
Inventory			
Transportation or Movement			
Motion			
Waiting			
Overproduction			
Over-processing			
Defects			
Underutilized people			

What types of waste can you identify in your work?




209

210

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UNDERSTANDING THE WORK FLOWS OF VALUE AND WASTE:

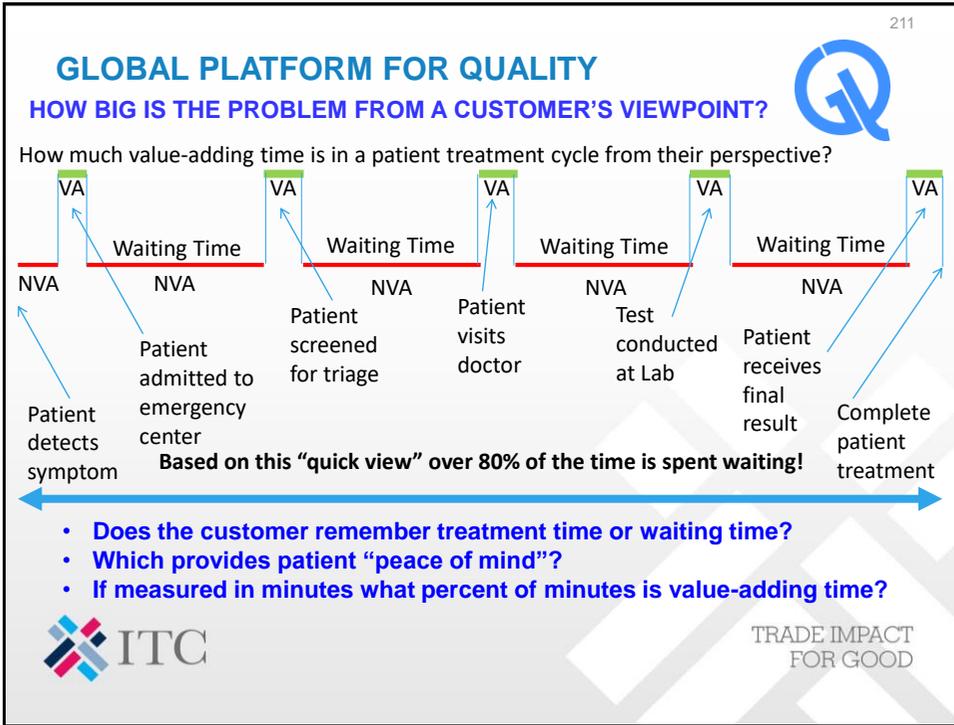


Understanding the Flow of Value = The Value Stream:

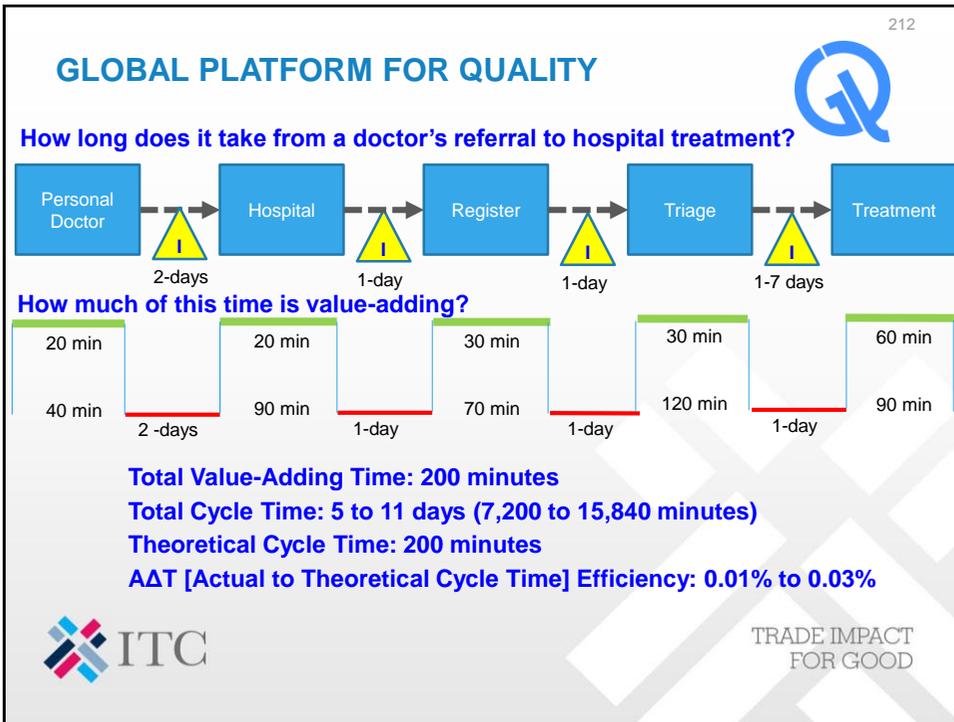
- Value streams refer to any series of steps that create a valuable product or deliver a valuable service. The way to improve value streams is to reduce waste and to create a process that flows to a valuable output.
- In healthcare, a value stream would technically be something such as oncology care or asthma care, and the stream would track care from beginning to end both inside and outside the hospital. Many systems interact to provide this care.
- The more complex a healthcare system, the more difficult it is to understand what are the interactions between individual elements and to identify waste in a value stream. Waste hides in complexity. By focusing on the value of adding each step into a process, such as giving the correct medicine at the correct time, we can focus on improving and reducing the wasteful steps in the process.




210



211



212

213

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NOW ESTIMATE THIS FOR A PROCESS THAT YOU UNDERSTAND:

Process Step	Value-Adding Time	Non-Value-Adding Time

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Introduction to Quality

Lecture 8: Developing a Quality Mindset

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214

215

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WHAT CHARACTERIZES A QUALITY MINDSET?

EMPHASIS ON PERFORMANCE TO REQUIREMENTS OF CUSTOMERS:

- Quality is evaluated by the customer – the individual who receives the goods or services of an organization or sole proprietorship. Thus performance against the expectations or requirements of a customer must be the starting point in designing and delivering quality.

EMPHASIS ON CONTINUAL IMPROVEMENT FOR COMPETITIVENESS:

- Customers tend to inflate their expectations and desires over time; therefore, it is important to consistently review their changing needs and improve the conditions of business to meet (or exceed) those needs relative to other offerings that could be considered by the customer – relative to one's competitive positioning.
- Continual improvement of performance is essential to remain viable in competing markets – a quality mindset seeks to regularly make “cycles of improvement” in the way that it addresses customers and delivers its goods and services.



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QUALITY MUST BE EMBEDDED IN EACH EMPLOYEE'S ATTITUDE:

Business structures like job design, organizational culture, and the guidance and encouragement of leaders must be orchestrated to reinforce a worker commitment to quality through collaboration in a teamwork environment to build a competitive organization.

- Organizational psychology deals with the way that people are treated to become a valuable contributor to the success of the entire organization. This must be based on an understanding of how to motivate people and encourage them to commit to the shared objectives because they see them as mutually beneficial (remember the Process of Management?).

Human motivation is achieved through dedicated management action:

- The model for leaders to follow in an organization emphasizes coordinated work to engage each participant in discovering how they make a difference.



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218

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“Motivation is stimulating an employee's desire to work!”

INDIVIDUAL MOTIVATION ENABLES PARTICIPATION IN TEAMWORK:

```

    graph LR
      A[Understanding of humanity] --> B[Self-control]
      B --> C[Improved Ability]
      C --> D[Participation]
      D --> E[Keen Interest in others work]
      E --> F[Teamwork]
      G[Improvement of Job Design] --> B
      H[Leadership] --> I[Guidance and Encouragement from Superiors]
      I --> B
  
```

Design of Standard Work (points to Improvement of Job Design)

Self-control is the critical leverage point! (points to Self-control)

Leadership is the driver of motivation! (points to Leadership)

Role of the Supervisor (points to Guidance and Encouragement from Superiors)

In Japan, leadership enables followership.



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219

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CLASS DISCUSSION SUMMARY:

- What must business leaders do to create a work environment that motivates their employees to deliver quality results to customers?

System Elements in the Analysis of Work Activities for Motivation	Human Elements in the Analysis of Work Activities for Motivation




219

220

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UNDERSTANDING HOW WASTE IS PRODUCED:

What is waste? Waste is any activity that adds cost or time, and does not add value or that increases risk to employees through hazardous work conditions.

Waste of all resources represents poor management responsibility!

Japanese quality teachers use three words to describe waste:

- Muri (無理):** No waste from bad thinking – irrational waste.
This type of waste arises from poor decision-making.
- Mura (無斑):** No waste from unbalanced working – flow waste.
This type of waste arises from poor integration.
- Muda (無駄):** No waste in work discipline – process waste.
This type of waste arises from poor operations.

Each of these wastes may occur at any level of an organization!




220

221

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THE SEVEN “ZERO’S” AIM TO ELIMINATE THE SEVEN WASTES:

Goal-directed emphasis in the Toyota daily management system:

1. **Zero Defects:** To avoid delays due to defects (quality at the source)
2. **Zero (Excess) Lot Size:** To avoid “waiting inventory” delays (usually stated as a *lot size of one.*)
3. **Zero Setups:** To minimize setup delay and facilitate small lot sizes.
4. **Zero Breakdowns:** To avoid stopping tightly coupled line.
5. **Zero (Excess) Handling:** To promote flow of parts.
6. **Zero Lead Time:** To ensure rapid replenishment of parts (very close to the core of the zero inventories objective).
7. **Zero Surging:** Necessary in system without major WIP buffers.



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221

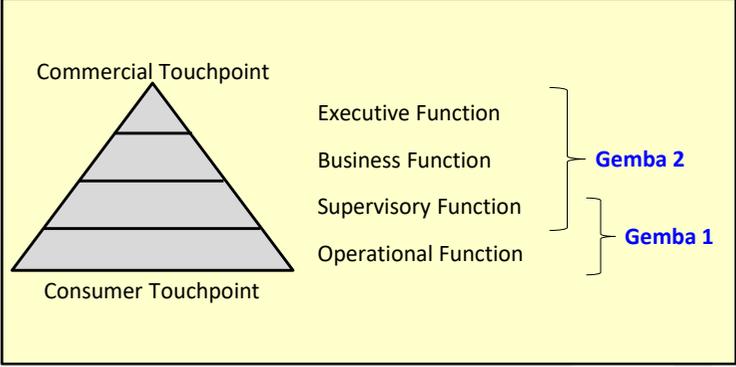
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THERE ARE TWO DISTINCT WAYS OF UNDERSTANDING WORK:

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



The diagram shows a pyramid with four levels. The top level is labeled 'Commercial Touchpoint' and the bottom level is 'Consumer Touchpoint'. To the right of the pyramid, four functional levels are listed: 'Executive Function', 'Business Function', 'Supervisory Function', and 'Operational Function'. A bracket groups the top two levels (Executive and Business) as 'Gemba 2'. Another bracket groups the bottom two levels (Supervisory and Operational) as 'Gemba 1'.

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



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223

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WHAT IS THE MEANING OF THE JAPANESE WORD “GEMBA”?



5W + 1 H QUESTIONS: **ANSWERS:** ***Gemba*** (現場)

What happened? → Survey – conduct a detailed scrutiny

Who was there? → The King – executive function

When did it happen? → At Sunset – end of working period

Where did it happen? → At the point of doing the real work

Why did it happen? → To understand the real thing

How did it happen? → Personal activity required to notice



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TOYOTA ELIMINATES WASTE, LOSS AND INEFFICIENCY IN DAILY WORK:

Lean enterprise management tends to focus its improvement activities on the work done in Gemba 1 where physical activities drive performance outcomes and create waste.

All three types of waste can occur in either Gemba 1 or Gemba 2; however, ***if muri waste originates in Gemba 2 then it is most likely to produce a mura waste condition across Gemba 1 that generates muda waste within Gemba 1 which the workers are unable to eliminate.***

Reliance on the process does to eliminate muda in Gemba 1 cannot address all of the types of waste, loss and inefficiency inherent in organizations. This can lead to overoptimistic assessments of potential outcomes available and may create significant mistakes that can be avoided by a broader perspective in application of lean methods integrating an approach that addresses both Gemba 1 and 2.



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225

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WHAT DO JAPANESE BUSINESS LEADERS ACTUALLY DO?

Genchi genbutsu (現地現物) – go and see!

Go to the real place and observe the **“actual entity”** or the **“ding an sich”** (thing itself) in order to understand the real thing that is happening based on the real facts and learn what will bring the state of performance back into control. This approach follows the “five G’s” or “five real’s” of Japanese management:

- Gemba (現場) – the real place**
- Genbutsu (現物) – the real thing**
- Genjitsu (現術) – the real facts**
- Genri (原理) – the real reason**
- Gensoku (原則) – real control**

Is the gemba visible (e.g., a human system) or is it an invisible system (e.g., like an information intensive system)? When managers of an invisible system observe the visual systems they do so with a different set of eyes and they will interpret it using a very different language – money!



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225

226

GLOBAL PLATFORM FOR QUALITY

UNDERSTANDING DELEGATION OF MANDATED PROJECTS:

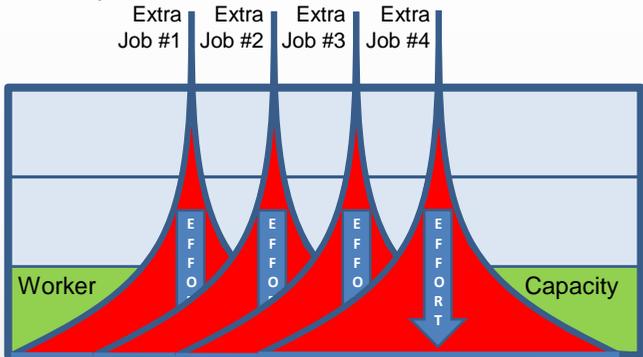
PRINCIPLE: Work expands to saturate the time that is available.

Level of Control

Executive

Function

Process



Level of Activity

Program

Project

Tasks

RESULT: Assigning mandatory work of low personal value will displace substantive work of high value and thereby create friction, an overload condition on worker capacity and then personal frustration, thereby reducing efficiency.



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226

227

GLOBAL PLATFORM FOR QUALITY



EMPLOYEE CAPACITY TO WORK IS NOT UNLIMITED!

The primary focus of a lean enterprise is to identify and eliminate waste in all areas of its work – whose job is it to eliminate which waste?

How is work load managed in your organization?

Level of Control	How is work load managed in your organization?		Categories of Waste
Executive	Organizational Direction		Muri
Function	Organizational Coordination		Mura
Process	Worker	Value-Adding Work	Muda
		Capacity	




227

228

GLOBAL PLATFORM FOR QUALITY



INTEGRATING THESE TWO GEMBA MANAGEMENT SYSTEMS:

“Insufficient work standardization and rationalization create waste (muda), inconsistency (mura), and unreasonableness (muri) in work procedures and work hours that will eventually lead to the production of defective products.”
 ~ Taiichi Ohno

Toyota integrates two management systems into a management system called the Toyota Production System: (1) Quality Management System objective is to reduce waste, and (2) Cost Management System objective is to reduce cost.

Within this management system time is a proxy measure for cost and quality as any increase in production throughput time will be due to quality-related problems and the effect of the problem will be an increase transaction cost.

Corporate-wide improvement projects are managed cross-functionally, so they are coordinated for planning and implementation. Improvement projects are aimed at increasing the effectiveness (throughput), efficiency (cycle time) and economy (cost of transactions) of the daily management system.

Thus, lowly work standards are the critical control mechanism for quality!




228

229

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CLASS DISCUSSION SUMMARY:

- What activities occur in your organization that are characteristic of Gemba 1 and Gemba 2?

Gemba 1 – Workplace Activities	Gemba 2 – Leadership Activities




229

230

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OVERCOMING INERTIA IN WORKING SYSTEMS:

- Harvard business professor Dorothy A. Leonard described a circumstance whereby **traditional sources of the core capabilities of a firm** (e.g., **technical systems**, **personnel skills and competence**, and **management systems**) result in the creation of a dysfunctional state, called “core rigidity,” where the organization’s innovation becomes restricted by a state of “inertia.”
- To overcome this situation, a fourth dimension of capability must be considered: **organizational values and norms**. Behavioral factors can enhance new product development to create distinct core capability that responds to markets in more flexible ways to link psychological factors with the need for dynamics in organizational response to the changing market dynamics from technical and business risks.

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




230

231

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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
<ul style="list-style-type: none"> • Inhibitive • Mechanistic • Mindless • Static • Risk-avoiding • Closed • Collusive • Opaque 	<ul style="list-style-type: none"> • Innovative • Adaptive • Mindful • Dynamic • Risk-embracing • Open • Accountable • 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.




231

232

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CLASS DISCUSSION SUMMARY:

- What activities in your organization create core rigidity and core flexibility?

Activities Creating Core Rigidity	Activities Creating Core Flexibility




232

233

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DEVELOPING “OWNERSHIP” AT ALL WORKING LEVELS:

Ji Kotei Kanketsu (JKK) (自工程完結) is a concept for process ownership by workers which is supported by related concepts of daily management and the assignment of decision rights to workers for stopping production to assure that poor quality is not passed on to the next step in the process.

- JKK also engages workers in their responsibility for seeking the continual improvement of standard work.
 - However, JKK also relates to supervisors and managers.
 - Supervisor JKK takes responsibility for integrated work flows.
 - Managerial JKK takes responsibility for developing a system of adequate resources and assuring that the system can operate effectively, efficiently and economically.
- These activities are managed through a “system of kanri” using the method of hoshin kanri for identifying and deploying strategic change projects.



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234

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DEFINING THE BASIC RESPONSIBILITIES OF WORKERS:

Become an ‘efficient’ and ‘effective’ and ‘economic’ process DOER!

What is the responsibility of the worker?

- Learn how to perform own work to the level required for standard work.
- Expand work scope to the conduct of work in adjacent working areas.
- Perform work according to the standard requirements.
- Check the quality of incoming process deliverables and check quality of their own work activities.
- Improve the efficiency of own work performance.
- Increase the integration of own work with the system of performance.
- Suggest system-level improvements that could increase effectiveness or efficiency of work processes (beyond group’s scope of action).



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DEFINING THE RESPONSIBILITIES OF WORK SUPERVISORS:
Being an 'efficient' and 'effective' and 'economic' process OWNER!

What is the responsibility of the supervisory function?

- Document process activities as standard work for flow and failure risk.
- Train the workers in performance of standard work and problem solving.
- Monitor process throughput for flow efficiency and task performance.
- Check worker performance against standard work requirements.
- Facilitate problem solving team activities with workers.
- Assure workflow balance and equity of operator tasking.
- Solicit task improvement ideas from workers.
- Conduct small-scale experiments to improve process performance.
- Recommend system-level performance improvements to management.
- Participate in system-level performance improvement projects.



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236

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EVERYONE HAS AN OBLIGATION TO IMPROVE THEIR OWN WORK:

Organization Level	Objective	Quality Emphasis	Waste Emphasis
Senior Executives	Agility	Policy	<i>Muri</i>
Cross-Functional Management	Harmony	Flow	<i>Mura</i>
Front-Line Workers	Discipline	Perfection	<i>Muda</i>

Guiding Principles

↓

Methods

↓

Activities and Tools

Areas of Emphasis for Improvement:

Workers: Mistake-proofing standard work and reducing the seven wastes

Managers: Managing improvement experiments and streamlining the seven flows

Executives: Directing strategic change and assuring long-term financial strength



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DESIGNING A MORE COLLABORATIVE WORKPLACE:



Jishuken (自主権):

- Management driven *kaizen* activity to identify areas needing improvement and spread information through the organization to stimulate *kaizen* activity.
- The literal meaning of *jishuken* is “**a fresh set of eyes**” (implying autonomy) which suggests that sometimes workers may be too close to a problem and this keeps them from seeing what is wrong in a process – they have become accustomed to waste, so it no longer appears as waste to them. Using autonomous study groups to conduct an inquiry into problems provides “fresh eyes” for those who are doing work in a daily management system. If a company assists a supplier to correct a problem, this is also a *jishuken* team.

Jishu kanri (自主管理):

- *Jishu kanri* literally means “**self mastery management system**” where the meaning implies that “every worker is an inspector.” This term applies to independent, self-regulated or autonomous work management, voluntary participation, and work self-control systems in Japanese companies. Work is conducted in *jishuken* teams, supported by human resource practices as information sharing, job rotation, employment security, and profit sharing.




237

238

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EVERYONE HAS AN OBLIGATION TO IMPROVE THE SYSTEM:



Organization Level	Improvement Projects	Competence Areas to Develop
Senior Executives	<i>Hoshin Kanri</i>	Presidential Review S-7 Strategic Methods Cross-Functional Teams Master Black Belt for Advisors
Cross-Functional Management	<i>Kaizen Kanri</i> <i>Hinshitsu Kanri</i>	<i>Gemba</i> Walk 5-S for Managers Project Teams Black Belt for Process Leaders
Front-Line Workers	<i>Nichijo Kanri</i> <i>Hinshitsu Kanri</i>	Self-Inspection 5-S for Workers Quality Circles Green Belt for Supervisors

Areas of Required Competence:

Workers: Problem-Solving & Teamwork
Managers: Process Improvement & Project Management
Executives: Strategic Focus & Change Management

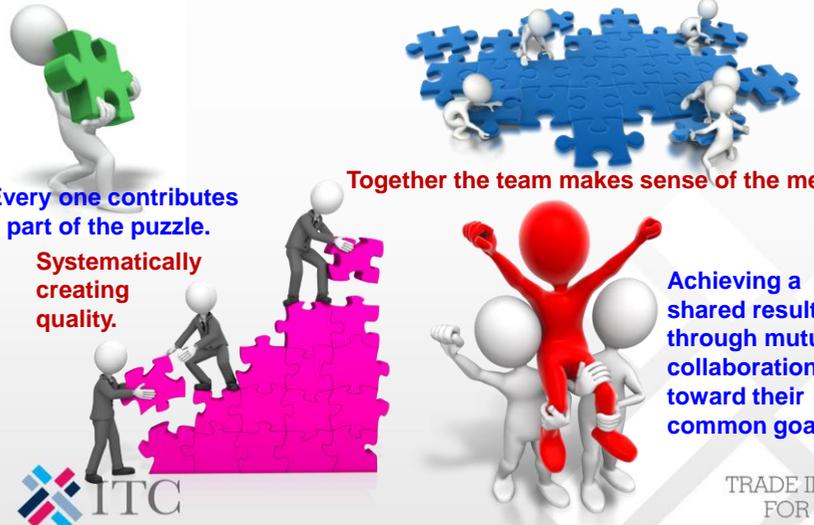



238

239

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HUMAN ASPECT OF QUALITY COORDINATES GROUP WORK:



Every one contributes a part of the puzzle.
Systematically creating quality.

Together the team makes sense of the mess.

Achieving a shared result through mutual collaboration toward their common goal.



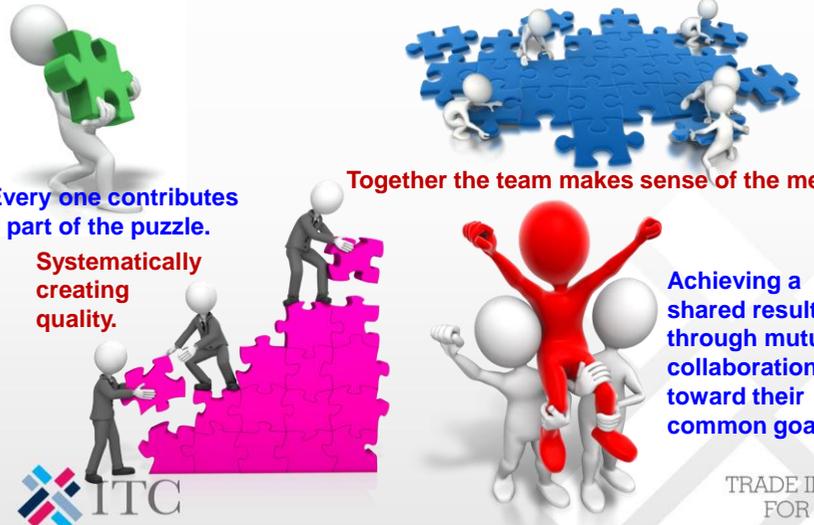
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240

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DISSECTING THE QUALITY MINDSET INTO ACTIONABLE COMPONENTS:



STANDARDS-FOCUSED QUALITY ACTIONS:

- **QUALITY ASSURANCE:** maintaining minimal acceptable performance
- **QUALITY CONTROL:** assuring targeted performance

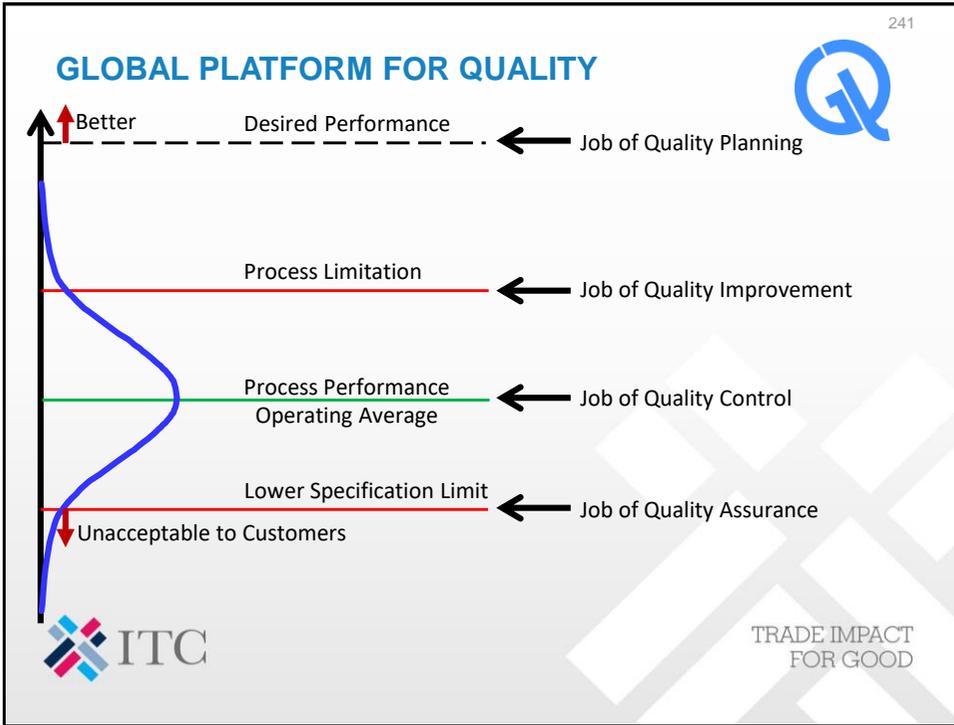
IMPROVEMENT-ORIENTED QUALITY ACTIONS:

- **QUALITY IMPROVEMENT:** stretching toward known performance limits
- **QUALITY PLANNING:** creating new possibilities and going beyond



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241

242

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CLASS DISCUSSION SUMMARY:

- How should managers work to achieve quality based on your understanding of the four dimensions of quality that were described? What could be their specific actions?

Quality Dimension	What should be done to achieve quality?
Quality Assurance	
Quality Control	
Quality Improvement	
Quality Planning	

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OPERATIONALLY DEFINING QUALITY MANAGEMENT



Taking a systems approach to quality management:

Quality Assurance +

Quality Control +

Quality Improvement =

Quality Management



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OPERATIONALLY DEFINING QUALITY DEVELOPMENT



Forging a pathway toward the future of quality:

Quality Planning +

Breakthrough Improvement +

Quality by Design =

Quality Development



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OPERATIONALLY DEFINING LEADERSHIP THROUGH QUALITY

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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WHAT OBJECTIVES DO THESE QUALITY SYSTEM ELEMENTS HAVE?

Quality Phase	Desired Performance Outcome
Quality Management	Establish trade access to markets.
Quality Development	Create market competitive advantage
Quality Culture	} Sustain enduring business success.
Leadership through Quality	



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247

GLOBAL PLATFORM FOR QUALITY
HOW TO DESIGN SCIENTIFIC LEADERSHIP?

Design organizations as productive systems for quality products:

Technical System
Knowledge System
Human System

Productive System

Certify the System
Qualify the Deliverables

Design Quality into all Processes **Design Quality into all Products**

247

248

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CLASS DISCUSSION SUMMARY:

- Quality professionals drive quality performance in their organization and act as the designer and developer of the mental models that advance quality. Considering all four levels presented in these models: what specifically is your role in each phase?

Quality Phase	What is the role of the Quality Professional?
Quality Management	
Quality Development	
Quality Culture	
Leadership through Quality	

248

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Thank you for your participation!



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249



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Global Platform for Quality

Standardizing Work

Instructor: Gregory H. Watson, PhD, EUR Ing



1

2

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QUALITY 202: STANDARDIZING WORK

The first step in the improvement journey is to assure that products or services can be produced consistently according to an external standard of performance. Joseph M. Juran said: "Without a standard there is no basis for improvement." This course has four modules which make concepts of quality more practical:

- (1) Understanding work as a process and the ability to map work flows as processes that can be tracked based on time spent in individual activities;
- (2) Identifying waste within processes and focusing on measurement of process activities to discover location of wastes that could be eliminated using "lean" methods;
- (3) Developing standard work including written standard operating procedures, job analyses, work instructions and cross-functional procedures; and
- (4) Defining the quality system that enables maintenance of the standard.

This course will enable the design and commencement of a management implementation plan to pursue quality system certification to the ISO 9001:2015 standard.



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EDUCATIONAL PROGRAM – STANDARDIZING WORK:

- **Lecture 1: Understanding Work as a Process** ←
- Lecture 2: Identifying Waste, Loss and Inefficiency in Work
- Lecture 3: Developing Standard Work
- Lecture 4: Defining a System to Maintain Standard Work



3

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Standardizing Work

Lecture 1: Understanding Work as Process



4

5

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WHAT HAVE WE LEARNED SO FAR?

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

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

Improving work requires an objective way to evaluate opportunities to improve:

- Statistical Thinking provides the approach to achieve objectivity in analyzing 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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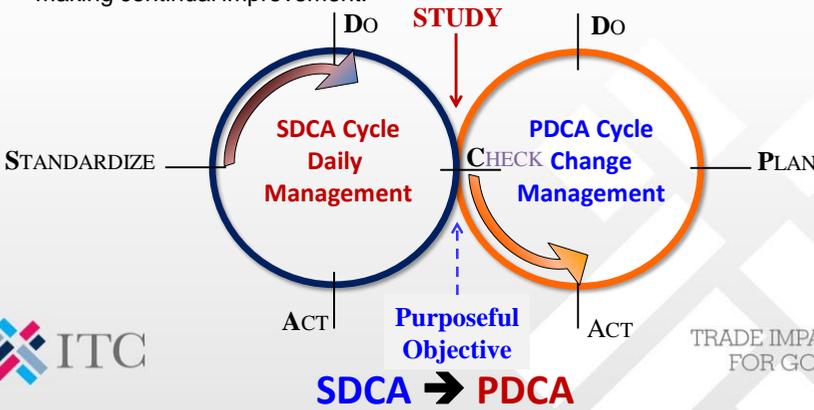
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How is standard work part of the improvement process?

- What does the following quotation mean to you?
“Without a standard there can be no improvement.”
 ~ Joseph M. Juran
- Japanese lean methods begin with standardization and then move toward making continual improvement:



SDCA → PDCA



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MOVING FROM OUT OF CONTROL (OOC) TO IMPROVEMENT:

Steps toward developing standard work processes.



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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 the activities of 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 within each of these process to simplify and streamline the work activities by eliminating all of the 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 the bad behaviors discovered in the past.



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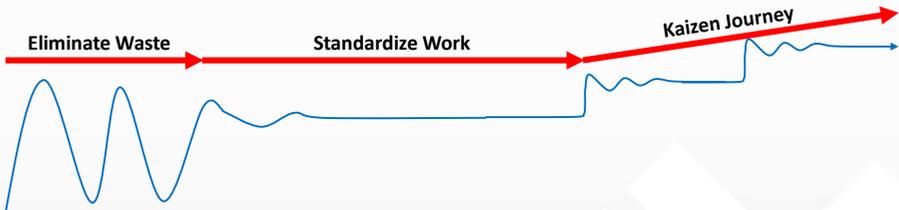
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9

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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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10

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Why is standard work important to assure quality outcomes?

Standard work defines the best practice for performing a production activity and is implemented in a way that assures that all employees can do the work in order to deliver value to their customers.

Standard Work:

- Standard work provides a detailed definition of the **most efficient method** to produce a product (or perform a service) at a balanced flow to achieve a desired output rate. It breaks down work into elements, which are sequenced, organized and repeatedly followed. Standard work should be able to produce the required product demand at the lowest total cost and with minimal delay and defects.
- Standard work must be updated into **scientifically tested work elements** so that when it performs better than the old standard improvements can be substituted for the old work standards for continual improvement of work.
- Workers must be: **trained in tasks required; provided adequate tools, methods, and equipment to perform their tasks; permitted decision rights to regulate the performance** to assure that targets for output are achieved and maintained for requirements of cycle time, takt time, and standards for Work-in-Process.



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11

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CLASS DISCUSSION SUMMARY:

- Identify a particular aspect of standard work in a process of your choice using six of the “7 M’s” to categorize tasks and discuss what can be done to improve work:

The “6 M’s”	Standard Work Element	Opportunities to Improve
Material		
Method		
Measurement		
Mother Nature		
Machinery		
Manpower		
Money		



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12

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WHAT DO WE MEAN BY A “STANDARD” FOR WORKING?



Standard Work Documents

- Standard Operating Procedures

- Work that cuts across people or covers a sequence of activities.
- Work Instructions

- Work that defines the sequence of steps and detailed actions of an individual and their tasks.
- Job Aids

- Tools that serve to guide or help remind workers of the details of their daily work.
- Inspection & Test Procedures

- Specific steps required to carry out a deliverable test and record the results for assessing quality.
- Quality Criteria for Assessment

- Criteria for evaluating goodness of work deliverables – pictorial or photographic - defining the boundaries of acceptability.



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12

13

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HOW CAN STANDARD WORK BE STRUCTURED?



Standard Operating Procedures (SOP): Written procedures that define the standard work to be performed.

Work Area Boundary Markings: Visual lines that indicate the flow of work or boundary areas that are reserved for special equipment or work areas.

Identification Methods: Marking or color codes placed on the instruments used in standard work to identify where the instrument is used and what is its proper storage location.

Kanban Inventory Management: Workplace methods for the control of inventory and assurance that standard supplies or parts are available when and where they are needed.

Work Status Boards: Current status boards that inform work team members of information that is necessary for routine conduct of the daily management system.



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14

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HOW DO YOU DEVELOP A STANDARD OPERATING PROCEDURE?



1. Establish an improvement team
2. Determine the takt time for your process
3. Calculate the cycle time.
4. Specify the sequence of operations
5. Determine the standard quantity of the work in process
6. Map the value stream of the process
7. Eliminate work process waste (e.g., non-value-adding work), constrain the conditions that create process losses, and minimize inefficiency in process activities.
8. Prepare a standard operations sheet to define the content of the standard work required (specifying all the tasks, tools, performance standards, work procedures and safety cautions)
9. Continuously improve process performance



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15

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What elements in a hospital system are subject to identification?

Some of the elements within a hospital that have unique identification:

- Patient identification
- Medical records identification
- Medicine identification
- Surgery kit identification
- Anesthetic identification
- Blood type identification
- Human and artificial organs
- Hazard and safety identification
- Equipment calibration identification

What is the best way to uniquely identify these items?

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What means can be used to identify tools and equipment?

- Visual placement of tools and equipment: location of the most frequently used equipment should be at the point of use and in line of sight of the tool user.
- Tool identification color tabs or tactile markers: identify tools or equipment using color code or tactile markets (e.g., Braille) to identify where they belong.
- Stencils to outline the shape of tools: apply stencils that mark a positive outline for specific locations of equipment or tools in the work area.
- Carts for movement of standardized toolkits (e.g., medical use of a “crash cart” for “Code Blue” response).
- Standardized packaging for “consumable tools” (e.g., kits of surgical instruments for dedicated medical procedures).
- Shadow board for mounting permanent tools and equipment (e.g., location of emergency equipment in a hospital ward).
- Inventory of items included in the card or shadow board.

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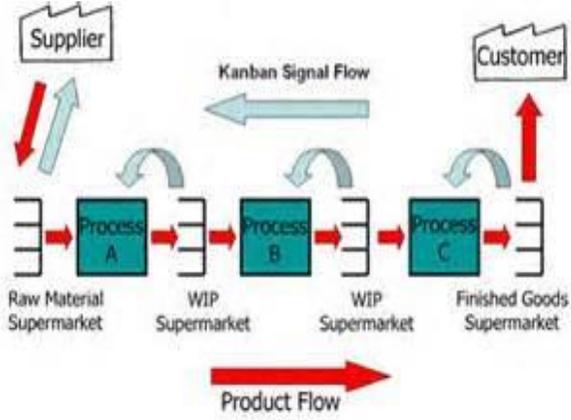
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17

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Kanban systems are signs used to help facilitate flow in a process:



- Kanban mechanisms may be either manual (e.g., use a card system or rotation of containers to signal the authorization for pull of parts through the supply chain) or electronically (using an info system to manage the flow of the materials).
- Kanban mechanisms are operated in the same way a “withdrawal kanban” is operated within a factory.
- In a withdrawal kanban a signal specifies type and quantity of product that the downstream process may withdraw.

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17

18

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Kanban systems are signs used to help facilitate flow in a process:

- Kanban queues create a “pull signal” that move items through a work process: moving patients through a diagnostic pathway or inventory to the point of use. Kanban management can be either a visual system or designed electronically to manage the flow through a system.
- Kanban systems may be supplemented by “status boards” that show the current state of the flow at a particular location or by Andon signals (e.g., like traffic lights) that indicate the overall state of performance at particular location (e.g., green means the flow is within control, amber or yellow indicates that the flow is off the desired takt time/cycle time, while red indicates that the flow has halted).
- Kanban systems may also signal actions by workers (e.g., the arrival of a requisition triggers a purchase order, the depletion of a box signals an order for replacement material, etc.).



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19

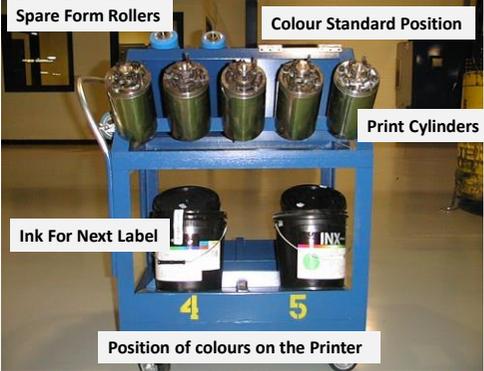
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Examples of Kanban Systems:



Organizing the flow of the working material and supplies so that it is always available when the work is being done – at the right time in the right location – at the right quantity.





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Poke Yoke – the Japanese art of mistake-proofing work processes:

- Mistake-proofing begins by examining risk and hazards that exist in work processes. Mistakes that can occur based upon human action that is unplanned need to be safeguarded from happening.
- The strategy to accomplish this is to first eliminate any chance of the mistake occurring by making the process robust so that it will not create the mistake conditions.
- If this is not possible, then the next step should be to take any action that would reduce the probability that the mistake can occur. If this doesn't work then take action to reduce the level of severity of the outcome from the mistake. Finally, if this is not possible, then a warning or caution about the impending mistake's consequence should be given.



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Examples of Mistake-Proofing:








Establishing order in the way work is organized so that everything has a place and everything necessary is in its place when work is commenced.

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Examples of mistake-proofing in medical applications:

- Attaching an identity bracelet to each patient to assure there is a positive identification.
- Checking the identity of each patient before they receive their daily medicines.
- Segregating dangerous medicines from more routine ones (e.g., narcotics and opioids).
- Creating child-proof bottles in which to store medicines.
- Placing a mark on the part of a body that is to receive an operation to assure that there is no confusion.
- Placing the patient identification on radiological pictures to relate the images to the patient.
- Using "tattoo" marks as aim points for alignment of a linear accelerator radiation beams.



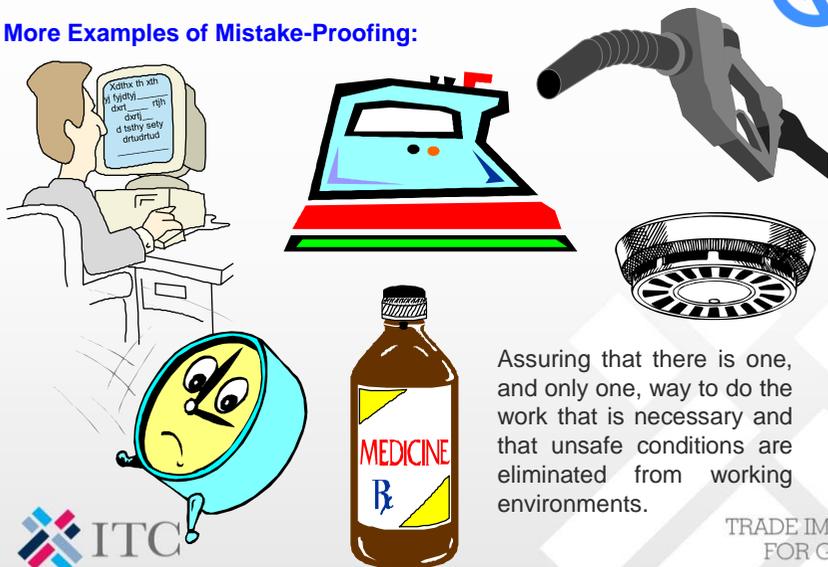
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More Examples of Mistake-Proofing:



Assuring that there is one, and only one, way to do the work that is necessary and that unsafe conditions are eliminated from working environments.

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24

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How can a status board be used to aid in routine management?

- Status boards can illustrate the tasks required for daily work and their priorities (e.g., what needs to be accomplished on what schedule).
- Status boards can be used to show the progress that is being made in longer-term areas (e.g., patient recovery).
- Status boards can be used to show performance trends in the way work processes have been operating (e.g., measures that are accumulated over time – infection rate by ward, local bed occupancy rate, etc.).
- Status boards can be used for assigning personnel (e.g., who will work on what shift, have vacations when, or assigned to which work station).
- Status boards can be used to describe the progress of long-term improvement projects.

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25

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Examples of a Status Board:



Quality Promotion Status Board

Communicating status and progress about the ways teams are operating to develop success in their daily management system and results achieved there are two types of communication used:

(1) Promotional Status Boards which show summary information about events, targets and team and employee recognition for achievements and projects and (2) Work Status Boards which show the exact status of work-in-progress and required actions.



PÄIVITTÄISJOHTAMINEN / OPERATIVE DAILY MANAGEMENT						
PITS9						
Connections	Sales Order	Target	Employees	Status	Problems	Comments
1	1234HG300 6/6 - 123	21.12.2017	A. Asentaja	●		
2	234HG301	27.12.2017	S. Säästäjä	●		Säästäjä tekee kyttemöitä ov. 27.12.
3	345HG300 6/6 - 234	27.12.2017		●	Muutos kytkentäsuunnitelmaan. Odotetaan vahvistusta	Jatketaan ehkä 28.12. Valmis 29.12.
Main Assembly	Sales Order	Target	Employees	Status	Problems	Comments
1	123HG300 6/6 - 124	22.12.2017	A. Asentaja	●		A.A. tekee myös kokoonpanon.
2	456HG300 6/6 - 456	29.12.2018		●	Välitietelo suunniteltu uudestaan, TA 2.1.2018	
3	456HG300 6/6 - 457	29.12.2018		●	Välitietelo suunniteltu uudestaan, TA 2.1.2018	
4	123HG302	3.1.2018	S.Säästäjä	●		S.S. turtaa erikokojen päättämiskäytön.
5	234HG303	4.1.2018		●		
6	567HG300	20.12.2017	P. Elämies	●		
7						

Work Status Board



26

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CLASS DISCUSSION SUMMARY:

- Lean methods simplify work and increase work standardization.
- What methods that we have discussed so far will help to improve efficiency at both the worker level and at the supervisor level in the organization processes your team has been discussing? Are some methods more appropriate for workers or supervisors?

Lean Methods for Workers	Lean Methods for Supervisors





Global Platform for Quality

Standardizing Work

Lecture 2: Identifying Waste, Loss and Inefficiency in Work




27

28

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EDUCATIONAL PROGRAM – STANDARDIZING WORK:

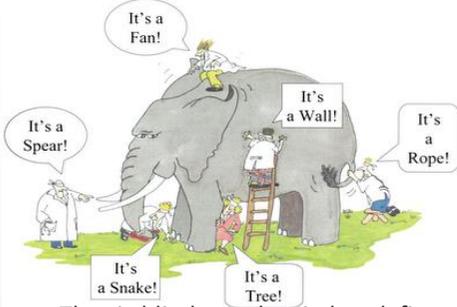
- Lecture 1: Understanding Work as a Process
- **Lecture 2: Identifying Waste, Loss and Inefficiency in Work** ←
- Lecture 3: Developing Standard Work
- Lecture 4: Defining a System to Maintain Standard Work




28

29

GLOBAL PLATFORM FOR QUALITY

What happens when six blind men try to describe their experience of an elephant?

- The six blind people tried to define an elephant just by using their personal experience with only a single aspect or part. They never obtained a holistic understanding of the meaning of the elephant!
- Productive systems are more than the tools and methods – they are a **system for coordinating work** into a collaborative enterprise that is focused on the process to deliver content and it is connected by the flow of its work directly to the demand of customers.



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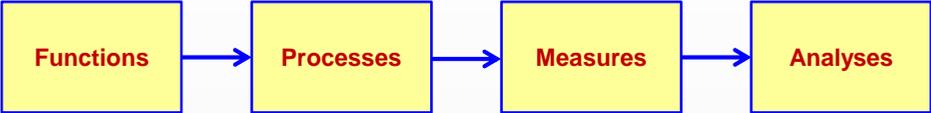
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30

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ELEMENTS IN AN END-TO-END FLOW OF WORK ACTIVITIES:



```

graph LR
    A[Functions] --> B[Processes]
    B --> C[Measures]
    C --> D[Analyses]
  
```

Functions

- Productive systems are composed of different functions that organize work.

Processes

- Functions execute processes in order to accomplish the objectives of work.

Measures

- Process performance can be measured and recorded to manage progress of work.

Analyses

- Analyses of performance measures can indicate opportunities for improvement.



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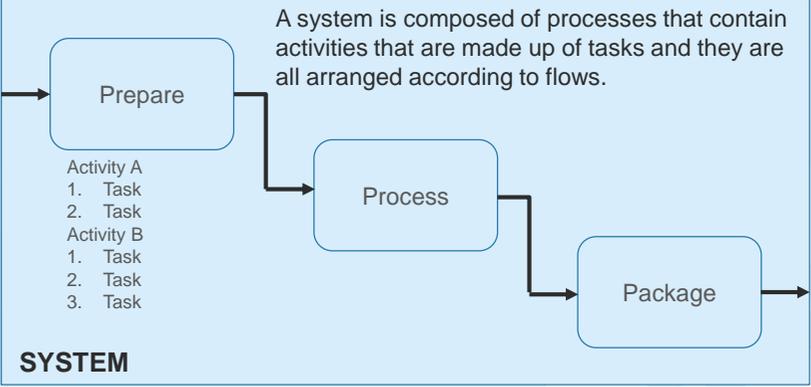
31

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A SYSTEM IS A SET OF PROCESSES CONNECTED BY A SEQUENCE OF FLOW:

A system is composed of processes that contain activities that are made up of tasks and they are all arranged according to flows.



SYSTEM


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32

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WHAT FLOWS IN A SYSTEM?

Movement occurs in many ways – the 7 flows in a system of work processes:

- 1. Physical Flow:** Material, parts and sub-assemblies
- 2. Asset Flow:** Production equipment and vehicles
- 3. Logical Flow:** Data and information
- 4. Human Flow:** People and competence
- 5. Financial Flow:** Monetary investments and expenses
- 6. Conceptual Flow:** Mental models and ideas
- 7. Authoritative Flow:** Decisions and accountability


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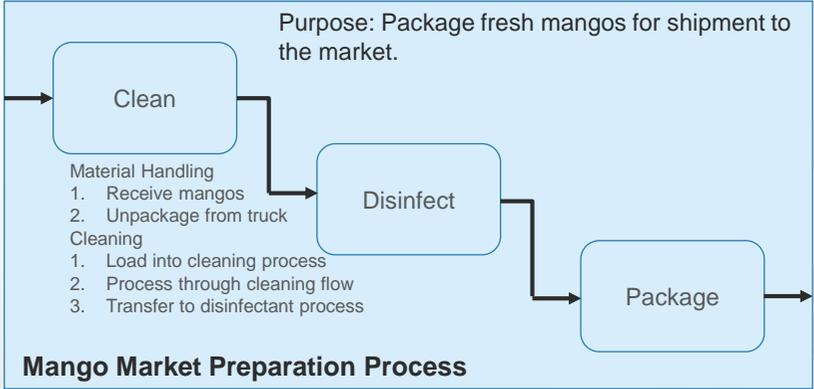
33

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EXAMPLE OF A PRODUCTIVE SYSTEM – MANGO FRUIT PROCESSING:

Purpose: Package fresh mangos for shipment to the market.



```

graph LR
    Start(( )) --> Clean[Clean]
    Clean --> Disinfect[Disinfect]
    Disinfect --> Package[Package]
    Package --> End(( ))
    
```

Mango Market Preparation Process

Material Handling

1. Receive mangos
2. Unpackage from truck

Cleaning

1. Load into cleaning process
2. Process through cleaning flow
3. Transfer to disinfectant process



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GROUP DISCUSSION SUMMARY:

- What did you learn from your “process walkthrough”?

Process Steps	Measurement Opportunities	Improvement Opportunities



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35

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IF YOU DON'T MEASURE WORK, THEN YOU CAN'T MANAGE WORK:

Define the performance indicator and measurement system:

- Operationally define the performance measure – how is it measured, using what device or instrument, what calculations are made, and how are defects, conditions of badness or errors distinguished from acceptable throughput?

Determine the quality characteristics of goodness and badness:

- Clearly define the defect codes that should be used as rational sub-groups so that data may be properly collected so the defect categories are well-differentiated. Is it possible to provide photographic evidence of these differences?

Assure that you capture these indicators in daily work and they are understood as items of standard work:

- Work standards should include all required measurement items as well as the set of procedures for capturing this data, including sample-size, sampling frequency, and storage requirements if samples are to be achieved.



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36

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ANALYZING WORK PROCESS MEASUREMENT:

Information Item: How Much?

- The volume of output of a work process that is completed satisfactorily within a fixed period of time (e.g., the number of cashew nut packages produced in a day).

Information Item: How Long?

- The amount of time that it takes from the beginning of the production of the output of work to the successful completion of the final result (e.g., from the receipt of the raw cashew nut to the completion of a packaged product that is ready to ship).

Process Flow: How Much Divided by How Long

- The amount of satisfactory work output (e.g., packages of cashew nuts) produced in each day for a period of time (e.g., cashew nut packages per day over 30 days).



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37

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MEASURING THE FLOW OF WORK

What is the performance measure that will be used?

- What is the important quality characteristic that you wish to evaluate regarding the flow of process content and what is the best measure to indicate how it performs?

What is counted as included in that measure?

- What throughput items should be counted to evaluate this performance? How should the quality characteristic defects be defined and what identifies their defects?

What are the boundary conditions defining limits of goodness and badness?

- What performance limits define the extent of the “tolerable” process performance for this quality characteristic beyond which the results become unacceptable?



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37

38

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PLOTTING THE FLOW OF PRODUCTIVITY – 1:

Choose the performance indicator:

- What should be the measure?

Identify the scale of measurement:

- How should the value be measured and what is the process for its calibration?

Determine the desired direction of performance:

- Which limit of the performance relates to the Best of the Best (BOB) productivity experience? Where is the measure indicating the Worst of the Worst (WOW)? How does the process flow from WOW to BOB?

Choose the units of time for recording the analytic perspective:

- How often should the measure be taken and recorded and what is the process by which it will be analyzed – how should it be graphed and interpreted?



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38

39

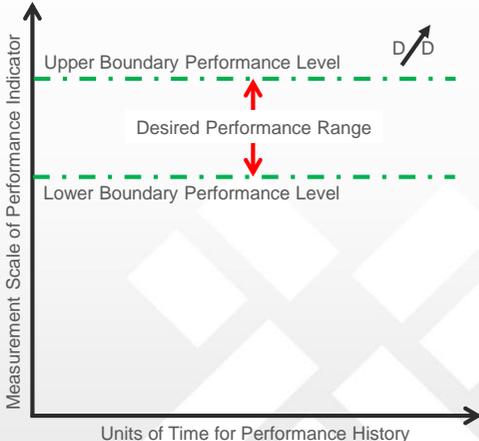
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PLOTTING THE FLOW OF PRODUCTIVITY – 2:

- **Performance indicator:**
- **Scale of measurement:**
- **Desired performance direction:**
- **Boundary conditions for results:**

Analysis question: How does process performance relate to this framework as observations about work outcomes are made over time?



Units of Time for Performance History

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 = Desired Direction

39

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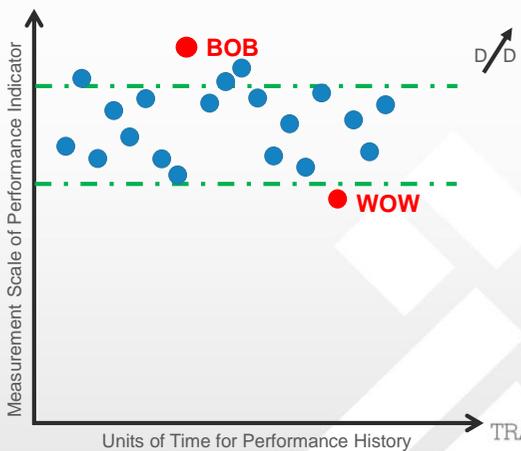
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DISCOVERING BEST-OF-THE-BEST (BOB) AND WORST-OF-THE-WORST (WOW):

To understand the reasons for these results, ask yourself “Why?” five times!

- WHY?
- WHY?
- WHY?
- WHY?
- WHY?



Units of Time for Performance History

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Note “the 5 why’s approach” can be used with the Spaghetti Diagram to track the flow of the problem.

40

41

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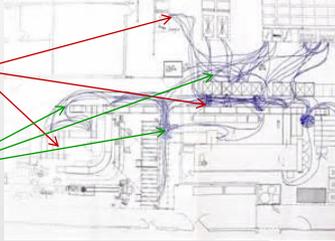
PROCESS INQUIRY METHOD – THE FIVE WHY’S

- **What it is:** either a graphical or measurement representation of movement or flow in a physical location is used to identify “*mura*” waste or problems in the flow of work activities.
- **How it works:** a graphical layout of the physical work space is used to trace the actual flow of work and identify where there is a ‘tangled mess’ based on a daily track of worker movement by tracing the flow of one item in an end-to-end work process (tracing several individual items will illustrate opportunities to improve flow, reduce delays from waiting time, and reduce the distance traveled in the process). The same approach may be done by starting with a BOB or WOW event and tracing it to the source of its variation.
- **What it can look like:**



Work Stations

Work Flows



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41

42

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CLASS DISCUSSION SUMMARY:

- Measurement systems determine loss. What losses are identified by the standard set of five process indicators?

Standard Process Measure	Loss identified using this measure
Quality	
Cost	
Delivery (Time)	
Safety	
Motivation	



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42

43

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WHAT SHOULD BE INCLUDED IN WORK PROCESS DOCUMENTATION?

Checklist of sequenced tasks included in the work activity

- Identify the sequence of steps required to successfully complete an activity's tasks.

Instructions for the use of job-aids and equipment required for the work activity

- How should equipment and tools that support the proper performance of the process be used in the operational activities of the work tasks?

Inspection instructions and examples of quality defects and acceptable results

- What inspections should be performed for incoming work to the process? What are the inspections that the worker should do of their own work? What are the test criteria for successful completion of the outgoing process work?

Reference related to the process materials, testing, and standard requirements

- Identify the references that describe material safety, specifications, safety references, and standard procedures that influence the performance of the activity and should be included in the training of the work process operator.



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43

44

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WORK PERFORMANCE RECORDS FOR TRACEABILITY:

Traceability is required for some products (food, drugs, and electronics).

- Traceability means an ability to track the material in a finished product through the sequence of production steps back to the original source of all the materials so that any problems in any of the product's components may be examined for issues and any concerns all the way back to its source in "Mother Nature,"

Products that require traceability should also specify the terms required for the storage of the traceable data. Some data should be archived as it is required for an extended period of time (for some products it could be as long as 10 years).

- Data management issues related to process measures should also be included in the work instruction – including how the data is stored, how long it must be maintained, and when it should be archived and no longer available for rapid on-line access.



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44

45

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TEAM PROJECT:

- Based on these considerations, what is the minimal set of information that should be included in a work instruction? Choose one activity in your process to provide an example of this information that should be recorded for each task.

Tasks Identified	Information Item	Rationale for Information Inclusion




45

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Standardizing Work

Lecture 3: Developing Standard Work




46

47

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EDUCATIONAL PROGRAM – STANDARDIZING WORK:

- Lecture 1: Understanding Work as a Process
- Lecture 2: Identifying Waste, Loss and Inefficiency in Work
- **Lecture 3: Developing Standard Work** ←
- Lecture 4: Defining a System to Maintain Standard Work



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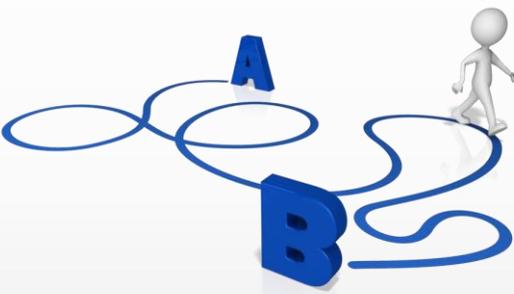
47

48

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HOW SHOULD YOU PLAN WORK PROCESS REVITALIZATION ACTIVITIES?



How do you advance a work improvement project from A to B?

Elements contained in a work process transformation plan:

1. Defining the focus: issue statement or problem-statement
2. Assigning responsibilities: RACI matrix
3. Managing the improvement effort: Project charter
4. Assuring standardized results: Control plan
5. Tracking improvement efforts: Benefit capture plan



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49

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HOW TO CREATE A PROBLEM OR ISSUE STATEMENT?

- Identify the issue – what circumstance is out of control?
 - Specify the indicator of performance that needs to be addressed
 - Current state of performance:
 - Desired state of performance:
- Evaluate the elements involved in this issue:
 - Who it affects?
 - What would be the outcome if the this is not corrected?
 - Where is this taking place?
 - When does this need to be fixed (sense of urgency)?
 - Why is it important for this to be fixed?
- Define the issue to be addressed as a problem statement:
 - Specify the objective characteristic that needs to be improved
 - Activities to move toward improvement (reduce, increase, or control the performance indicator?)
 - Identify the location where the improvement is required



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WHAT IS THE DIFFERENCE: ISSUE OR PROBLEM STATEMENT?

- **Issue Statement:**
 - Describes the unsatisfactory situation as noticed, preliminary way that it is understood by management, and the summary that its presented to initiate a inquiry.
- **Problem Statement:**
 - Identifies the desired direction of improvement:
 - Measurable outcome to be addressed.
 - Desired action to be achieved: reduce, control, or improve
 - Location of the measurement check point for the assessment
 - NOTE: a proper problem statement for an inquiry does not identify the magnitude of improvement this is desired to be achieved – this is only done after the Exploratory Data Analysis (EDA) is conducted.



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50

51

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HOW TO DEVELOP A CUSTOMER REQUIREMENT?

- The purpose of a customer requirement is to remove all ambiguity in the activity required for development of a product or service. A requirement that is clear should lead to ultimately creating clarity in work standards.
- What are the components of a customer requirement:
 - Identifying the targeted customer: “I” **WHO?**
 - Identifying the desired function: “want_____” **WHAT?**
 - Identifying the value proposition: “for this reason.” **WHY?**
- The requirement could be described as “I (customer) want (function) so that (beneficial value proposition).”
- This should be a targeted customer who is expected to be profitable (the city of Metropolis).
- The function should be expressed as a “noun-verb” phrase so it is clear what action should be taken on what subject (e.g., “create electricity”).
- The beneficial purpose should produce value to the customer so they are willing to invest in this outcome (e.g., meet the growing power demand of our citizens).



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51

52

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RESPONSIBILITY ANALYSIS – THE RACI MATRIX:

Responsible:

- The individual who is charged with the authority for; executing an activity; possessing an obligation to perform; controlling the outcome; or owning a process. There is only one individual in who holds the final authority and responsibility for an act or decision.

Accountable:

- The individual who is exercising delegated authority and is expected to justify their actions and explain their behaviors and motivations to their superior authority.

Consulted:

- An individual whose advice and opinion is solicited regarding a particular subject.

Informed:

- An individual who is communicated with after-the-fact of a decision.



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52

53

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HOW DO YOU SPECIFY RESPONSIBILITY FOR DECISION MAKING?

Process	Decision	Participant	Role (RAC)	Objective	Measure	Target	Result

Who are the major participants in each of the principal process decisions? What is the role that they play in this decision-making process?

How does each person participate in the process decision? In what way does their performance contribute to the outcome measure conform with the overall objective of the process? Is it compatible and aligned?

How does each person in the process measure their performance against their process objective? What is the targeted performance and what result is achieved after a decision action has been taken? Does the result provide any lessons how to make better decisions in the future?

53

54

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PROJECT CHARTER DESCRIBES TERMS OF REFERENCE FOR TEAMS:

PROJECT OBJECTIVE	
What is the challenge that needs to be addressed by the team for improvement? What do you believe can be achieved?	
PROBLEM STATEMENT	SCOPE OF THE PROJECT
What is the problem/ pain affecting the process? What is the most important improvement opportunity? How is performance measured and what is the current level? How can you state the problem formally? FORMAT: (Improve/Control/Reduce) (Measure) at (Location)	What is in scope or boundary conditions for the problem? Is the process location-limited or time-limited? What is out of scope? Where does the process begin and end? What is the end-to-end process?
EXPECTED BENEFITS	TEAM MEMBERS
What is the business case? What needs to be improved by how much and why? Consider three perspectives: <ul style="list-style-type: none"> · What is the impact of things gone wrong on the customer? · What benefit is desired from the employee viewpoint? · What are the financial consequences of process change? 	Who are key people working in the problem area? Who is the team leader? Who is the project sponsor?

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55

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CONTROL PLAN MANAGES PERFORMANCE FOR QUALITY:

Elements contained in a work process control plan:

A Control Plan...

- ✓ Specifies desired output characteristics of a process, the measurements that define it, and activities needed to sustain it;
- ✓ Provides useful information for future training or troubleshooting, and
- ✓ Needs to be a controlled document that is kept current

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

Critical Parameter Identification

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

Measurement System Specification

Action Limit	Decision Rule	Countermeasures	SOP Reference

Response Characterization



Control plans assure standardization in a quality management system.

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ENFORCING IMPROVEMENT EXECUTION – BENEFIT CAPTURE PLAN:

Purpose: To monitor execution of planned improvements and report on benefits received as a result of these improvements.

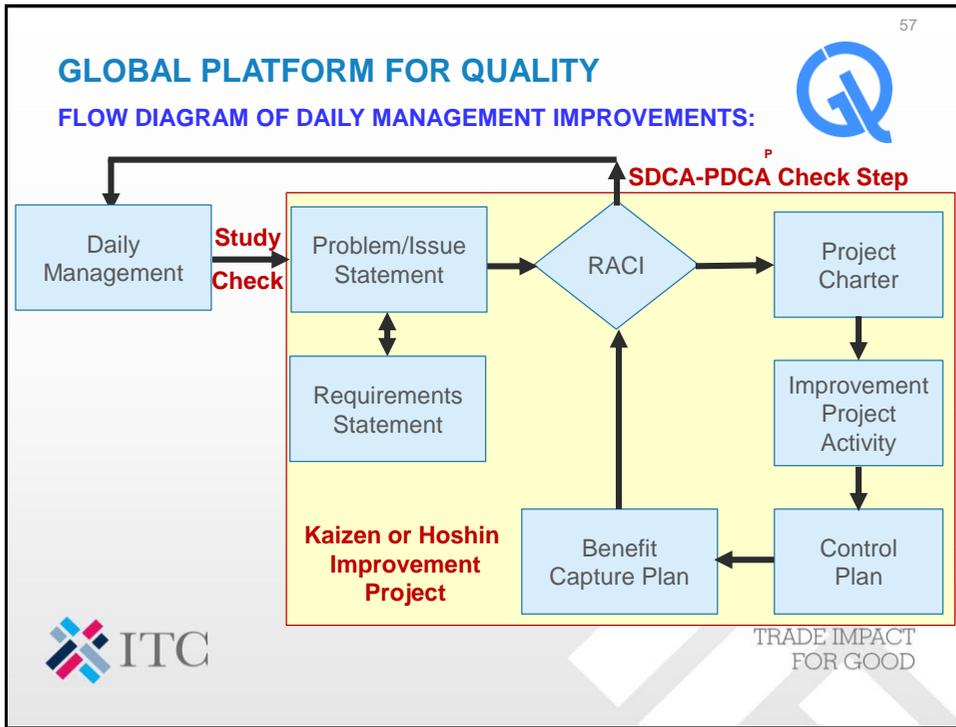
Information Content:

1. Identification of improvement opportunity
2. Responsibility accepted by a line manager/supervisor
3. Monitored Performance Measure
4. Baseline Measure
5. Achievable Performance Target
6. Expected Achievement Date
7. Expected Financial Benefit
8. Achieved Completion Date
9. Percentage of Task Completion
10. Financial Benefit Achieved
11. Additional Improvement Available



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56



57

58

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CLASS DISCUSSION SUMMARY:

- How do these methods help to assure standard work?

Method	Contribution
Issue/Problem Statement	
Statement of Requirement	
RACI Matrix	
Project Charter	
Control Plan	
Benefit Capture Plan	

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58

59

GLOBAL PLATFORM FOR QUALITY

5-S for workers is for TQM-based daily management:



- Takashi Osada (1991), *The 5S's: Five Keys to a Total Quality Environment* (Tokyo: Asian Productivity Organization). [Conceptual focuses on philosophy and integration of 5-S into Total Quality Management.]
- Hiroyuki Hirano (1995), *The Five Pillars of the Visual Workplace: The Sourcebook for 5S Implementation* (New York: Productivity Press). [Emphasis on “visual workplace.”]
- Hiroyuki Hirano (1996), *5S for Operators: 5 Pillars of the Visual Workplace* (New York: Productivity Press). [A condensation of Hirano’s 1995 book simplified to support worker implementation of 5-S. This book popularized 5-S methods as applied to workers.]

Japanese Term	English Term	Meaning of the Step
Seiri (整理)	Sort	Remove the unnecessary
Seiton (整頓)	Systematize	Place work into order
Seisou (清掃)	Sanitize	Clean the work station
Seiketsu (清潔)	Standardize	Develop standardized work
Shitsuke (躰)	Sustain	Maintain the standard



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Do we really understand the basics of 5-S?



The first four terms in 5-S all begin with the term “sei” in the *romaji* text.

BUT

The *kanji* indicates that there are two different characters are used to create the same term.

整 This “sei” means to “turn chaos into order.”

清 This “sei” means to make something “pure.”

Finding the true Meaning: Perhaps we have been just a little too fast making judgements in the English!



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60

61

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Understanding Seiri (整理):

整 This “sei” means to “turn chaos into order,”

理 plus “ri” is a thinking or cognitive process.

Together seiri (整理) describes a *method applied or “how” to make order out of chaos through application of a thinking or cognitive process* of setting items into logical categories and making decisions about what to do about them or making up rational sub-groups to understand the nature of things. This rationalization or “streamlining” of work to make it operate in its most simple state or condition. But, in English this term is reduced to just meaning “sort and remove” the unnecessary things.




61

62

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Understanding Seiton (整頓):

整 This “sei” means to “turn chaos into order,”

頓 plus “ton” means “immediately available.”

Seiton (整頓): In this step the “sei” term is the same as in “Seiri” but, the second term has changed to “ton” (頓). “Ton” has a medical meaning and refers to medicine that is *able to have an “immediate” effect* – taken together this means that work should be organized so that necessary things can be accessed immediately. But in English, this is reduced to the meaning of “organize” or “set in order.”




62

63

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In Japan they say: Seiri-Seiton (整理整頓):

整理 Seiri – rational order

整頓 Seiton – close at hand

Students learn from teachers at school that they must make their workplace in order: “*seiri-Seiton*” they are told. **They are not told to first “seiri” then to “seiton” their work.** This is an external stimulus that encourages the change. Taiichi Ohno said that it is the job of supervisors to teach the workers so worker harmony may grow. Thus, supervisors are teachers of process. This role of supervisors begins before the first “S” in “5-S” occurs, so they must observe and reflect, learn where to focus efforts to standardize and improve.

 ITC

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64

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Understanding Seisou (清掃):

清 This “sei” means “purity” or “spotlessness,”

掃 plus “sou” means “sweep, exterminate, or clear.”

Seisou is typically translated as “sweep” or “sanitize” or “clean and inspect” but this misses the deeper meaning. **In cleaning a house there are typically two levels of cleaning:** a rough-cut cleaning or sweeping out the major dirt (e.g., what is brought in by children on a muddy day) or sweeping away the debris after a party. This is the type of cleaning that is implied in seisou.

 ITC

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65

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Understanding Seiketsu (清潔):

清 This “sei” means “purity” or “spotlessness,” plus

潔 “ketsu” means “sanitary, virtuous, or immaculate.”

Seiketsu (清潔): “Sei” means a state of being “pure” but is combined with “ketsu” (潔) which also means *cleaning* but *in a deeper and more hygienic sense: sanitary, virtuous, immaculate*. It implies a medical use: sanitization and sealing of medical instruments, so they are packaged and ready for an operation. ***This is translated “standardize” which forces meaning to developing a work standard.*** However, this form of cleaning is deeper; like “spring-cleaning” that occurs after a long-winter.

 ITC

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66

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Understanding Shitsuke (躰):

躰 “Shitsuke” means “discipline, training, or teaching manners.”

Shitsuke (躰): the final “S” in the “5-S” system and it implies the idea of *discipline, training, or teaching manners*. This is usually translated as “sustain” and implies ***a state of constant altering between performing and improving***. Again, this misses the mark as kaizen is not limited to one step but is itself a dynamic cycle that integrates the Standardize-Do-Check-Act (SDCA) process of daily management with the Plan-Do-Check-Act (PDCA) change management process.

 ITC

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67

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“5-S” Fails to Recognize all Daily Management Roles:

Some lean consultants have claimed that over 70% of the “5-S” improvement efforts have failed to deliver results.

The original “5-S” approach was focused on improving the way workers managed daily management in the environment of their work processes and ignored the contribution of supporting workers and supervisors (taking a remedial journey without first taking the diagnostic journey).

An expanded approach blends “5-S for Workers” with “5-S for Supervisors” to define a systems approach to daily management and continual improvement:

1. Study	6. Simulate
2. Sort	7. Synchronize
3. Systematize	8. Safeguard
4. Sanitize	9. Standardize
5. Streamline	10. Self-Discipline



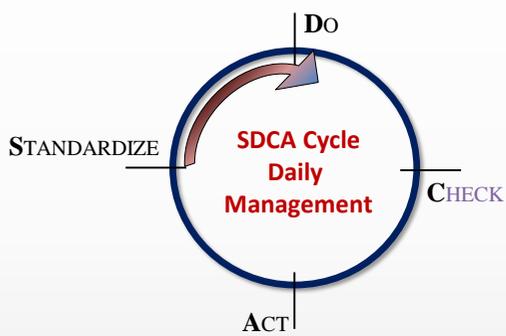

67

68

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Workers simplify and improve work standards:



Standardize

↓

Do

↓

Check

↓

Act

→

↑

Arrange daily work activities into standard ways of working; Perform work activities; evaluate work against standards for compliance; and adjust work activities if there is a shortfall in results or improve the standard way of working. Continue this work management process routinely.




68

69

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Interpreting history: being present - seeing the future!

Insight is gained by reflective study:

The Bayesian Moment [Current State Analysis]

Hindsight
The "As-Is" process.

Foresight
The "Should-Be" process.

Insight
What needs to change?

The Bayesian Moment: Insight transforms Hindsight into Foresight to permit improvement planning for the future.

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69

70

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FLOW DIAGRAM OF DAILY MANAGEMENT IMPROVEMENTS:

10 - S!

SDCA-PDCA Check Step

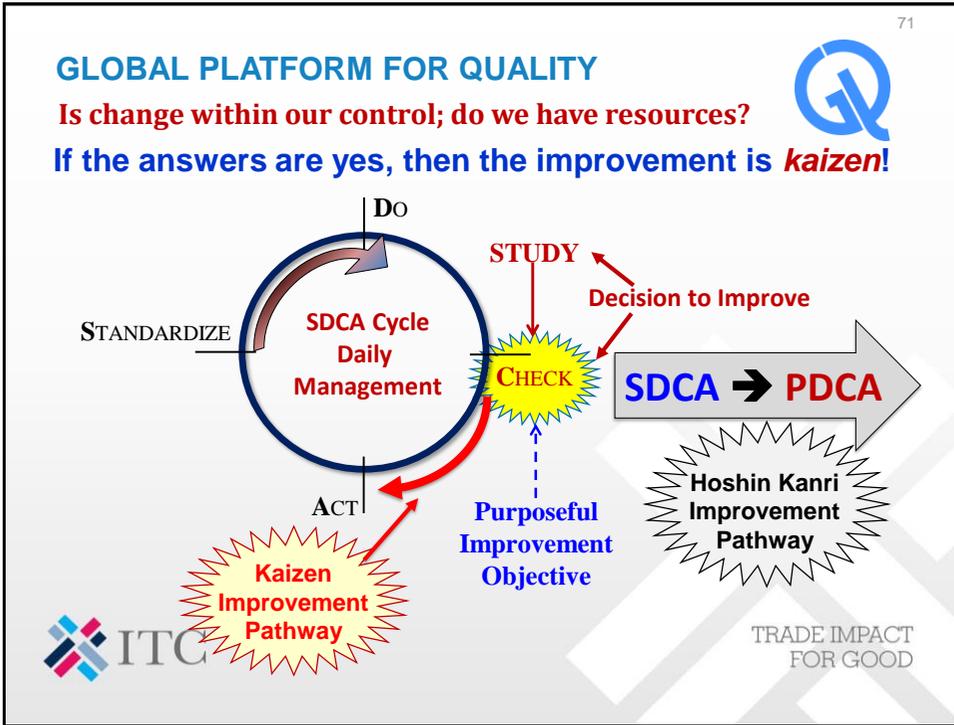
Daily Management → **Study Check** → **Problem/Issue Statement** ↔ **Requirements Statement**

RACI → **Project Charter** → **Improvement Project Activity** → **Control Plan** → **Benefit Capture Plan**

Kaizen or Hoshin Improvement Project

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70



71

72

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In SDCA-PDCA the “Check” step is the crucial point:

Do we have control? Do we have sufficient resources?

“Check” is the pivot point between standardization and change management.

What happens in the “Check” step of SDCA-PDCA?

- **Performance is evaluated** against standards, historical records, and targets.
- **Reflection occurs** regarding learning how process performance really works.
- **Problem-Solving is conducted** to evaluate issue causality from measures.
- **Experiments are made** to define the performance boundaries and ability to meet expectations implicit in operational performance hypotheses.
- **Decisions are made** to start Improvement projects applying new resources.

But, if the answer is no, then improvement may then require escalation to *hoshin kanri* planning – PDCA!

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72

73

GLOBAL PLATFORM FOR QUALITY

Standardizing leads to a need for improving!

“Without a standard there can be no improvement.”

~ Joseph M. Juran

STUDY

Purposeful Improvement Objective

Deming was “almost right” but “somewhat wrong.” Learning is necessary to transform, but “Study” is not a substitute for the “Check” step – it supplements it!

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73

74

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Execute SDCA by applying 10-S!

<p>Reflection</p> <p>Housekeeping</p> <p>↓</p> <p>Transformation</p> <p>↓</p> <p>Standardization</p>	<ol style="list-style-type: none"> 1. Study 2. Sort 3. Systematize 4. Sanitize 5. Streamline 6. Simulate 7. Synchronize 8. Safeguard 9. Standardize 10. Self-Discipline 		<p>Check</p> <p>Act</p> <p>↓</p> <p>Standardize</p> <p>Do</p>
--	---	--	---

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74

75

GLOBAL PLATFORM FOR QUALITY

DAILY MANAGEMENT IS A SHARED RESPONSIBILITY

10-S METHOD = 5-S for Workers (*) + 5-S for Supervisors



- 1. Study** – Analyze work to find waste and value losses
- 2. Sort*** – Divide work into categories according to value
- 3. Systematize*** – Organize the flow of the work activity
- 4. Sanitize*** – Clean the work place so waste is more visible
- 5. Streamline** – Eliminate unnecessary activities, bottlenecks
- 6. Simulate** – Check work performance prior to change
- 7. Synchronize** – Set the timing for optimal work flow
- 8. Safeguard** – Eliminate the possibility of inadvertent errors
- 9. Standardize*** – Assure all work follows the standard practices
- 10. Self-Discipline*** – Consistently perform and improve




Gregory H. Watson (2007), *Strategic Benchmarking Reloaded with Six Sigma* (New York: Wiley).

75

76

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BEGIN THE IMPROVEMENT JOURNEY BY REFLECTIVE STUDY:



1. Study – Analyze work to find waste and value losses

- Definition of Lean
- SIPOC Analysis
- Fishbone Diagram
- Work Process Analysis
- Value vs. Non-value Adding
- 8-Waste Identification
- Value Stream Map
- Flow Measurements

- Takt Time
- Cycle Time
- Process Efficiency Measurement
- Calculation of Value Opportunity
- Spaghetti Diagram and 5 Why's
- Yamazumi Diagram
- Process Benefit Estimation




76

77

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DAILY HOUSEKEEPING MANAGEMENT – STEPS 2-4:

- Daily management pays attention to details of maintaining the workplace in the state of order that is required for proper functioning of routine, standard work.

<p>2. Sort*</p> <p>3. Systematize*</p> <p>4. Sanitize*</p>	}	<p>– Divide work into categories according to value</p> <p>– Organize the flow of the work activity</p> <p>– Clean the work place so waste is more visible</p>
---	---	--

3S is the core housekeeping capability in a daily management system.

- Daily management is a responsibility of supervisory functions and the workers who manage the flow of activities across the end-to-end sequence of the work process.
- Work standard ensure that these activities and accomplished in a safe, efficient, effective and economic manner.




77

78

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TRANSFORMATION MANAGEMENT – STEPS 5 TO 8:

<p>5. Streamline</p> <p>6. Simulate</p> <p>7. Synchronize</p> <p>8. Safeguard</p>	<p>– Eliminate unnecessary activities</p> <p>– Check work performance prior to change</p> <p>– Set the timing for optimal work flow</p> <p>– Eliminate the possibility of mistakes</p>
---	--

- Transformation of our current way of working to a “lean” way of working requires action on the part of the supervisors and all workers.
- Reorganizing work according to observations from the study step, checking to assure that the redesigned work meets the lean objectives, synchronizing work across the end-to-end flow of activities in the process, and eliminating any potential for inadvertent errors or mistakes to creep into the tasks that people are performing.
- It takes cross-functional team work to achieve this type of transformation across the flow of the process.




78

79

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SUSTAINING QUALITY IS BASED ON MAINTAINING STANDARDS:

9. Standardize* – Assure all work follows the standard

10. Self-Discipline* – Sustain performance and constantly improve

In managing daily work improvement always consider both major flows:

- **Resource Flow** (based on equipment scheduling – measured as the number of minutes per customer as the resource Takt Time which can be compared for actual performance vs. the planned or scheduled performance which is used by accounting.
- **Work Flow** (End-to-End cycle time) or the customer-centric flow as served by the staff. This is illustrated as process steps across a deployment diagram which indicates involvement of all the team members. This can be used to create a Customer Takt Time (E2E cycle time provides a Customer view while Customer Takt Time is a management scheduling view of the same data.



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80

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CLARIFYING CONFUSION AROUND THE “SANITIZING” OF WORK

4. Sanitize* – Clean the work place so waste is more visible

9. Standardize* – Assure all work follows the standard

Both of these steps define the concept of “**sei**” as “**pure**” – what is the difference?

4. Sanitize: This activity is embedded in the daily, routine actions of workers. It is the cleaning required so a process operates efficiently. It means removing waste, and unused material or debris from the work place so it is in order for another day’s work. This is “sweeping” or “clearing away the garbage” from the operations.

5. Standardize: This activity focuses on assuring that the deliverable meets the necessary “sanitary” requirements of the customer (e.g., biological or safety tests of a product – the deeper cleaning that assures the product is ready for market).

While the first step focuses on cleaning of the process, the second step focuses on assuring that the product meets the health and safety standards of the customer and that the process is capable of delivering this output through its standard work.



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80

81

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INTEGRATING STANDARDS WITH STANDARDIZED WORK:

- **Standards with a “Big S”** – national or international standards that are used to demonstrate compliance and assure product quality regularity (product-focused standards), or management system design (ISO 9001 Quality Management System).
- **Standards with a “little s”** – the organization-wide documented work systems that demonstrate how work can be managed to deliver consistent outcomes to customers – this is the fruit of a well-disciplined 10-S system of daily management.

“little-s” daily work management system

10-S Process

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

“Big-S” compliance assurance system





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82

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CLASS DISCUSSION SUMMARY:

- How does the 10-S approach to Daily Management create continual improvement?

Daily Management Phase	Contribution
Reflection	
Housekeeping	
Transformation	
Standardization	



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Standardizing Work

Lecture 4: Defining a System to Maintain Standard Work




83

84

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EDUCATIONAL PROGRAM – STANDARDIZING WORK:

- Lecture 1: Understanding Work as a Process
- Lecture 2: Identifying Waste, Loss and Inefficiency in Work
- Lecture 3: Developing Standard Work
- **Lecture 4: Defining a System to Maintain Standard Work** ←




84

85

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REFLECTIVE STUDY INCREASES PROCESS AWARENESS:

Reflection refers to mental acts that lead to increased self-awareness through self-examination, reconsideration, introspection, meditation, or contemplation. This occurs during “Check” steps of the PDCA and SDCA cycles and it “**standardizes worrying!**” This encourages development of a “quality mindset” necessary for lean managing and it has several features which make “quality” become “personal”:

- There must be **recognition of a problem** which is primarily related to the personal performance of an individual rather than the failure of a process or overall system.
- **The person creating a problem must accept personal responsibility for the shortcoming.**
- **Taking personal ownership for the mistake is a critical part of reflection along with individual acceptance that the identified act was committed wrongly.** The worker should accept responsibility that they must act differently in the future and that they are obligated to work properly, and commit to improving future work by taking affirmative action to correct their standard work.

85

86

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DEVELOP PROCESS OWNERSHIP AT ALL LEVELS OF WORK:

Everyone has some responsibility for quality improvement!

- **Process ownership** supports daily management by assigning decision rights to workers for regulating their routine work to assure that poor quality is not passed on to the next step in the process. This idea engages workers in a responsibility to constantly seek how to improve the quality of their standard work by personal and team-based reflection on the reasons for the outcomes that they are achieving in the flow of their activities with in the end-to-end work process.
- This concept of ownership may also be applied to supervisory level managers where ownership is for the flow of work across the process.
- Ownership must also be embedded in the executive function for the appropriate allocation of resources to work processes in order to achieve the strategic objectives of the organization.

86

87

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CLASS DISCUSSION SUMMARY:

- What opportunities are there for workers to make decisions related to about the quality of their process in your team's project?

Process Decision	Opportunity for Decision Making




87

88

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TRANSFORMATION OCCURS THROUGH FOCUSED CHANGE PROJECTS:

- A Kaizen Blitz is a rapid transformation project that is focused on a particular workplace and it is targeted at the elimination of obvious non-lean attributes and achieving a “quick gain” in improvement.
- A Kaizen Blitz is usually conducted in a half-day to one-day but longer periods may be required if the team making a change has not been involved in improvement analysis and planning. The following illustration illustrates the longest cycle time for a Kaizen Blitz and should be decreased, as appropriate, for the shorter period that is normal.
- A Kaizen Blitz requires knowledge of the process as developed through the “study” step of the 10-S process.
- Planning for the Kaizen Blitz is conducted by the work process supervisor and the improvement team prior to execution of the improvement event.




88

89

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WHAT IS A “KAIZEN BLITZ” AND HOW IS IT PERFORMED?

- **Requires doing** not analyzing or proposing.
- Operates with a low budget – no capital investment in plant or equipment.
- Involves a collaborative management-worker effort.
- Executes ‘many small experiments’ to find the right way.
- Uses rapid prototyping – in less than 5 days Kaizen Blitz demonstrates enhanced operations from using the lean approach.
- Work is completed by mistake-proofing & documenting new standards.

Day 1	Day 2	Day 3	Day 4	Day 5
Understand the principles and methods of lean thinking and Kaizen Blitz	Uncover the value stream of work and calculate the time for processes. Begin 10S process.	Perform 10S work. Experimenting for: clarifying flows, subtracting waste, and adding value.	Finish 10S work. Reduce set-up time and design measures and forms to make work standardized.	Complete Kaizen project documents and report progress to management.




89

90

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KAIZEN BLITZ – DAY 1 AGENDA:

Agenda – Day 1

What to do? Build knowledge of the method and the problem!

- Choose a process area for your improvement focus.
- Invite a cross-functional team to participate – all levels.
- Conduct a workshop to teach the lean methods.
- Assign people to specific teams for Kaizen Blitz.
- Walk the process and brainstorm improvement focus areas.
- Develop detailed team plans for the next three days of work.




90

91

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KAIZEN BLITZ – DAY 2 AGENDA:

Agenda – Day 2

What to do? Start work early on this second day of a Kaizen Blitz!

- Flowchart the value stream for the process.
- Identify all the logical sub-groups for production cells.
- Measure time and value across the process.
- Calculate response to the pull signal and rolled throughput yield.
- Document the 'lean performance baseline' of the process.
- Initiate 3S housekeeping in the production cells.

Note: Video the process tasks to document motion studies.



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92

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KAIZEN BLITZ – DAY 3 AGENDA:

Agenda – Day 3

What to do? Continue where you left off yesterday!

- Continue 3S housekeeping activities.
- Identify priority lean improvement opportunities.
- Subtract non-value adding waste steps.
- Initiate set-up time and changeover improvements.
- Experiment with flow changes and workload balancing.
- Reduce inventory levels and improve material flow.

Note: Video the process tasks to document motion studies.



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93

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KAIZEN BLITZ – DAY 4 AGENDA:

Agenda – Day 4

What to do?

- Complete set-up time, changeover and 3S improvements.
- Measure post-improvement process performance.
- Prepare forms or safeguards to mistake-proof the process steps.
- Complete change documents to standard operating procedures (4th S).
- Train process operators in the revised work methods.
- Prepare a short presentation (15 minutes) by each team.
- Prepare a report (no more than 2 pages) documenting results.

Note: Video the process tasks to document motion studies.



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94

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KAIZEN BLITZ – DAY 5 AGENDA:

Agenda – Day 5

What to do? Report on your progress

- Provide your process owner with a presentation on changes.
- Celebrate the success with a team recognition event!
- Photograph the team and write a story for your newsletter.



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KAIZEN BLITZ – FOLLOW-UP AGENDA – EVENT POST-MORTEM:

Feedback and Assessment – Day 5 (5th S)

Management Assessment: What to do?
 Answer: ***What went well? What needs improvement?***

Evaluate how effectively the lean tools were used by the team members and compare them with the statistical tools of Six Sigma for their relative degree of contribution to the process improvements.

What were the unique benefits of this Kaizen Blitz?

What lessons were learned that should be applied next time?



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96

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STORYBOARD – VISUALIZING PROCESS IMPROVEMENT:

- A storyboard (sometimes called a “poster board”) is a graphical way to organize a sequence of illustrations, graphs or pictures so it presents a visual illustration of the activities that have been performed during an improvement project.
- The storyboard records the outputs that are produced by a structured approach to improvement.
- These outputs are shown as a series of A-3 or A-4 panels on a Flip Chart in which graphical output of a team’s improvement project are shown consecutively so that important findings and developments from their improvement effort can be summarized for their presentation to management.



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EXAMPLE OF A STORYBOARD:

Summary Project Plan	Reason for Selection	Current State Analysis	
Insert MS Project Timeline Here	What is the initial process doing? Insert Baseline Process Data Here	What does the process need to do? Insert SIPOC Flowchart Here	Insert Customer Requirements Here Insert Initial Pareto Analysis of Issues and Problems Here
Measuring the Current State of Performance		Analyzing Problems in the Work Process Flow	
Insert the Fishbone Diagram Here	Insert the Process Flow Diagram (VSM) Here	Identify Waste and Loss Discovered within the Work Process Activities	Insert the 5-Why Causal Analysis and 5W+1H Definition
Improvement Made to the Process		Control Plan	Next Steps
Insert Initial Pareto Here	Insert Pareto (Improved) Here (Same Scale)	Summarize the Improvements Made in Work Activities Here	Insert Control Plan Here
		Insert Control Plan Here	Insert the Work Transformation Plan Here




97

98

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CLASS DISCUSSION SUMMARY:

- Why should you use a storyboard to summarize an improvement project?

Value of the Storyboard to Project	Value of the Storyboard to Company




98

99

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CLASS DISCUSSION SUMMARY:

- What opportunities can you identify in your process to conduct a Kaizen Blitz?

Process Step	Current State	Focused Opportunity for Improvement




99

100

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WHAT IS A “QUALITY IMPROVEMENT MINDSET”?

Take personal responsibility to deliver quality results to customers!

Embedding a “quality improvement mindset” into everyone who participates in an organization requires the active engagement and involvement of everyone:

- **Leaders:** Develop an organizational culture where everyone is actively engaged in the assurance of quality for customers.
- **Managers:** Delegate responsibility for quality through a set of consistent actions that encourage workers to take personal responsibility for the quality of their work.
- **Workers:** Accept personal responsibility for achieving quality outcomes and take ownership of their standard work process that achieves this result consistently.




100

101

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HOW IS “QUALITY ACCOUNTABILITY” ASSURED?

Workers must have:

1. Knowledge of what the process is supposed to do.
2. Knowledge of what the process is currently doing.*
3. Ability to self-regulate the process which means:
 - The process must be capable of meeting its target.
 - The process must be responsive to actionable controls through a cause-and-effect relationship.
 - The workers must be trained in the proper way to operate the control mechanisms or procedures.
 - The act of adjustment should not be personally distasteful to the worker or require excessive exertion.
 - The worker should be delegated the authority to determine at what point the process adjustments should be made and also be given the authority to halt operations when process adjustment no longer operates effectively.



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102

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WHAT WORK SHOULD WE DO TO CONSTANTLY IMPROVE?

- Elimination of waste throughout the end-to-end process
- Protection from losses within each work activity
- Development of efficiency in the performance of work
- Improvement in the use of organizational resources
- Assurance of consistency in the quality of work output
- Emphasis on continual improvement of work by everybody
- Driven by the need to increase value for customers



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102

103

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HOW SHOULD YOU PLAN FOR CONTINUAL IMPROVEMENT?

- The first step to improvement is to understand your process.
- The second step is do document the process and its measurements.
- Then you can analyze and simplify the process so it is standardized.
- Improvement should be made to standardized work processes.
- When standard processes cannot be further improved and whenever better performance is required, then it is time to design a new process!



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103

104

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REGULARLY EXECUTE THE “CHECK STEP” IN SDCA:

Current State
“As Is Process”

Current way of doing work

Current Results

Improved Activities

Improvement Results

Desired State
“Should Be Process”

New way of doing work

New Results

Target to be Achieved

- Everyone must share a mutual understanding about what needs to get done.
- Everyone has two jobs – do the work AND improve way of working.
- We must make our way of working visible so everyone can see what we do.
- Making a work process visible allows us to discover the best way of working.
- Develop profound knowledge by examining measures (e.g., throughput time)
- Set intermediate goals to achieve long-term goal.
- Identify what must be improved is the first step!



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105

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WHAT SHOULD YOU DO TO ASSURE CONSTANT IMPROVEMENT?

- Determine areas required for business improvement
- Identify projects that will create the desired change
- Assign action teams to pursue improvement activities
- Provide resources required to facilitate these changes
- Review improvement activities to assure adequate resources
- Remove “roadblocks to improvement” within the organization
- Implement evidence-based change that makes a difference

Note: in Gemba 1 workers and supervisors manage the flow of work; however, resource flow is managed by participants in the Gemba 2 decision-making processes.




105

106

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CLASS DISCUSSION SUMMARY:

- Based on all the discussion so far about your team project, where would you want to focus on quality improvement first? Why is this a “burning issue” that needs to be addressed as a priority?

Burning issue for improvement:	Why?




106

107

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Thank you for your participation!



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107



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Global Platform for Quality

Service Quality

Instructor: Gregory H. Watson, PhD, EURIng



1

2

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QUALITY 203: SERVICE QUALITY

All organizations serve customers either through the delivery of products or services. This is a course that describes the elements of service quality and how organizations can develop a culture of service quality among their front-line employees who interact with the outside world at “customer touch points” in their relationship with external markets. This program consists of four modules:

- (1) Understanding Customer Requirements
- (2) Identifying Customer Touchpoints
- (3) Defining Customer Relationships
- (4) Monitoring and Managing Customer Feedback

This course will enable organizations to manage their customer interfaces and provide them with an ability to satisfy customer requirements through the development of a systematic way of delivering services to influence positive feedback and assure an increase in customer satisfaction.



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3

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EDUCATIONAL PROGRAM – SERVICE QUALITY:

- Lecture 1: Understanding Customer Requirements
- Lecture 2: Identifying Customer Touchpoints
- Lecture 3: Defining Customer Relationships
- Lecture 4: Monitoring and Managing Customer Feedback



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Service Quality

Lecture 1: Understanding Customer Requirements



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4

5

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EDUCATIONAL PROGRAM – SERVICE QUALITY:

- **Lecture 1: Understanding Customer Requirements** 
- Lecture 2: Identifying Customer Touchpoints
- Lecture 3: Defining Customer Relationships
- Lecture 4: Monitoring and Managing Customer Feedback



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6

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What is “service quality” and how is it produced?

Service business deliver personally-tailored outcomes directly to customers:

- Service quality is **subjective** – a comparison of the expectations of the user or customer for the quality of an outcome as compared to their perception of the quality of the delivery of that outcome.
- The definition **changes flexibly with circumstances** of the customer and it is also variable as **compared to the economic alternatives** for the service.
- Examples of **services may be direct** (e.g., restaurant, hotel, retail sales, etc.) **or indirect** (e.g., automobile repair services, mobile phone connectivity, package delivery).
- The **customer’s judgment is the critical determinant of quality**.



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7

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Joseph M. Juran on “Service Quality”

“Study of well-regarded service firms discloses a shared feature – they have put in place six essential components in their quality programs:

1. Service performance **standards**
2. A system to **measure conformance** to those standards
3. Analytical **procedures to determine causes of deviation** from standard performance
4. A **corrective action program to eliminate causes** of nonconformance
5. A **program for making improvements** (breakthroughs) to achieve levels of quality above those traditionally achieved
6. A **control function** to ensure the service quality improvement program is ongoing.

~ Juran’s Quality Control Handbook, 4th edition, 33.13



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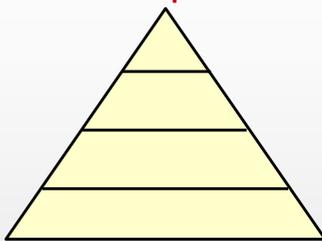
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Organizations are designed as a functional hierarchy of activities:

Functions provide structure as organizations mature from the small to medium-large in their operational scale.

**Commercial Financial
Touchpoint**



**Consumer-User
Touchpoint**

Executive Function

Business Function

Supervisory Function

Operational Function

**Functional
Structure of
Management**



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9

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All organizations have a “service” component.
Customers define two critical business ingredients necessary for success:

Commercial Deliverable
Consumption Touchpoint



Consumer-User
Requirement Touchpoint

**Output delivered to consuming
user-customers – experience**

Financial Quality

Business Quality

Service Quality

Product Quality

**Output desired by consuming
user-customers – requirements**

} **All businesses**

} **Production**

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10

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Reducing service quality to a formula:
How is service quality actually judged by customers?

Service Quality = Customer Perception of Deliverable Performance - Customer Performance Expectation

Customer Opinion
of the Outcome

↑

Customer Requirements

↑

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11

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CLASS DISCUSSION:

- Improving service quality requires an understanding of what lies behind customer communications – either their requirements or their spoken comments about their perceptions of service (either compliments or complaints). In your project company what communications have you received from customers and would you consider them to be requirements (expectations) or service quality feedback (perceptions)?

Service Quality Element	Example of Customer Communications




11

12

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Conclusion: All organizations MUST have a service component!

Success Imperative: Design the service component to meet consumer needs!

There are two critical success ingredients:

1. Service **requirements must be explicitly designed to assure they meet or exceed both consumer requirements and competitive offerings**, and
2. The **service delivery process must be agile and robust so that it maintains intimate connectivity with fluctuations in customer perceptions, market dynamics, technological advances, and more attractive than any of the market alternatives.**




12

13

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What should be the focus areas to achieve quality service?

Service company operational characteristics to be addressed:

- Direct contact and sales to customers or through restricted distribution chains or channels (e.g., travel agency or Internet application) so **intimate knowledge of the market for current and potential customers** is critical-to-quality.
- Benefits of service are provided on demand, so **timely availability of services** is a critical-to-quality characteristic as is timeliness of performance.
- Service output is created as it is delivered, and this intangible product must be **adaptable to changing customer requirements during service delivery as the service is being performed** is a final critical-to-quality characteristic.



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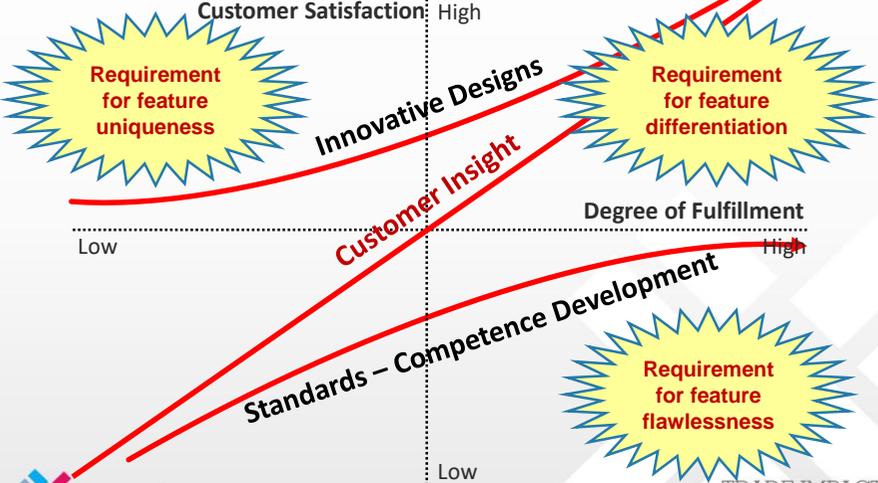
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14

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The Kano Model illustrates the need for customer intimacy:







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14

15

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Establishing Customer Requirements for Service:
Design services with the customer need in sight.

There are three elements in specifying a customer requirement properly:

- **Identifying the targeted customer** – who is saying “I want” and what is their reason for such a request? [Customer segment and rationale]
- **Specifying the function or outcome that is desired** – what is the specific action or outcome that is desired? [Desired result or deliverable]
- **Determining the specific benefit obtained and level of satisfaction** – what will be able to satisfy the essential customer need? [Performance measure and level that indicates the desired value proposition is fulfilled]



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16

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CLASS DISCUSSION:

- Explicitly defining customer requirements is the starting point for designing great customer service processes. For your project company identify the dominant types of customer requirements and then describe the service component of work that delivers this requirement. How would you specify each of these service elements?

Customer Requirement	Service Component that Addresses Requirement



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16

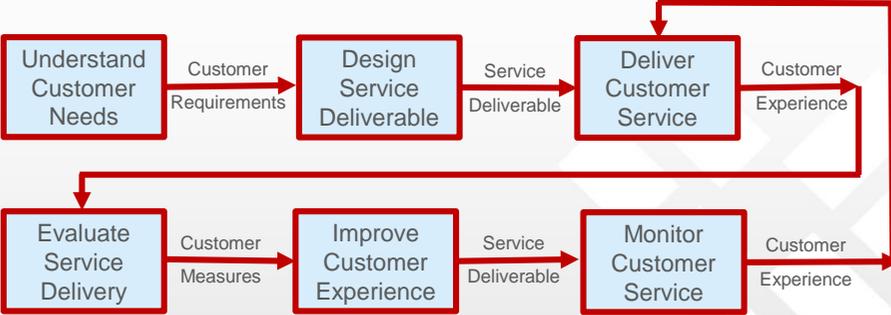
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Service Management Process – End-to-End Activities:
How to assure quality in the process of service design, development & delivery?

- What is the process of service management?



```

    graph TD
      A[Understand Customer Needs] -- "Customer Requirements" --> B[Design Service Deliverable]
      B -- "Service Deliverable" --> C[Deliver Customer Service]
      C -- "Customer Experience" --> D[Monitor Customer Service]
      D -- "Customer Experience" --> E[Improve Customer Experience]
      E -- "Customer Measures" --> F[Evaluate Service Delivery]
      F -- "Customer Requirements" --> A
      C -- "Customer Experience" --> A
      D -- "Customer Experience" --> A
    
```




17

18

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CLASS DISCUSSION:

- Designing and managing customer service is itself a process. Given the six steps that are suggested for this process, how well is your project company operating in each of these steps? What challenges do you face to improve customer service in order to “put smiles on the faces” of your targeted customers?

Service Process Activity	Current Performance Challenge
Understand Customer Needs	
Design Service Deliverable	
Deliver Customer Service	
Evaluate Service Delivery	
Improve Customer Experience	
Monitor Customer Service	




18

19

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How to measure the perception – expectation gap?
What dimensions are ranked as most important to service customers?

WHAT SERVICE IS PROVIDED – Service Content:

Functional Content: the activities or deliverables that are provided to the customers in fulfillment of their required need or expectation – **Do well!**

Tangible Content: appearance of physical facilities, equipment, personnel, and communication materials – **Look sharp!**

HOW SERVICE IS PROVIDED – Human delivery processes:

Reliability: ability to perform promised services dependably and accurately

Responsiveness: willingness to help customers promptly

Assurance: knowledge and courtesy of employees; ability to convey trust

Empathy: the caring, individualized attention that is provided to customers



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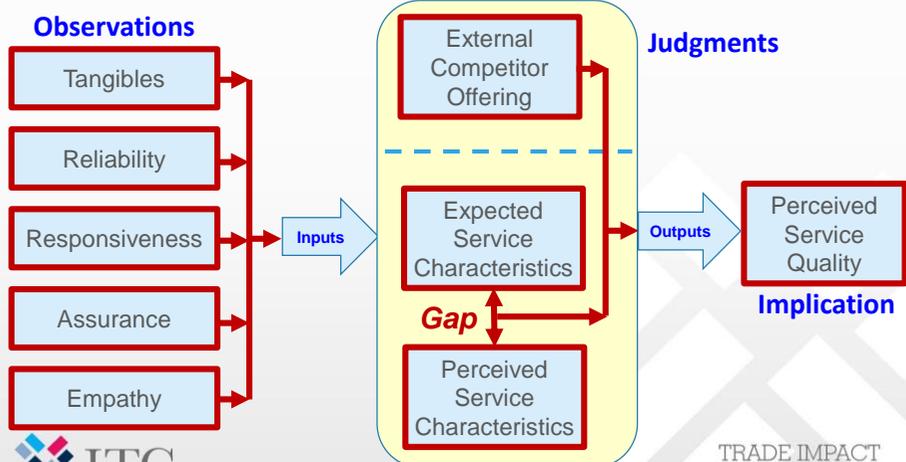
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20

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Model of Service Quality Performance:
How are these factors of service quality related to each other?



Observations

- Tangibles
- Reliability
- Responsiveness
- Assurance
- Empathy

Inputs

Judgments

- External Competitor Offering
- Expected Service Characteristics
- Perceived Service Characteristics

Gap

Outputs

Perceived Service Quality

Implication



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21

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Service Delivery Process

What characterizes exceptional customer service delivery?

- Delivering exceptional customer service requires strong human processes.

HOW SERVICE IS PROVIDED – the human processes:

Reliability: Just do it!
Say what you are going to do when you say you are going to do it.

Responsiveness: Do it now!
Respond quickly, promptly, rapidly, immediately, instantly – without delay.

Assurance: Know what you are doing!
Demonstrate expertise in the service that you are delivering – be in control.

Empathy: Care about customers as much as you do about the service!
Demonstrate that you care about all expressed customer concerns.



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22

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CLASS DISCUSSION:

Identifying service quality deliverables and the human components that make these deliverables of exceptional customer value are two very important quality inquiries that must be addressed. Considering your “company” what are the top five service quality characteristics that need to be designed and how do the “what” and “how” of service quality need to be developed to increase the benefit to customers?

Service Characteristic	Specific Service Quality Improvement Ideas
Functional Content	
Tangible Content	
Reliability	
Responsiveness	
Assurance	
Empathy	



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Lecture 2: Identifying Customer Touchpoints



23

24

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EDUCATIONAL PROGRAM – SERVICE QUALITY:

- Lecture 1: Understanding Customer Requirements
- **Lecture 2: Identifying Customer Touchpoints** ←
- Lecture 3: Defining Customer Relationships
- Lecture 4: Monitoring and Managing Customer Feedback



24

25

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What is a service industry?

Examples of service industries:

- Restaurant
- Transportation
- Healthcare
- Beautician
- Hotel
- Insurance
- Banking
- Automobile repair
- Telecommunications
- Package delivery
- Electrical power
- Food supermarket
- Convenience store
- Home repair

In your industry can you identify where your customer touchpoints are located?



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What are the characteristics of service-oriented companies?

Direct face-to-face relationships are built with customers:

- **Direct sales** – selling without a middle-man or third-party.
- **Direct contacts with users** – communicating with users directly.
- **Benefits provided on demand** – what is needed and when it is needed.
- **Completion time is important** – customers do not want to be waiting.
- **Work activities are not storable or transportable** – delivered at point-of-sale.
- **Work output is created as it is delivered** – service produced as it is provided.
- **Primary benefits are not a physical product** – intangibles are more important.



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How is service designed to be delivered to customers?

What are the characteristics of service quality design?

- **Designs for many customers** – must provide a “broad menu” of service choices.
- **Technical assistance may be required** – even for “simple services” such as in a restaurant – dietic needs for food ingredients or allergy notifications.
- **Simplicity of the service offering is essential** – customers can clearly consider their needs as there is an “unwillingness” to read the fine print in offers.
- **Often “free” additional services are offered** - they support the primary offer for which the purchase is made – to increase customer “well-being” or to build a relationship with customer that will endure.



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What is a “customer touchpoint” and how does it operate?

How is this defined in a “customer-centric” organization?

- **Customer Touchpoint:** Any point where a customer may choose to interact with the company. This activity may or may not occur in the same way as channels by which a company communicates with its customers (difference between an online marketing channel and “online chat” – especially if those communications are one-way types of information broadcasts.
- **Customer Touchpoints Examples:** point-of-sales, point-of-service, calling to a help desk, submitting a customer complaint, submitting a warranty claim or claim for violated service level agreement (SLA), returning a product, writing a comment on social media, submitting a “like” or similar emoticon satisfaction grade, making a payment for service, canceling a service, etc.



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CLASS DISCUSSION:

- Customer Touchpoints identify “control points” within the customer relationship process whereby two-way communication may occur to identify issues that concern customers and provide an organization with an opportunity to correct situations at the earliest possible moment. To achieve this outcome the communication content at each customer touchpoint must be known. For your project company how does this work?

Customer Touchpoint	Content of Two-Way Communications




29

30

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What information may be captured at a customer touchpoint?

What can you learn at the interface of your organization with its customers?

- Define “**the voice of the customer**” in terms of **requirements**.
- Identify “**customer importance**” of product and service **features**.
- Obtain insight into “**concerns and issues**” customers have with **deliverables**.
- Gain knowledge about **how customers use** your products and services.
- Build **relationships of trust** with customers by **servicing them with care**.
- Create a **mutually supportive relationship** that permits **open dialog**.
- Discover ideas to **increase customer value proposition** in your deliverables.




30

31

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CLASS DISCUSSION:

- Managing customer touchpoints requires active listening, capturing information that is important to customers, acknowledging customer concerns and issues, and responding to rapidly resolve the presenting issue while treating customers with respect and courtesy. In your project company what touchpoints exist and how do you manage them to assure customer satisfaction?

Channels of Communication	Content and Actionability of Feedback




31

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Lecture 3: Defining Customer Relationships




32

33

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EDUCATIONAL PROGRAM – SERVICE QUALITY:

- Lecture 1: Understanding Customer Requirements
- Lecture 2: Identifying Customer Touchpoints
- **Lecture 3: Defining Customer Relationships** ←
- Lecture 4: Monitoring and Managing Customer Feedback



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How does responsiveness relate to touchpoint management?

*Time is the **inventory of customer service** – manage it carefully so it does not become a source of waste to customers! Nobody likes to wait!*

There are two major aspects of time management in customer relations:

- **Acknowledgement of Listening and Committing to Respond:** Customers do not want to be ignored. It is important to rapidly acknowledge all of their communications and assure them you are interested in their concerns or issues. Don't make them wait to realize if they have been heard!
- **Rapid Permanent Resolution of the Problem or Issue:** Delivering a very fast time-to-resolution for issues and problems, coupled with a high first-time-problem-resolution rate assures that customers will become loyal as they build trust in a firm's reliability and responsiveness to problem situations.



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What time measurements are important to customers?

Time is the essential measurement of customer service performance:

Time is identified as a significant quality ingredient in most service companies and the emphasis is placed upon three elements:

- **Access Time** – The time that is elapsed between a customer’s first attempt to request a service and they successfully achieve this attention to initiate their service request.
- **Queueing Time** – The waiting time that a customer endures prior to being serviced – also important is following the principle of queue management so that “first-come, first-served” means that all people are treated equally.
- **Action Time** – The time between taking the customer order and delivering the service as requested (this applies to both delivery of the service as well as the timeliness of the payment process).



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What relationship must be developed with customers?

Designing for exceptional service requires intimate customer knowledge:

- How to consider what are the essentials of customer well-being in delivery of a service engagement? What is the impact of the provider of the service on the environment of the customer? Do service providers treat customers with respect?
- Elements of positive customer service:
 - **Atmosphere** – customizing the atmosphere of the place where service delivery is located to the tastes of customers.
 - **Information** – customers need to know what to expect and understand what are the opportunities and implications of the service offering.
 - **Feeling of importance** – customers expect attention, courtesy, respect, and to feel appreciated.
 - **Safety** – customers need to feel safe in the service environment.



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How does a customer touchpoint act as a “call to action”?

*Discovery of concerns, issues, or problems **MUST** initiate a “call to act” that will resolve the symptoms rapidly and permanently!*

- **Treat all customer communications as if they were “gold.”**
- Developing a **“customer-in” communication perspective** means that active listening is being used to hear, process, and understand circumstances and situations that create concerns or opportunities for your customers. This is a **“customer pull” process for information and ideas.**
- Relying on **“company-out” communications** means that you are imposing a message or commanding in your messages which operate like **“controlling”** types of communication; no dialog only **“preaching”** which tends to put off customers and create barriers to communication rather than bridges that lead to cooperation.

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There are many reasons to build positive customer relations:

Customer relationships are the cornerstone of exceptional service:

When meaningful relationships exist between customers and those organizations that supply them with services, there can be many **positive outcomes**, such as the following:

- **Customer experience improves**, which then will generate increased customer satisfaction, loyalty, and sales
- **Effectiveness and efficiency of service provision improve** as does the supporting transactional activities
- The **supplier of services develops specialized knowledge and skills** that enhance its ability to meet customers’ needs every time and perform better than competitors

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CLASS DISCUSSION:

- Creating an “imaginative understanding of customer needs” means that you can have “deep empathy” with the customer – understanding what are the “important” relationship dimensions and build an “appreciative understanding” of what it is that customer prefer and desire? In your project company identify the most important customer relationship dimensions and what is your understanding of expectations of your customers in each of these areas.

Relationship Dimension	Understanding of the Customer’s Expectation




39

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Lecture 4: Monitoring and Managing Customer Feedback




40

41

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EDUCATIONAL PROGRAM – SERVICE QUALITY:

- Lecture 1: Understanding Customer Requirements
- Lecture 2: Identifying Customer Touchpoints
- Lecture 3: Defining Customer Relationships
- **Lecture 4: Monitoring and Managing Customer Feedback** ←



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42

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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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43

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Service organizations must prioritize customer service time!

Responding to the critical nature of service time, organizations should:

- **Establish service quality standards** – the components of a service delivery or engagement process must be defined, and controls established to support standard that assure delivery of expected results (e.g., service level agreements (SLA) or guarantees).
- **Improve time performance** – studying cases of service failure permit the organization to discover where it is possible to improve performance time.
- **Design future services based on time** – service should be designed from the customer’s viewpoint of “elapsed time” in the customer engagement. The cumulative effect of “delay” means that service excellence in just one of the service ingredients may be destroyed by delays in another (e.g., the slowness in food delivery and payment processes may overcome the rapid seating in a restaurant).



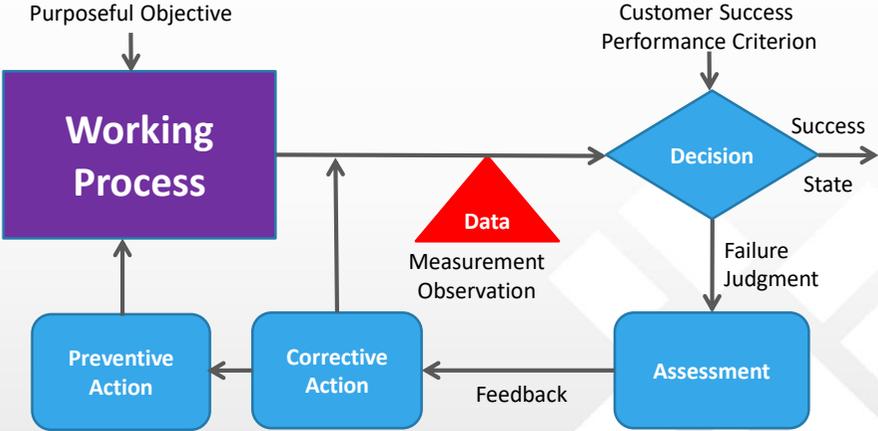

43

44

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Respond to process design issues with CAPA actions:



```

    graph TD
      PO[Purposeful Objective] --> WP[Working Process]
      WP --> D{Decision}
      D -- Success State --> S[Success State]
      D -- Failure Judgment --> A[Assessment]
      A -- Feedback --> CA[Corrective Action]
      CA --> WP
      A -- Feedback --> PA[Preventive Action]
      PA --> WP
      D --> Data[Data Measurement Observation]
      Data --> WP
  
```




44

45

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Managing a “Customer Touchpoint” follows the same process!

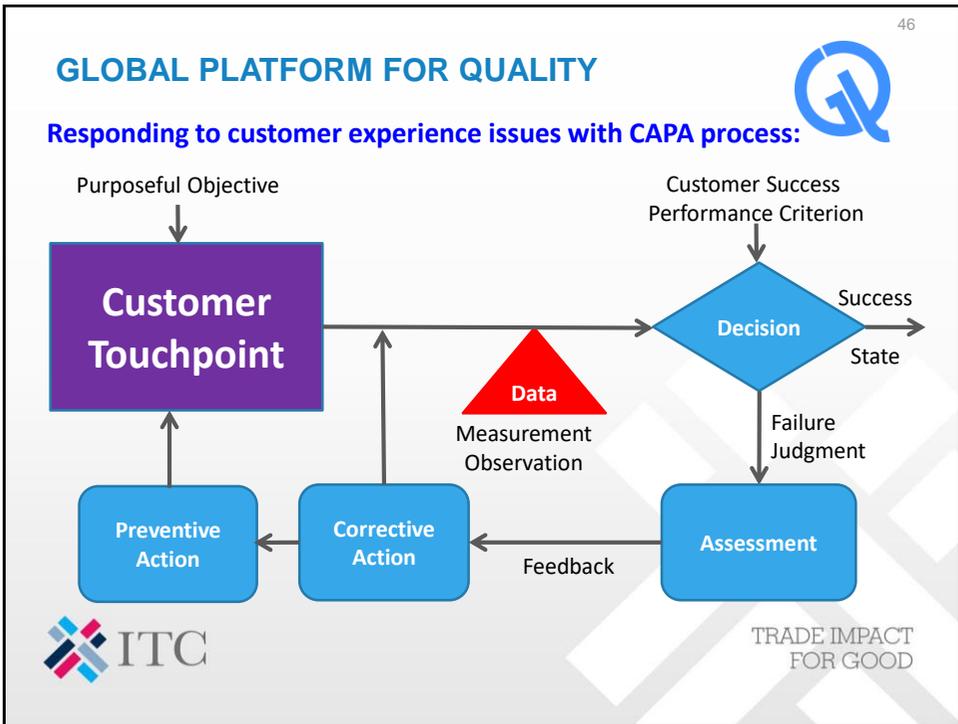
Customer touchpoints require the same analytical attention and corrective / preventive action as any other process control point:

- The CAPA model is intended to reduce the gap between a desired state and achieved state of performance.
- This is exactly the same situation with customer service – needing to close the gap between the customer expectation (desired state) and customer perception (achieved state).
- **Thus, we can substitute a customer touchpoint for the working process to create a model for managing the customer touchpoint!**



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46

47

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Customer experience monitoring requires process learning:
Single-loop learning must be continuously engaged at each customer touchpoint:

- Applying the “Triple-Loop Learning Model” to the relationship process of the customer engagement, it becomes clear that **managing the issues or concerns that arise at a customer touchpoint is a ‘single-loop learning process’ focusing on the question – are we doing things right?**
- The **service design** problem **is a “double-loop learning process” – focusing on the question – are we doing the right things?**
- The **management decision of determining what is the right service to deliver is a “triple-loop learning process” – how do we decide what is right?**



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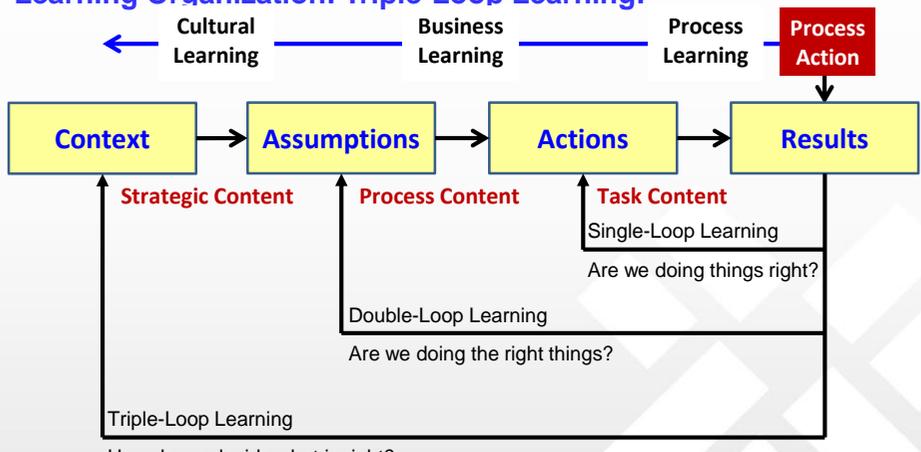
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48

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Learning Organization: Triple-Loop Learning:



← Cultural Learning — Business Learning — Process Learning — **Process Action**

Context → **Assumptions** → **Actions** → **Results**

Strategic Content Process Content Task Content

Single-Loop Learning
 Are we doing things right?

Double-Loop Learning
 Are we doing the right things?

Triple-Loop Learning
 How do we decide what is right?



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The world's oldest recorded customer complaint:

Recorded in the land of Ur around 2000 BC:



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Translation of this Sumerian cuneiform:

Ea-Nasir was a prominent merchant within Ur who specialized in the large-scale trade of metal blocks. He also worked in a business of formed metal commodities, food and fabrics.

"What do you take me for, that you treat somebody like me with such contempt?" a disgruntled customer named Nanni wrote to Ea-Nasir. "I have sent messengers to collect the bag with my money [deposited with you]. But you have treated me with contempt by sending them back to me empty-handed several times."

"How have you treated me for that copper? You have withheld my money bag from me in enemy territory." On top of that, Nanni provided a solution, "It is now up to you to restore [my money] to me in full."

Concluding, Nanni wrote, "Take cognizance that [from now on] I will not accept... any copper from you that is not of fine quality. I shall [from now on] select and take the ingots individually in my own yard. And I shall exercise against you my right of rejection because you have treated me with contempt."

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Dissecting a customer relationship issue:

How would you describe this relationship with the customer?

- What was the presenting cause?
- What escalated the situation?
- What caused the relationship to degrade?
- How could the issue have been stopped?
- When could this situation have been defused?
- Who has been wronged in this relationship?
- What could have prevented this situation?



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What should be done to improve this relationship?

Consider the advice of one of Ea-Nasir's colleagues:

- A man by the name of IIsu-ellatsu is believed to be one of Ea-Nasir's professional associates had also grown weary of Ea-Nasir's poor business practices. Consequently, in another tablet IIsu-ellatsu warns Ea-Nasir to behave. **“Act in such a way that [the customer] will not become angry.”**



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CLASS DISCUSSION:

- Discuss the questions posed in the “case of the curious cuneiform” in your team to determine the best answers. For each factor identified in the first column evaluate what could be the reason or what could have been done to improve the situation. Is this type of situation to improve customer relationships?

Problem Characteristic	Situation Diagnosis and Assessment
Presenting Cause	
Escalation Factor	
Cause of Degradation	
Response to Relive or Defuse	
Who was wronged	
What could have prevented	




53

54

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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 sources 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.




54

55

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What are specific measurable indicators?

After considering all of the potential sources of customer information to create a “*customer scorecard*” or “*customer dashboard*” then the focus should be placed on particular measures that are used to present trends in performance. Some examples of measurements include:

- **Timeliness of Service:** Each of the steps in a customer engagement is defined by its start and end time. The duration of these times can be compared with the desired service performance targets to determine where improvement is necessary.
- **Completeness of the Service:** Do the customers receive their order not only “on time” but also “in full” – were all of the service deliverables provided with the quality level that was advertised.
- **Consistency and Persistence of the Service:** Reliable service is consistent from delivery event to delivery event and across all customers.
- **Customer Satisfaction:** Compare the fulfillment of customer expectations as indicated by the customer perception of that fulfillment.




55

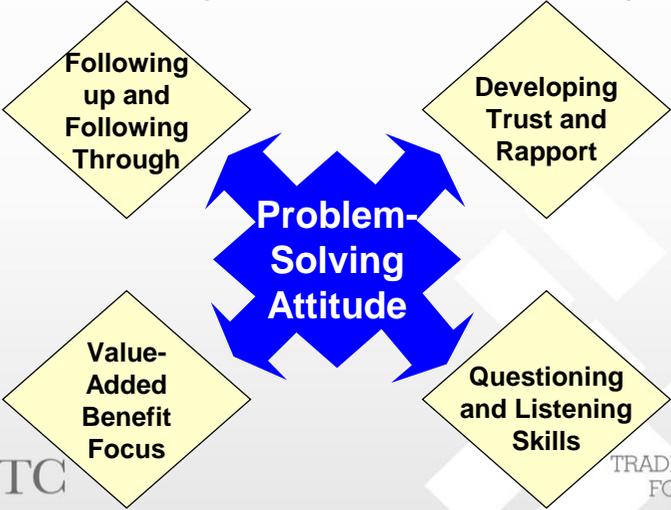
56

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Develop a problem-solving attitude toward your customers:

A model for relationship-based customer service delivery:






56

57

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Developing Trust and Rapport with Customers:

Embed the attitude “we are here to solve your problems” in all your employees.

- *If you don’t build trust and rapport with customers, then they may not want to share their needs and wants with you.*
- Communicate in language that the customer understands.
- This requires “**credibility**” – reasonable grounds for accepting claims and statements about your products. Third-party endorsements or awards are not enough – employees must themselves act in a credible way.
- Establishing “**deep empathy**” means viewing things from a customer’s angle.
 - How do your experiences align with the customer? What is relevant?
 - What would satisfy you in the customer’s circumstance? Also, what would dissatisfy you?
 - If you were the customer what response would you desire in this situation?



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Increasing Questioning and Listening Skills:

Effective questioning and listening skills are the success factors in customer communications and relationship-building.

- First, you need to **establish why customers want your services**. What will this product or service do for them?
- Building relationships with customers means **gaining their respect and their approval for the value that you deliver to them**. But, sustaining respect and gaining approval takes time; both positive experiences and appropriate dealing with failures in your performance. **Both provide an opportunity to create increased customer loyalty**. Customers then know that they can count on you and have confidence in you. This increases the credibility of your organization.



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Focusing on Delivery of Value-adding Benefits:
Offer solutions which uniquely fit the customer's expressed requirement:

- **Customization of products** (e.g., allowing changes to a restaurant's menu) **may be required to create a satisfactory product order** – but to achieve this outcome with good quality assurance, the kitchen must be willing and able to produce the desired change!
- **Alignment of each component in the service delivery process is required to assure that the customer benefits are delivered according to the way that the "voice of the customer" spoke at the time of ordering.**
- Front-line employees must be able to negotiate and consult with customers.



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Following-up and Following-through:
Customer engagement must be managed as an interactive process.

- **The provision of service is not a single step event, it is important to build good follow-up and follow-through skills that depend on understanding what happens in a customer's mind after a purchase, showing appreciation for the customer's business, and concern for the customer's well-being.**
- **Follow-up:** Monitoring a customer engagement to get feedback on how well it progressed – effectiveness, efficiency, satisfaction, etc. Discovering what is able to be improved in the service design and its delivery processes.
- **Follow-through:** to build a continuing relationship by creating future actions that can be accomplished (e.g., thank you note or text sent after a customer engagement is completed).



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CLASS DISCUSSION:

- What activities can be conducted using the Double Loop Learning process to fix or improve each of the four problem-solving attitudes necessary to improve customer relationships? Apply the knowledge of your project case study to identify a specific action in each of these four areas that could improve relationships with customers of your organization.

Problem-Solving Attitude Issue	Potential Improvement Activities
Develop Trust and Rapport	
Questioning and Listening skills	
Focus on Value-added benefits	
Follow-up and Follow-through	



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Global Platform for Quality

Quality Management System Design

Instructor: Gregory H. Watson, PhD, EURIng



1

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QUALITY 204: QUALITY MANAGEMENT SYSTEM DESIGN

ISO 9000 is a universally accepted standard for the design of a quality management system. This course describes the requirements of ISO 9000 and identifies how the previous courses in this curriculum provide the content that organizations must apply in addressing how they will comply with these requirements. This course is an overview of ISO 9000 which links to the Quality Specialist program and acts as a prerequisite course for ISO 9000 Assessor training. In this course a link between standard work, quality assurance, control and improvement will be developed and the responsibility of the quality professional for administration and auditing of this system will be described. This course will also develop a strategy to combine the development of a quality management system in a way that assures compliance to the principles and requirements of ISO 9000.



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EDUCATIONAL PROGRAM – QUALITY MANAGEMENT SYSTEM (QMS) DESIGN:

- Lecture 1: Understanding QMS Design Principles
- Lecture 2: Process Approach to ISO 9000
- Lecture 3: ISO 9000 and Risk
- Lecture 4: Managing with ISO 9000



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Joseph M. Juran on “Quality Management Systems”

“A company-wide quality function arises from the fact that **product quality is the resultant of the work of all departments** ... Each of these specialized departments has not only the responsibility to carry out its special function; it also has the responsibility to do its work correctly – to make its products fit for use. In this way each department has a quality-related activity to carry out along with its main function.”

~ Juran’s Quality Control Handbook, 4th edition, 2.4



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Quality Management System Design

Lecture 1: Understanding the Principles Behind
Quality Management Systems




5

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EDUCATIONAL PROGRAM – QUALITY MANAGEMENT SYSTEM (QMS) DESIGN:

- **Lecture 1: Understanding QMS Design Principles** ←
- Lecture 2: Process Approach to ISO 9000
- Lecture 3: ISO 9000 and Risk
- Lecture 4: Managing with ISO 9000




6

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Quality Management Systems (QMS) Overview:

Introducing the ISO 9000 family of quality standards:

ISO 9000 is a series, or family, of quality management standards, while ISO 9001 is a standard within the family. The ISO 9000 family of standards also contains an individual standard named ISO 9000. This standard lays out the fundamentals and vocabulary for quality management systems (QMS).

ISO 9000 Series of Standards

The ISO 9000 family contains these standards:

- ISO 9001:2015: Quality management systems - Requirements
- ISO 9000:2015: Quality management systems - Fundamentals and vocabulary (definitions)
- ISO 9004:2009: Quality management systems – Managing for the sustained success of an organization (continuous improvement)
- ISO 19011:2011: Guidelines for auditing management systems



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ISO 9000 is a Non-Prescriptive Standard

Standard Requirements are Based on Adherence to a Set of 7 Quality Principles:

- ISO 9000 provides general guidelines for the architecture and infrastructure of a quality management system; however, it does not specify what tools are to be applied nor does it make any judgment about which quality methods are most appropriate for a particular business application.
- Management is responsible for identifying the best approach that is most suitable for their needs (defining the approach); developing competence and skills in application of the methodologies in the system (deploying all chosen approaches); and assuring that results are achieved.



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ISO 9000 quality principles to promote organizational improvement:

1. Customer Focus

- Understand the needs of existing and future customers
- Align organizational objectives with customer needs and expectations
- Meet customer requirements
- Measure customer satisfaction
- Manage customer relationships
- Aim to exceed customer expectations



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10

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ISO 9000 quality principles to promote organizational improvement:

2. Leadership

- Establish a vision and direction for the organization
- Set challenging goals
- Model organizational values
- Establish trust
- Equip and empower employees
- Recognize employee contributions



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11

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ISO 9000 quality principles to promote organizational improvement:

3. Engagement of people

- Ensure that people's abilities are used and valued
- Make people accountable
- Enable participation in continual improvement
- Evaluate individual performance
- Enable learning and knowledge sharing
- Enable open discussion of problems and constraints



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ISO 9000 quality principles to promote organizational improvement:

4. Process Approach

- Manage activities as processes
- Measure the capability of activities
- Identify linkages between activities
- Prioritize improvement opportunities
- Deploy resources effectively



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ISO 9000 quality principles to promote organizational improvement:

5. Improvement

- Improve organizational performance and capabilities
- Align improvement activities
- Empower people to make improvements
- Measure improvement consistently
- Celebrate improvements



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ISO 9000 quality principles to promote organizational improvement:

6. Evidence-based decision-making

- Ensure the accessibility of accurate and reliable data
- Use appropriate methods to analyze data
- Make decisions based on analysis
- Balance data analysis with practical



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ISO 9000 quality principles to promote organizational improvement:

7. Relationship Management

- Identify and select suppliers to manage costs, optimize resources, and create value
- Establish relationships considering both the short and long term
- Share expertise, resources, information, and plans with partners
- Collaborate on improvement and development activities
- Recognize supplier successes



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CLASS DISCUSSION:

- How are the quality principles behind the ISO9000 Quality Management System made practical? Consider each of the principles in turn relative to your case study company. How does the principle help management understand what they should do to improve the quality of deliverables to customers of their products / services? Provide one example of an application for each principle.

Quality Principle	Application
Customer Focus	
Leadership	
Engagement of People	
Process Approach	
Improvement	
Evidence-based Decision-making	
Relationship Management	



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Quality Management System Design

Lecture 2: Process Approach to ISO 9000




17

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18


EDUCATIONAL PROGRAM – QUALITY MANAGEMENT SYSTEM (QMS) DESIGN:

- Lecture 1: Understanding QMS Design Principles
- **Lecture 2: Process Approach to ISO 9000** ←
- Lecture 3: ISO 9000 and Risk
- Lecture 4: Managing with ISO 9000




18

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Process Approach to Work Standardization – ISO 9000:2015

Establish the Business Context for your Operating System:

The Process Approach.

- A process approach to managing requires a QMS to consider the organization as a series of interlinked processes. Leadership should promote this and determine the needs as well as the expectations of all interested parties in its business.
- A process approach will identify and determine the key processes; define standards for how these process operate; and identify how the processes should be measured, analyzed, and evaluated.
- The QMS documents results of deploying the process approach so past performance can be used as a basis for continual improvement.



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The QMS must be facilitated by leadership to plan its actions:

Quality is a strategic activity to manage, avoid risk and seize opportunities.

- **Leadership**
 - Provide leadership by focusing on quality and customers
 - Provide leadership by establishing a suitable quality policy
 - Provide leadership by defining roles and responsibilities and delegating decision rights and fiduciary responsibility
- **Planning**
 - Define actions to manage risks and address opportunities
 - Set quality objectives and develop plans to achieve them
 - Control changes to your quality management system



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ISO 9000:2015 Defines and Improves Operations:

Daily management systems define the way operational work is conducted:

- **Operations**
 - Develop, implement, and control operational processes
 - Determine and document product and service requirements
 - Establish a process to design and develop products and services
 - Monitor and control external processes, products, and services
 - Manage and control production and service provision activities
 - Implement arrangements to control product and service release
 - Control nonconforming outputs and document actions taken



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Evaluation and Improvement Assure Continued Viability:

Competitiveness requires increased efforts at satisfying customers

- **Evaluation**
 - Monitor, measure, analyze, and evaluate QMS performance
 - Use internal audits to examine conformance and performance
 - Carry out management reviews and document your results
- **Improvement**
 - Determine improvement opportunities and make improvements
 - Control nonconformities and take appropriate corrective action
 - Enhance the suitability, adequacy, and effectiveness of your QMS



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Risk-Based Thinking Must be Embedded throughout the QMS:

Risk-Based Thinking considers current state and change possibilities:

- Establish a systematic approach to considering risk, rather than treating “prevention” separately in a QMS.
- Risk is inherent in all systems, processes and functions. Risk-based thinking ensures these risks are identified, considered and controlled throughout the design and use of business operations.
- Risk must be proactively managed, not reacting to failure but focusing on preventing or reducing undesired effects by early identification. It must build-in preventive action into the management system.
- Opportunity is not the positive side of risk. Opportunities are the sets of circumstances which makes it possible to do something. Taking or not taking an opportunity offers its own set of risk.




23

24

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CLASS DISCUSSION:

- There are many considerations in creating or building an excellent quality system for organizations. Some of the characteristics of a QMS are listed below. How are these characteristics observable in your project case study? Provide examples.

QMS Characteristic	Project-based Example
Process Approach	
Customer Requirements	
Risk-Based Thinking	
Business Context	
Evaluation Method	
Quality Records	
Leadership Action	




24

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Quality Management System Design

Lecture 3: ISO 9000 and Risk




25

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26

EDUCATIONAL PROGRAM – QUALITY MANAGEMENT SYSTEM (QMS) DESIGN:

- Lecture 1: Understanding QMS Design Principles
- Lecture 2: Process Approach to ISO 9000
- **Lecture 3: ISO 9000 and Risk** ←
- Lecture 4: Managing with ISO 9000




26

27

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What is the idea of risk in quality management?

Taking a Systems Approach to Risk:

- **Risk** is defined in **ISO 31000** as the effect of uncertainty on business objectives. Risks originate from many sources: they can come from uncertainty in financial markets, threats from project failures (which originate at any phase in research, design, development, production, or sustainment life-cycles), legal liabilities, credit risk, accidents, natural causes and disasters as well as deliberate moves by competitors, or events that have uncertain or unpredictable causes.
- **Risk management** is a process of identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities.



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28

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Steps in the process of Risk Management:

Risk management may be characterized as a process:



```

graph LR
    A[Situational Awareness] --> B[Observation and Identification]
    B --> C[Assessment and Evaluation]
    C --> D[Screening and Prioritization]
    D --> E[Treatment and Management]
  
```

- **Situational Awareness:** Making sense out of potential risks
- **Observation and Identification:** Perceiving and classifying risk
- **Assessment and Evaluation:** Analyzing alternatives and options
- **Screening and Prioritization:** Ordering risk response by criticality
- **Treatment and Management:** Taking action and achieving control



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Steps in the process of Risk Management – 1:

Situational Awareness: Making sense out of potential risks

```

    graph LR
      A[Situational Awareness] --> B[Observation and Identification]
      B --> C[Assessment and Evaluation]
      C --> D[Screening and Prioritization]
      D --> E[Treatment and Management]
  
```

- Identify the objectives of the process or product stakeholders
- Define the basis upon which risks will be evaluated
- Determine the action context and scenarios that could impose risk
- Identify and characterize the spectrum of potential risks
- Assess the vulnerability of the process or product to specific threats
- Evaluate unintended consequences of projected actions
- Characterize the degree of ambiguity in the external situation
- Clarify potential issues and concerns for achieving desired outcome




29

30

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Steps in the process of Risk Management – 2:

Observation and Identification: Perceiving and classifying risk

```

    graph LR
      A[Situational Awareness] --> B[Observation and Identification]
      B --> C[Assessment and Evaluation]
      C --> D[Screening and Prioritization]
      D --> E[Treatment and Management]
  
```

- Observe the situation to define the framework for actions
- Witness the process activity at the source of the risk
- Determine what events could trigger problems or benefits
- Evaluate scenarios internally and externally (e.g., at competitors)
- Identify the threats or failures that create the identified risk (e.g., risk of losing money, abuse of information, threat of human errors, accidents, or safety hazards, etc.)




30

31

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Steps in the process of Risk Management – 3:

Assessment and Evaluation: Analyzing alternatives and options



```

    graph LR
      A[Situational Awareness] --> B[Observation and Identification]
      B --> C[Assessment and Evaluation]
      C --> D[Screening and Prioritization]
      D --> E[Treatment and Management]
  
```

- Information must have integrity so that noise in the data does not overwhelm the signals that contain information.
- Information is the combination of the location of performance, the trend in performance and the consistency of performance.
- Statistical control is the state of process behavior where there are no unanticipated occurrences or unpredicted conditions.
- Without statistical control there can be no reliable prediction and risk will exist in the behavior of the process.




31

32

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Steps in the process of Risk Management – 4:

Screening and Prioritization: Ordering risk response by criticality



```

    graph LR
      A[Situational Awareness] --> B[Observation and Identification]
      B --> C[Assessment and Evaluation]
      C --> D[Screening and Prioritization]
      D --> E[Treatment and Management]
  
```

- Determine the probable severity of the impact of potential risks
- Rank the severity on a scale that defines the relative impact
- Assess the probability of occurrence of the risk trigger event
- Chart a combined risk indicator combining severity and probability
- Evaluate the independencies and dependencies among these risks
- Develop a composite risk index to rank risks for action planning




32

33

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Steps in the process of Risk Management – 5:

Treatment and Management: Take mitigating action to achieve control

```

    graph LR
      A[Situational Awareness] --> B[Observation and Identification]
      B --> C[Assessment and Evaluation]
      C --> D[Screening and Prioritization]
      D --> E[Treatment and Management]
      style E fill:#ffff00
    
```

- Design a new process with built-in risk control and containment
- Transfer risks to an external agency (e.g., using insurance)
- Avoid risks completely by closing down a high-risk business area
- Take action to:
 - **Avoid** – eliminate individual risks / withdraw from risky ventures
 - **Reduce** – optimize performance to inherently mitigate risks
 - **Share** – transfer risk by outsourcing hazards or insuring work
 - **Retain** – accept and budget for risky outcomes (e.g., warranty)
- Reassess accepted risks to determine if further action is required




33

34

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CLASS DISCUSSION:

- Risk management requires building awareness and developing keen assessment skills in analyzing and defining means to manage risk and keep it under control. In your project teams can you identify what are the dominant risks that your business faces and determine what are the major opportunities to mitigate that risk and keep it in a state of control so it does not adversely affect your business objectives?

Business Objective	Critical Risks to Manage




34



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Quality Management System Design

Lecture 4: Managing with ISO 9000



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36

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EDUCATIONAL PROGRAM – QUALITY MANAGEMENT SYSTEM (QMS) DESIGN:

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- Lecture 2: Process Approach to ISO 9000
- Lecture 3: ISO 9000 and Risk
- **Lecture 4: Managing with ISO 9000** ←



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Documentation Requirements and Control

Document what you do and do what you document:

- Quality documents such as work instructions, testing procedures and the records of the results of production activities and test results must be kept in a state of control. Individual records must be retrievable from the historical files and products must be traceable from the customer's product back to the source of original materials that are part of that product.
- Managing the documentation system is a major requirement of an ISO 9000 and requires significant attention to assure control is maintained in both the governing instructions and the records that report on the performance.



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Resource Management

People must be developed to assure competent practices:

- Resources must be dedicated to the development of quality management activities so it can become an effective system. Resources include both the test equipment and records management systems and the training that is required for operator skill and quality knowledge.
- Internal audits must be performed to assure management that they are fulfilling their responsibility for quality control.
- External audits must be performed to assure customers that the ISO 9000 system is operating effectively.



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Product Realization

Delivering quality products and services is the ultimate objective:

- Development of product and service requirements must be accomplished to meet customer needs. Product realization is the ability of deliverables of the quality management system to satisfy validated customer needs as they are defined in the market.
- Contracts and assurances of performance to customers and markets must be managed with integrity to assure that claims and advertisements are honest and supported by objective evidence of performance from the test results conducted during product or service development.



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Measurement Analysis and Improvement

If you don't measure and analyze your performance, you can't improve it.

- ISO 9000 requires that management determine what are the appropriate methods and statistical techniques to be used for measuring and analyzing product performance; however, evidence-based analysis is required.
- Improvements should be based upon such evidence and the evidence must be preserved in such a way that it can be evaluated by an third-party audit.
- Evidence may be either statistical or judgmental; however, objectivity in the methodology is a primary consideration for validity.



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CLASS DISCUSSION:

- What activities must be planned and managed to assure ISO 9000 certification and how should management embrace these activities into its daily management system? Consider your project case company and identify what needs to be done to gain compliance and maintain compliance with the ISO 9000 standard.

ISO 9000 Requirement	Daily Management Activities



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Global Platform for Quality

Basic Problem Solving for Quality Improvement

Instructor: Gregory H. Watson, PhD, EURIng



1

2

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QUALITY 205: BASIC PROBLEM-SOLVING FOR QUALITY IMPROVEMENT

This course defines the concept of a problem and presents an analytical process for conducting an inquiry into problem situations that results in a sound diagnosis of the problem condition and an effective remediation of its solution. It describes how to identify and solve problems using methods that have proven helpful for analyzing quality issues: flow charts to understand processes, fishbone diagrams to dissect processes into component functions, histograms to record frequency of failures of quality issues, failure analysis to identify sets of mechanisms by which failures occur, run charts to illustrate the time history of performance shortfalls, Pareto charts to analyze the occurrence of the failure events in order of frequency of occurrence, box plots to show the distribution of events over time, capability histograms to demonstrate performance with respect to targets, and individuals control charts to demonstrate process performance with respect to control limits.



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3

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EDUCATIONAL PROGRAM – BASIC PROBLEM-SOLVING:

- Lecture 1: Understanding the Nature of a Problem
- Lecture 2: Solving Problems as a Learning Process
- Lecture 3: Diagnosing the Causal System of Problems
- Lecture 4: Achieving Remediation of Problems



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Frank M. Gryna on “Problem statements”

“A **Problem Statement** identifies a visible deficiency in a planned outcome: e.g., “during the past year, 7 percent of invoices sent to customer included errors.” Note that this statement is specific and manageable (it names a specific and limited process) and it is observable and measurable (describes the size of the problem). A problem statement should never imply a cause or a solution.”

~ Frank M. Gryna, Quality Planning and Analysis, p. 62.



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Basic Problem-Solving for Quality Improvement

Lecture 1: Understanding the Nature of a Problem




5

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6

EDUCATIONAL PROGRAM – BASIC PROBLEM-SOLVING:

- **Lecture 1: Understanding the Nature of a Problem** ←
- Lecture 2: Solving Problems as a Learning Process
- Lecture 3: Diagnosing the Causal System of Problems
- Lecture 4: Achieving Remediation of Problems




6

7

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What is a problem?

“Putting out fires is not improvement.” ~ W. Edwards Deming

- A **gap** between the current state and desired state.
- An **unwelcome situation** that needs to be improved or overcome.
- An **obstacle that hinders achievement** of a particular goal or objective.
- The **difference between an ideal state and the actual state** of things.
- An **inquiry that starts from a given condition** to achieve performance gains.
- A **riddle that requires concentrated thought** to resolve.
- It is **something to be worked out and solved**.
- A **problem is a problem if it is perceived to be a problem**.



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How should we think about problem-solving approaches?

There are many ways to solve a problem – some of them even work!

- Daniel Kahneman identified two systems of thinking which apply also to the idea of problem-solving: System 1 is an emotional approach that is based on subjective, inductive thinking while System 2 is a logical approach based on sound use of deductive methods. System 2 logic maybe considered as the engineering approach to decision-making while System 1 is a rationalistic or judgmental approach based on generalizations and heuristics.
- Most management decisions are based on System 1 thinking while most of the operational/engineering decisions are based on System 2 thinking.
- System 1 generalizations are learned from experience; however, they may not be formally structured. If they are influenced by System 2 logic then their quality is improved greatly.
- Kahneman concluded that the best decision-making approach blends these two methods. This is the approach that is developed in this course.



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How to judge that a problem-solving method can deliver good results?

There are three criteria for judging the quality of a problem-solving process:

- **Breadth of Application:** The methodology can be adapted across a broad spectrum of problem types from human-based or interpersonal problems to technical, engineering-based and from macro-system problems to micro-system problems. The methodology should describe how it is best applied.
- **Power to Resolve Problems:** The methodology should demonstrate ability to deliver problem solutions within the breadth of its application. Either by case study or by demonstration, the methodology should prove effective in the context of its application and within the resource constraints available to an organization or team.
- **Ease of Application:** The problem-solving team or problem-solver must be able to apply the methodology without undue difficulty.



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How will this course prescribe a problem-solving method?

Approach: Blended methodology for collaborative analytics:

- **Heuristics:** Prescriptive methods developed based upon experiences which demonstrate their utility. Approaches like problem decomposition (e.g., stratification): problem tracking (e.g., the 5 Why's); conceptual analysis (e.g., comparison of "is" and "is not" conditions of a problem state), and information analysis (e.g., mind-mapping). Such methods can display new ways of looking at the problem but need supplemental tools to find causes.
- **Graphics:** Visual representations of the problem according to a dimension that may be illustrated graphically – process flow, data flow, tree diagram, fishbone diagram, Gantt Chart, etc. These graphics illustrate associations but do not indicate "strength" of the association that is drawn.
- **Analytics:** Statistical methods can illustrate overall variable performance (enumerative view) or the time series perspective (analytic view) of the data. The Enumerative view defines probability and risk while the analytic view enables root cause analysis.



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What is the meaning of “collaborative analytics” in problem-solving?

Collaborative Analytics – Problem-Solving in a Data-Intensive Age:

- **Collaborative Analytics** represents the convergence of: accessible, massive data bases of raw information; unlimited computing power available through cloud technology resources; highly flexible logical algorithms for searching and sorting data according to patterns established through multi-variable attributes for textual meaning as well as spacial and temporal attributes; and a wide variety of available analytics which can be commented upon and interpreted by a distributed network of human analysts. In this model data, processing power, and human analysts are distributed and their unique strengths are collaboratively integrated to solve problems.



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What questions need to be addressed in a problem inquiry?

Methods and Tools can help to reveal a problem’s true nature:

- **Issue Definition**
- **Operational Definitions**
- **Problem Statement**
- **Process Dominance Nature**
- **Process Flow Analysis**
- **Functional Decomposition / Fishbone**
- **Measurement Interpretation Rules**
- **Drill-down Logical Process**



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How should a customer issue be defined and described?

Defining customer Issues clearly is also a critical-to-success factor:

- **Issue:** a concern that arises as a difference between customer expectation and their observations or perceptions with respect to these expectations. The issue defines the basic anatomy of a presenting negative experience.
- Identify the issue – what circumstance is out of control?
 - Specify the performance indicator that needs to be addressed.
 - Define both current and desired states of performance.
- Evaluate the factors involved in this issue:
 - Who does it affect? Where is it taking place?
 - What would be the outcome if the this is not corrected?
 - When does this need to be fixed (sense of urgency)?
 - Why is it important for this to be fixed?
- Define the issue to be addressed as a problem statement.



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METHOD / TOOL REVIEW: ISSUE DEFINITION

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Issue Definition	



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How is agreement on the issue achieved among team members?
Operational definitions provide the basis for establishing transferrable meaning between the members of a problem-solving team.

Operational Definition: Statements that provide a common and accepted way to describe terms that are important in a shared communication environment.

- Operational Definitions **remove ambiguity** and assure that everyone has the same understanding or meaning for common language is used for key terms in their shared work.
- They provide **precise descriptions about how to value a characteristic** that is of importance (e.g., problem definition, measurement definition, etc.). It includes an identification of logical sub-groups that compose the term; the boundary conditions that establish the limits of its meaning; and formulae or calculations that demonstrate what is measured; how key performance indicators (KPI) are calculated and assures that results are repeatable and reproducible.



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METHOD / TOOL REVIEW: OPERATIONAL DEFINITION

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Operational Definition	



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What goes into a problem statement?

Defining a problem is essential as there are usually no easy answers:

- What necessary information must be included in a **problem statement**, so it is clear, and it communicates accurately the improvement focus area? The statement of a problem is most clearly described using the performance measure and defining how it should change (e.g., must it increase in level, decrease in level, or maintain stable outcomes within action limits).
- Additionally, problem statements should identify where performance gains are needed – the specific change required, and the specific location where change should be made.
- For example, consider these problem statements:
 - **Decrease cycle time** for **emergency room patient admittance**.
 - **Increase satisfaction with food service delivery** for dinner meals at the **Quality Restaurant**.
 - **Control check-in time** at the front desk reception for new hotel guests.




17

18

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METHOD / TOOL REVIEW: PROBLEM STATEMENT

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Problem Statement	




18

19

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How does 5 W + 1 H specify a problem statement?

5W + 1H is a shorthand for specifying a problem statement:

- This set of **six interrogatory questions** help gather information that will clarify the ‘symptomatic’ issue that has been observed in the gemba and turn the observations into a more factual premise from which a problem statement may be initiated.
- When an issue is identified, a series of queries should be pursued to answer: What (object)? Who (subject)? When (time)? Where (location)? Why (purpose)? and How (method)? This sequence of questions may provide greater clarity than the ‘5 Why’s’ when workers are not greatly familiar with a process.

What happened?
Who was there?
When did it happen?
Where did it happen?
Why did it happen?
How did it happen?

These questions help to organize thinking about an issue, problem, or a concern.




19

20

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METHOD / TOOL REVIEW: 5 W + 1 H

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
5 W + 1 H	





20

21

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How does process dominance reveal problem information?

The type of process dominance tells where solutions may be forthcoming:

- Often there is a single variable that will dominate in its contribution to the performance of an overall process. In a physical process the usual forms of dominance are elements such as: setup-dominance, time-dominance, component-dominance, worker-dominance, and information-dominance.
- Processes will vary in terms of the appropriate performance measures as well as the degree of ability to self-regulate or control quality in their results.
- Patterns of activities that dominate a process also provide the key for their effective control and each dominance pattern will employ different types of control mechanisms to produce effectively stable results.



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22

Mode of Process Dominance	Description of the Mode of Process Dominance	Related Process Control Methods and Mechanisms Recommended
Setup Dominance	Process has high stability for within-batch operations, no repeatability between each of the batches.	Studies of set-up operations using a Japanese method called SMED are highly recommended, supported by machine capability studies.
Time Dominance	Process suffers progressive change over time due to its physical degradation.	Monitoring process performance using time series analysis of critical process measures (SPC chart).
Component Dominance	Process quality varies as a function of part or material quality or part variations between suppliers.	Monitoring process performance by logical sub-group the component parts and identification of suppliers as basis for evaluating SPC charts.
Worker Dominance	Process performance will depend on the knowledge, skill, or knack of a worker.	Monitoring process performance by logical sub-group of the individual workers or work teams using SPC to indicate non-conforming events.
Information Dominance	Processes are subject to the frequent change of control or product information.	Setup inspections and audits of the document revision and control of all changes to documents.



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23

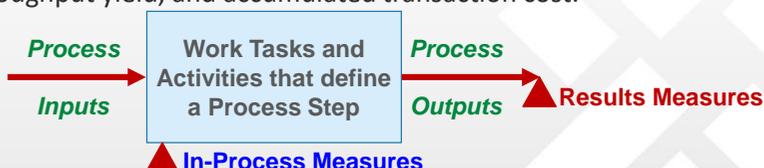
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How can work be identified as a sequential flow of activities?

Applying process maps to identify flows of value creation/destruction in work

A process map provides detailed representation of process steps and defines the flow of work activities, deliverables from one step to the subsequent step, and measurement observation points that define the work process. Process measures in each of the process steps ("X" measures) are used to control performance and define results for the overall process using measures like: value-adding cycle time, rolled throughput yield, and accumulated transaction cost.



NOTE: Define and label all flows, steps, and measures in the process sequence.

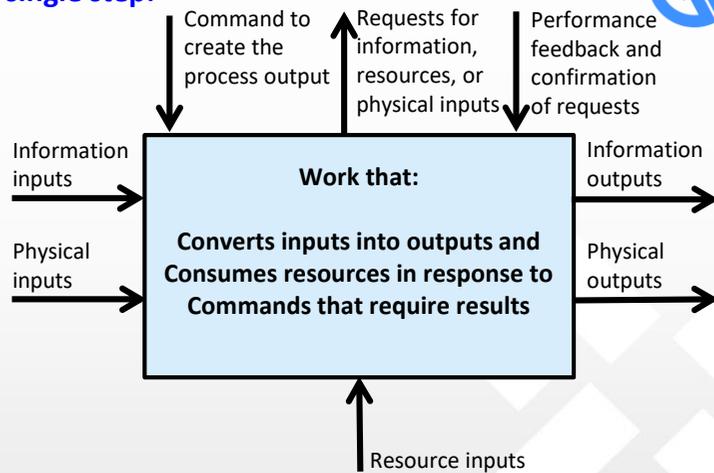



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24

Visualizing fundamental work process activity in a single step:





All processes have similar types of components.




24

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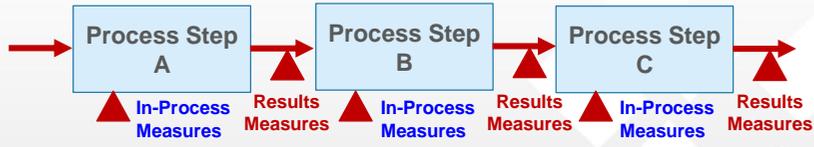
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How can work be identified as a sequential flow of activities?

Applying process maps to identify flows of value creation/destruction in work

Process maps trace the throughput flow of inputs across processes as they are transformed into outputs. It identifies the sequential flow of work activities as this transformation occurs and identifies how performance measures of work process effectiveness (productivity), efficiency (cycle time), and economy (cost) change as the work moves through the sequence of tasks.



Activities occur both *within the process step* and as flows occur *between the process steps*. Both should be defined. Internal process measures should be the same and accumulate to define overall throughput performance.




25

26

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METHOD / TOOL REVIEW: PROCESS MAP

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Process Map	




26

27

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What tasks can be considered to add customer value?

Not all things accomplished in a process activity actually add value that will be appreciated by customers.

- **Value-Adding Time (VAT):** Work that is done which advances the internal productivity and is considered as supporting customers with value (as this is judged by customers).
- **Non-Value-Adding Time (NVAT):** Work activities that produce waste, loss, or inefficiencies that reduce the value of process output and are not thought to be value contribution by customer (not worth the expense that it consumes.)
- **Required Non-Value-Adding Time (RN VAT):** NVA activities that must be done even though they do not add value to customers (i.e, ISO 9000 certification).

INTERPRETATION KEY:

	Value-adding Time (%)
	Non-value-adding Time (%)
	Required Non-value-adding Time (%)




27

28

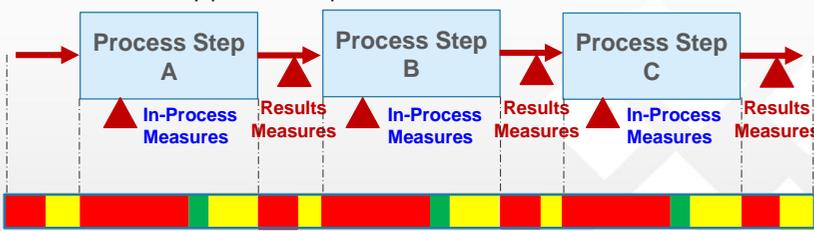
GLOBAL PLATFORM FOR QUALITY



How can work be identified as a sequential flow of activities?

Applying process maps to identify flows of value creation/destruction in work

Value Stream Analysis evaluates the content of each process step and flow to determine how much waste is produced as a function of the elapsed time for the performance of the work or the flow activity. A Value Stream Map (VSM) can be added to any process sequence flow as illustrated below:



INTERPRETATION KEY:

	Value-Adding Time (%)
	Non-Value-Adding Time (%)
	Required Non-Value-Adding Time (%)




28

29

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METHOD / TOOL REVIEW: VALUE STREAM ANALYSIS

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Value Stream Analysis	




29

30

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Stratification identifies rational sub-groups for in-depth analysis:
Stratification helps to organize problems and processes for investigation.

- Stratification analysis takes a collective group (e.g., suppliers) and divides it according to some rational scheme for further segmentation or analysis (e.g., mechanical parts, electrical parts, etc.). This stratification scheme can be varied by making further decompositions – for example: by location, by commodity, by size, by volume of business, etc.
- The concept behind stratification is that items within a group share a set of characteristics that are common while the distinctions between the groups are sufficiently different as to warrant separation in a further analysis.




30

31

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What are the functional elements contained in the problem?

Describe how functional structure underlies the process flow:

- Processes can be decomposed into functions and a Fishbone diagram illustrates a functional decomposition using seven fixed categories (“7 M’s”) to identify the logical sub-groups that are categorizable by the degree of control that they have over the process outcome (without significant investment or process change).
- Measurable factors that can be observed at each function are identified based upon ability to control performance of the process: contributes to control of the process (C); measurable aspect of the process but not related to in-process control (M); measurable and controllable factor that has the ability to influence process outcomes (X); noise factors that are not able to control or influence process performance without investment in process redesign or changes in the process recipe (N).




31

32

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What are the functional elements contained in the problem?

Describe how a fishbone diagram maps functional structure of a process:

C = Controllable factors that can be fixed in equipment, controlled by measure or managed during input
 N = Noise: uncontrollable factor that cannot be changed without additional resources or process redesign




32

33

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METHOD / TOOL REVIEW: STRATIFICATION BY FISHBONE DIAGRAM

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Fishbone Diagram	




33

34

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Performance measures provide may hints about process issues:
Embedded in the logic of a measurement system are lessons to be learned:

- The family of measures indicates what dimension of performance has now become problematic (product or service quality, performance cycle time, cost of transactions or materials, motivation or safety of workers).
- The measure itself will also imply a direction of expected performance to achieve “results” – bigger is better, nominal is best or smaller is better.
- The magnitude of the measure may establish limits for acceptable results that are desired or unacceptable results to be avoided (BOB and WOW).




34

35

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What does the statistical distribution tell us about a problem?

Distributions tell the story of process performance over time:

Rules to Measure Goodness:

What desired direction must a measure achieve?

Bigger is Better – The larger the value of the measure, the better the result indicated (e.g., productivity, revenue, profit, etc.)

Nominal is Best – When a process operates at its average then this is the best result (e.g., on-time delivery, physical tolerance, etc.).

Smaller is Better – The smaller the value of a measure, the better the result indicated (e.g., defects, cycle time, accidents, etc.)



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36

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What does the statistical distribution tell us about a problem?

Distributions tell the story of process performance over time:

Rules to Evaluate Data Performance Limits

When evaluating performance level of any result there are two points to observe:

Best of the Best (BOB) – The observed data point that gives evidence of the BEST level of performance that has been achieved.

Worst of the Worst (WOW) – The observed data point that give evidence of the WORST level of performance in the given historical period.



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37

Rule: Smaller is Better

Rule: Nominal is Best

Rule: Bigger is Better

BOB WOW

WOW BOB WOW

WOW BOE

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37

38

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METHOD / TOOL REVIEW: DISTRIBUTION ANALYSIS

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Distribution Analysis	

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38

39

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What is the requirement for demonstrating causality?

Causality implies that whenever one factor changes then it stimulates change in the process output. Four conditions that must be satisfied to demonstrate causality:

1. A causal event is **logically connected** to its effect (relationship is traceable)
2. A causal event **precedes** the effect in time (tightly or loosely coupled)
3. A causal event and the effect exhibit strong **statistical correlation**.
4. There are **no alternative explanations** for the effect than the cause (if this is true, then this causal event may be considered to be a “root cause”). This “root cause” relationship should be demonstrated using a well-controlled experiment where the suspect root cause “X” is manipulated to determine the probability that the suspected effect, the outcome or “Y”-measure, will occur with high regularity.



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39

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What logical path should be pursued to search for the problem causes?

- Effects of causes tend to be higher order performance measures such as total productivity of a process. These outcome measures (“Y” measures) are the result of lower level process actions that may be measured at the work process level (“X” measures).
- Thus the search for causation pursues what may be called a “drill-down” logic whereby the top-level processes or measurements are divided into sub-groups that have rational coherence (e.g., same location, same source of material or same supplier). This decomposition can follow process flow or data flow to discover where the origin of the issue occurs within process sequence of activities. The “root causes” meets the defined criteria and it can be evaluated by changing the “X” factor to observe what happens in the “Y’s” measurement effect.



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41

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How can the “5 Why’s” be used to guide the drill-down?

- The “5 Why’s” is an iterative process used to conduct an inquiry into the causative nature of a problem. The investigator asks “why” serially to discover the linkage between the presenting issues in a situation and the true underlying problem. The line of questioning “drill’s down” from the top level of the problem symptom through the process flow or data flow to trace the sequence by which the problem reached its point of detection. By the time “Why” is asked five times the investigator will most probably arrive at the original cause.
- Note that the “Why” question may be changed to “Where” as a way to trace locations – for instance by using a spaghetti diagram.
- The answer to the “5 Why” or “5 Where” questions can also use evidence-based data analysis rather than informal anecdotes to trace process and/or data relationships from the presenting cause to the root cause.



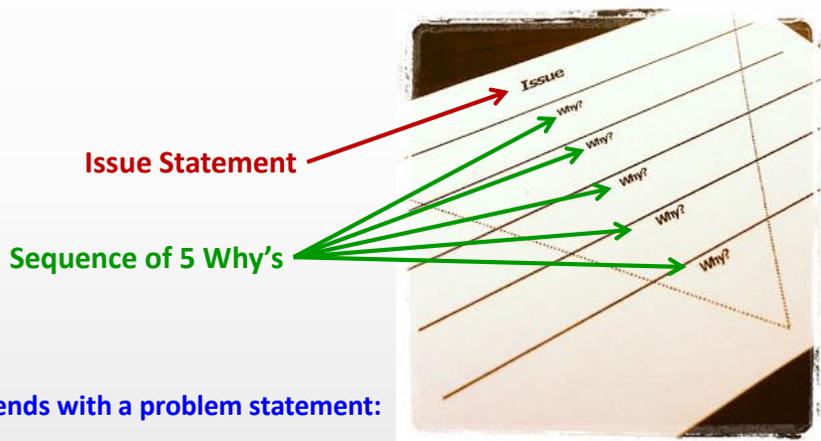

41

42

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A “5 Why’s” search begins at the presenting issue definition:



It ends with a problem statement:




42

43

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How can learning be coaxed out of a problem inquiry?

The “5 Why” logic can be used to guide a search into a process to find risk:

- When a presenting issue is first identified it can serve as “ground zero” for the problem investigation. Go to the point where the presenting issue was initially observed and ask the observer why it occurred. Then walk the flow and pursue sequential questioning with the “Why” question to each location that is a perceived source of the problem. This way the origin of a problem may be located. However, there is probably more to be determined at the point of origin than just its location. This probable cause may require further and deeper analysis to determine what is actually happening to create the process upset.
- Analytical tools may supplement the 5 Why method to reveal data patterns that indicate an underlying causal structure.



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44

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METHOD / TOOL REVIEW: 5 WHY'S

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
5 Why's	



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CLASS DISCUSSION:

- The beginning of the problem-solving process is a diagnostic journey or search to discover what is the structure of the situation. It examines the flow of work as well as the flow of data from the highest level of abstraction to the most detailed level of concreteness. This search separates what is relevant to the problem from what is not relevant and may be eliminated as immaterial to a presenting issue. In your project teams you have done a lot of analysis. How would these tools have helped you to more effectively or efficiently address those problems? Which of the tools would have been helpful (IS) and which would not (IS NOT)?

Related to Problem (IS) – Included	Not Related to Problem (IS NOT) - Eliminated



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Global Platform for Quality

Basic Problem-Solving for Quality Improvement

Lecture 2: Solving Problems as a Learning Process



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46

47

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EDUCATIONAL PROGRAM – BASIC PROBLEM-SOLVING:

- Lecture 1: Understanding the Nature of a Problem
- **Lecture 2: Solving Problems as a Learning Process** ←
- Lecture 3: Diagnosing the Causal System of Problems
- Lecture 4: Achieving Remediation of Problems



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47

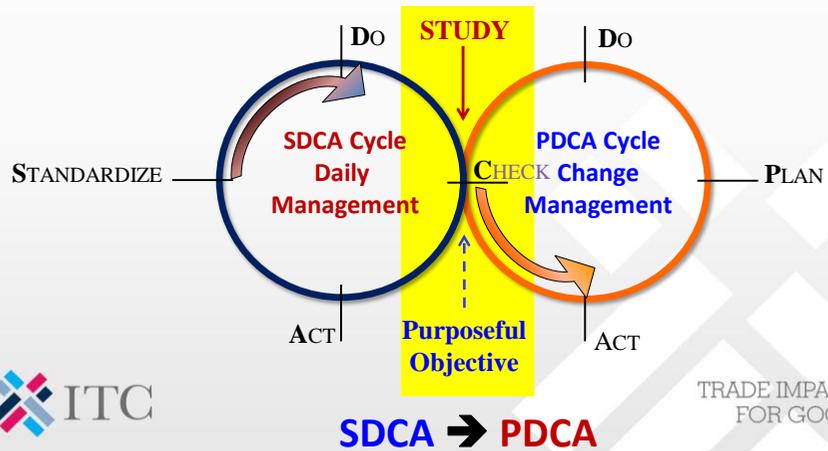
48

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How is standard work also a part of the problem-solving process?

- What does the following quotation mean to you:
 “Without a standard there can be no improvement.”
 ~ Joseph M. Juran



SDCA → PDCA



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49

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The “Check” step in SDCA-PDCA is a critical problem-solving point!
“Check” is a pivot point between standardization and change management.

What happens in the “Check” step of SDCA-PDCA?

- **Performance is evaluated** against standards, historical records, and targets.
- **Reflection occurs** regarding learning how process performance really works.
- **Problem-Solving is conducted** to evaluate issue causality from measures.
- **Experiments are made** to define the performance boundaries and ability to meet expectations implicit in operational performance hypotheses.
- **Decisions are made** to start Improvement projects applying new resources.



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50

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The “Check” step also conducts the CAPA process!

Purposeful Objective

Customer Success Performance Criterion

Success State

Problem Statement

Feedback

Measurement Observation

Data

Preventive Action

Corrective Action

Assessment

Decision

Performance Issue



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50

51

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Process learning occurs during a problem investigation:

Applying a logical step-by-step approach is the best way to root out causes:

- There are three levels of depth to which problems may be analyzed.
 1. Analyzing the presenting causal structure to determine what is the root cause of the problem – classical problem-solving.
 2. Analyzing the methods applied to determine why chronic causes will occur in a system – structural analysis of the adequacy of methods.
 3. Analyzing the infrastructure of measurement systems and process architecture to determine if the performance focus areas are right.




51

52

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Process analysis starts the learning experience:

← Cultural Learning — Business Learning — Process Learning — **Process Action**

Context

→

Assumptions

→

Actions

→

Results

Strategic Content Process Content Task Content

Single-Loop Learning
Are we doing things right?

Double-Loop Learning
Are we doing the right things?

Triple-Loop Learning
How do we decide what is right?




52

53

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The SDCA-PDCA Check step interacts between permanence and change:

Process learning occurs within the SDCA-PDCA “Check” step to decide what is most in need of attention – continued operation at the level of work that is being conducted or improvement in its performance level by changing work:

- The first step toward problem-solving is to establish an infrastructure so it is a natural part of the process management activity – process flows are known; work tasks are understood; failure mechanisms are investigated; performance measures are supported by data collection systems.
- This process infrastructure should be applied across the entire system of the end-to-end business process architecture to create a strong capability for rapid problem-solving. Then, problem-solving methods may be applied.



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53

54

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What is the detailed “Check” process and how are specific tools applied?

Collect Process Performance Data

Compare Outcome Results to Standards

Evaluate Overall Process Capability

Evaluate Overall Process Stability

Define Corrective / Preventive Actions

Determine Causal Relationships

- Define the process infrastructure
- Analyze process flow and results
- Identify instability points in the flow
- Study cause-effect relationships
- Eliminate special causes of variation
- Develop a plan for improvement of the end-to-end system

*Value Stream Map
SDCA-PDCA*

*Stratification Analysis
Fishbone Diagram*

*Pareto Chart
5 Whys*

*Failure Analysis
Yamazumi Diagram*

*Run Chart
Capability Study*



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55

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What learning occurs within quality problem-solving?

What is the learning process necessary to find the true causes of problems?

- Start with the issue definition, problem statement and value stream map.
- Walkthrough the process and collect data about the problem at its location
- Decompose problems into process and measurement rational sub-groups.
- Analyze potential failures to examine problem mechanisms and determine potential causes that could create the observed situation.
- Develop an overall histogram of performance output measures and then develop a step-by-step Yamazumi diagram to illustrate the location of key opportunities for work streamlining and efficiency development.



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CLASS DISCUSSION:

- Learning about the nature of a problem requires developing a deep understanding of the customer expectations that the process is required to fulfill and determining where the shortfall is occurring. The process starts with describing thoroughly what is the “presenting cause” or the issue that needs to be defined from the customer perspective and then developing an objective problem statement to be pursued by the team. These activities occur within a “Study” activity that occurs as a part of the “Check” step in the SDCA-PDCA cycle. Select a problem that your team has analyzed in your project, develop an Issue Definition and Problem Statement, then assess what learning your team captured from this process. Was this distinction helpful?

Methodology Applied	Insights obtained from the study
Issue Definition	
Problem Statement	



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Global Platform for Quality

Basic Problem-Solving for Quality Improvement

Lecture 3: Diagnosing the Causal System Problems




57

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58

EDUCATIONAL PROGRAM – BASIC PROBLEM-SOLVING:

- Lecture 1: Understanding the Nature of a Problem
- Lecture 2: Solving Problems as a Learning Process
- **Lecture 3: Diagnosing the Causal System of Problems** ←
- Lecture 4: Achieving Remediation of Problems




58

59

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How should the risk and failure analysis process be organized?

Define the potential consequence of process degradation or failure:

- The purpose of risk and failure analysis is to find where flaws or faults can be hiding undetected in the systems processes. Conduct risk analysis with special emphasis on steps in a Work Process Analysis and at the location of Customer Touchpoints. Analyze potential failures to examine problem mechanisms and determine those potential causes that could create the observed situation.
- Use the pathway of product deliverable development process steps to find what failures are possible and mechanisms create the failures. Objectively evaluate the severity and probability of risks discovered in the process.
- Eliminate or mitigate the most severe and most frequently occurring risks first, and if risks cannot be eliminated then develop contingent plans to deal with circumstances that could trigger the risk event.

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60

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How can you perform a Potential Problem Analysis (PPA)?

What are the steps involved in evaluating risk and failure opportunity?

Develop an objective approach to defining risks, evaluating their severity, and assessing their probability of occurrence:

1. Identify the potential problem or issue that can arise.
2. Enumerate all of the potential effects that can occur if the risk happens.
3. Determine the likely causes for each of the effects that is observable.
4. Describe the severity of the effect using a standardized, objective scale.
5. Estimate the probability of the issue using evidence-based data decisions.
6. Analyze the situation to identify actions that could prevent this occurrence.
7. Define the contingent actions that need to be taken if the risk is manifest.
8. Identify what events might trigger implementation of the contingent action.

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Potential Problem Analysis (PPA) Template:

A **Potential Problem Analysis** (PPA) is a systematic method used to uncover and deal with potential problems that are reasonably likely to occur and therefore worthy of attention. A PPA can be used to evaluate a project plan or process problem to determine areas of potential risk where there may be opportunities for failure. The logic to address the PPA was presented on the prior slide. The format for recording information is as follows:

POTENTIAL PROBLEMS							ACTIVITY:	
PLAN/ACTIONS /TASKS	POTENTIAL PROBLEMS	EFFECTS	LIKELY CAUSES	S E V	O C C	PREVENTIVE ACTIONS	CONTINGENT ACTIONS	TRIGGERS FOR CONTINGENT ACTION




61

62

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What scale should be used for severity and probability?

The scales should be designed to reflect degree of certainty in the estimates and each ranking level should be anchored with an understandable real-world example that is well-known to the evaluation team and agreed upon.

<p>SEVERITY:</p> <p>High - Will have a very strong negative impact on human safety or business operations</p> <p>Medium - Failure mechanism will disrupt normal operation or cause minor injury</p> <p>Low - Failure occurrence can create a nuisance to the using customer.</p>	<p>PROBABILITY:</p> <p>High - Failure incident is very highly likely to occur regularly</p> <p>Medium - Strong potential for failure to occur on an irregular basis</p> <p>Low - Unlikely for failure to occur in normal operation</p>
--	--



No matter what scale is used it must be objective, broad enough to demonstrate a practical spread in the data scale.



62

63

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METHOD / TOOL REVIEW: POTENTIAL PROBLEM ANALYSIS

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Potential Problem Analysis	




63

64

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Check sheets record data about problems, issues or incidents:

They are a tool to record situations that are predicted and classified using the rational sub-groups that define the expected risk or failure mechanisms:

- The Check Sheet allows workers to record data about observed process upsets in a way that enables easy follow-on analysis.
- Check Sheets record events occur at a particular process measurement check point which indicate defects or nonconformances that are failures to deliver the expected performance as specified for the process deliverable at that point in the process flow. Operators just place a mark in the box for the category of observed defect. This data can be further analyzed using a variables or attribute histogram (Pareto Chart), or run chart to understand the distribution or sequence in the operational time series which further exposes the causal situation of the observed failure or noncompliance.




64

65

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Check Sheet Example:

Check sheet for the quality of the customer service engagement in a restaurant.

Complaints must be recorded for both product and service issues.

Form must be very easy to complete.

Complaint	Product Quality		
	Menu Item		
	A	B	C
Portion Size			
Seasoning/Spice			
Cooked Poorly			
Heat			
Other			

Complaint	Service Quality		
	Server		
	A	B	C
Attitude			
Responsiveness			
Order Handling			
Billing Mistake			
Other			

Comments may be added to record additional data to amplify a “check” item and provide a more complete definition of the issue (e.g., heat of food – too cold or too hot, etc.)

65

66

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METHOD / TOOL REVIEW: CHECK SHEET

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Check Sheet	

66

67

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How should the process operate compared to how it actually does?
Define what loss, waste and inefficiency are found in a process or record the measurement of a particular quality item (depending if it is an attribute or variable data item that is being recorded):

- **Variable histograms** summarize the occurrence of data spread according to measured data and the frequency of occurrence of the measurement level. First, designate categories of interest or intervals of measurement, then count the observations of data in each of these categories, and finally construct a bar for each category or interval with its height representing this frequency.
- **Attribute histograms** record the frequency of failure modes for the quality issues anticipated in a product or service for nonconformances to specified outcomes. When this data is ordered by frequency of occurrence and also referenced to all occurrences as a percentage of observations, then this is called a **Pareto Chart**.



All histograms are enumerative statistical methods.

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68

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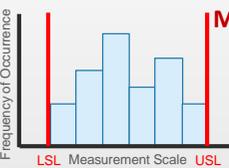


Variable histograms with specifications indicate capability:
Capability analysis compares the “voice of the process” with the “voice of the customer” to answer the question: can this process reliability produce results desired by customers or specified for delivery to customers? The comparison indicates the “robustness” of a process relative to performance expectations.

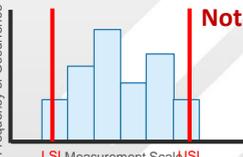


Capable Process

Boundaries of Performance for Customer Acceptability:
LSL = Lower Specification Limit
USL = Upper Specification Limits



Marginally Capable Process



Not Capable Process



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68

69

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METHOD / TOOL REVIEW: VARIABLE HISTOGRAM

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Variable Histogram	




69

70

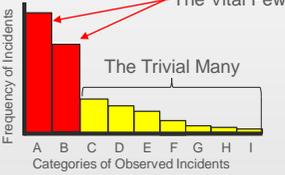
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Attribute histograms indicate likelihood of occurrence:

Pareto Charts indicate how often independent failure events occur in a work process – and follow the “80-20” rule whereby 80% of the problems that are occurring are caused by 20% of the potential causes. This uneven distribution indicates the “Vital Few” issues for focus while the “Trivial Many” may be set aside for future improvement projects.

- Concentrating on the most prominent or frequently occurring problems is a reasonable way to begin the problem-solving process, but it may not fix all problems as some may be from causes that are not independent or using a count may not indicate the cost impact or operational impact of a specific nonconformance outcome.



Frequency of Incidents

A B C D E F G H I
Categories of Observed Incidents

The Pareto Chart does not tell what to do about problems that are identified. It mostly helps to prioritize among the sub-issues.




70

71

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METHOD / TOOL REVIEW: ATTRIBUTE HISTOGRAM – PARETO CHART

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Attribute Histogram – Pareto Chart	




71

72

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Yamazumi Diagram: Stacked bar chart illustrating process waste:

A variant on histograms is a stacked bar chart called the Yamazumi Diagram:

- Yamazumi Diagram represents each process step using a bar that is divided into distinct categories of waste with the portion of each bar colored in a way to represent the percentage of that type of waste that is contained in that particular process step or the percentage of value-adding time.
- There are two categories of waste: **Unnecessary Waste that produces the non-value adding time** (e.g., process wastes, loss or inefficiencies that can be eliminated; **Necessary waste that produces required non-value-adding time** (e.g., required work that need not be optimized but can be minimized as the requirement is just completion of repetitive standard work that customers are ambivalent about).




72

73

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How is a Yamazumi Diagram constructed?

The Yamazumi Diagram combines a process flow with a stacked bar chart:

	Project Kick-Off	Engineering	Purchasing	Manufacturing	Inventory	Assembly and testing
Value-Adding Work	0	10	0	20	0	4
Required Non-Value-Adding Work	0.35	5	1	30	0	8
Non-Value-Adding Work	5.65	16	3	70	30	18

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73

74

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METHOD / TOOL REVIEW: YAMAZUMI DIAGRAM

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Yamazumi Diagram	

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75

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Run charts deliver a big step toward understanding causality:

Displaying raw measurement history in its time sequence of occurrence can provide insights into underlying data patterns that indicate causality:

- Run charts describe the time history of process performance indicating the shortfalls and overachievements of “**process average**” which summarizes the “**expected**” outcome of work from an accounting perspective. If there are any observed patterns that show “**unusual variation**” in results with either “**excessive variation**” or “**performance shifts**,” then this indicates there are “**special causes of variation**” operating on the process which need to be removed in order to stabilize and control the process output.

All time series charts are analytic statistical methods.



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75

76

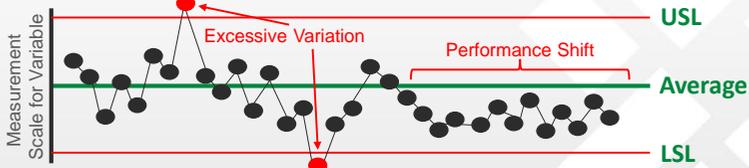
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A Run Chart is a “line graph” using time series data.

A “Run Chart” illustrates time series performance output data and it shows the sequence of events that occur in the operational real world as observed by a process performance measure.

- Two patterns are especially important: “**excessive variation**” or data that is unusual in magnitude in comparison to process average and standard deviation statistics and “**performance shifts**” where the data shifts from one side of the overall average to the other side for a substantial period of time. These patterns are illustrated below:



Data Recorded in Time Series Order of Observation



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77

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METHOD / TOOL REVIEW: RUN CHART

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Run Chart	




77

78

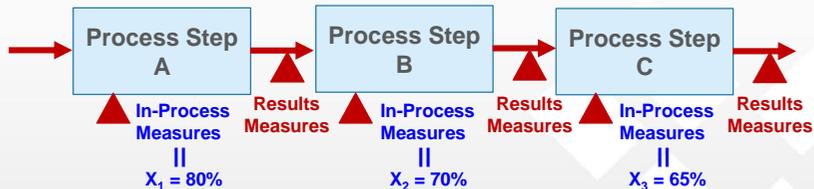
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Example – estimating the productivity of a process outcome:

Rolled Throughput Yield (RTY) indicates product throughput that is produced “right the first time” across all of the process steps.

- Multiplying the correct output productivity of each step in a process results in a statistical called Rolled Throughput Yield (RTY) which indicates the level of output that has been produced without errors in any step.



Rolled Throughput Yield (RTY) = $X_1 * X_2 * X_3 = 0.8 * 0.7 * 0.65 = 36.4\%$



Right the First Time!



78

79

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METHOD / TOOL REVIEW: ROLLED THROUGHPUT YIELD

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Rolled Throughput Yield	




79

80

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How can learning be coaxed out of a problem inquiry using data?

The questions we ask suggest the methods and tools we should use:

- Walking the flow of a work process or tracing the flow of data can help clarify the definition of an issue or determine the source of origin of a problem. As a situation becomes clarified and the location of the source becomes distinct, then more detailed data analysis can be used to scientifically characterize the state of the problem and refine the subjective or heuristic search.
- The tools and methods of this module can be expanded using in-depth means to analyze and further drilldown into data to discover patterns and linkages in data that specify causal circumstances better. This is the learning experience in the Lean Six Sigma Green Belt training program.




80

81

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CLASS DISCUSSION:

- When you conduct a process walkthrough or a data trace does the description of your issue definition or problem statement change? Consider each of the six tools presented in this module as they aid in basic problem diagnosis. How does this set of tools and their sequence help clarify a process upset? Trace such a condition in your project to see what can be learned as you apply the methodology.

Method or Tools	Learning from Application to a Situation
Check Sheet	
Failure Analysis	
Variable Histogram	
Attribute Histogram - Pareto	
Yamazumi Diagram	
Run Chart	
Rolled Throughput Yield	




81

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Basic Problem-Solving for Quality Improvement

Lecture 4: Achieving Remediation of Problems




82

83

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EDUCATIONAL PROGRAM – BASIC PROBLEM-SOLVING:

- Lecture 1: Understanding the Nature of a Problem
- Lecture 2: Solving Problems as a Learning Process
- Lecture 3: Diagnosing the Causal System of Problems
- **Lecture 4: Achieving Remediation of Problems** ←




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83

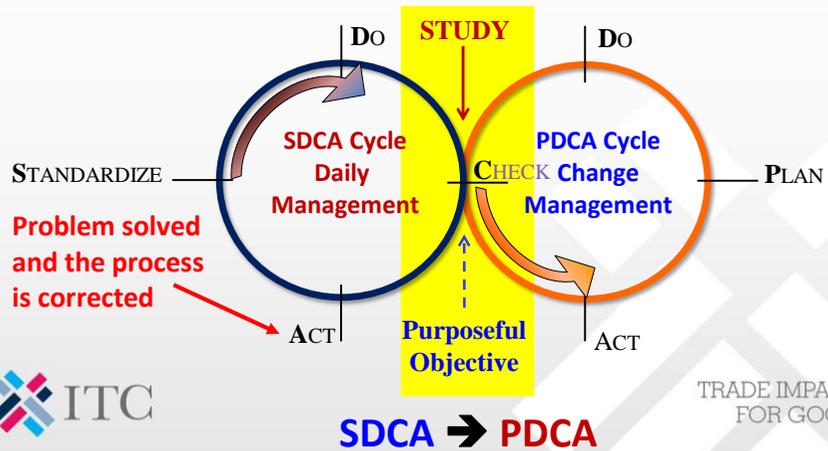
84

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Problem remediation is the “Act” step in SDCA!

What does the following quotation mean to you:
“Without a standard there can be no improvement.”
 ~ Joseph M. Juran



SDCA → PDCA



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How should a problem-solving team close out their task?

The work process or issue addressed must be permanently solved:

- **Risk** must be measured and recurrence of the issue detected. To achieve this two measurements must be monitored. A variables histogram of the process output should be used to monitor results relative to the customer performance requirements and assure risk is minimized and capability to perform the work is maintained. Also, a process run chart should be kept to demonstrate that process **performance** remains within specification limits, operates within a state of control, and remains stable within the designed performance conditions.
- Work standards should be updated to enable workers to control activities and check themselves for **consistency** in quality.



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What can be done to manage measurements at a check point?

The Control Plan specifies measures, sampling rate and sample size:

Control Plans guide process measurement and process quality assessments.

A Control Plan...

Specifies desired output metrics; the measurements their definitions; activities needed to sustain it; and information for future training and/ or trouble-shooting.

Critical Parameter Identification

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

Measurement System Specification

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

Response Characterization

Action Limit	Decision Rule	Countermeasures	SOP Reference



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METHOD / TOOL REVIEW: CONTROL PLAN

- Methods and tools used in problem-solving can be applied flexibly for all kinds of quality improvement activities and the basic set of methods and tools formulate the “kit” that can be creatively applied to improve quality, cost, safety, and efficiency in the way that work is performed. How can this particular method/tool be used to aid in problem-solving in your project team experience?

Method/Tool	How to apply and use it in the real world?
Control Plan	




87

88

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Standardized work holds gains made from process improvement:
Corrective and preventive actions must become embedded in work standards:

- Corrective actions isolate customers from observed issues or problems as a short-term precaution, but do not necessarily assure that long-term control can be maintained in a cost-effective way (e.g., extra work may be required to sort and scrap waste which costs more money than was allocated during the design of the work process.
- Preventive actions are forward-looking and have the effect of maintaining a high-quality output in future performance as the “root causes” of problems are permanently removed from the process design and standard work has been designed to manage work in a way that assures they do not recur.




88

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CLASS DISCUSSION:

- The problem-solving process must revert full-circle back to the standardize step of SDCA after defining and validating the solution. Revising work standards is one of the final steps in problem-solving – the validated solution must be incorporated in the definition of standard work as an updated standard and employees trained into the methodology and evaluated to assure that they understand and can apply the methods flawlessly. What steps does your project team take to assure standards are incorporated into the habits of workers in their daily routine?

Action Taken	Standardized Effect Achieved



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Global Platform for Quality

Personal Quality and Career Development

Instructor: Gregory H. Watson, PhD, EURIng



1

2

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QUALITY 206: PERSONAL QUALITY AND CAREER DEVELOPMENT

The most important type of control is self-control that is exercised by the humans operating in the quality system. This course identifies the key aspects that must be satisfied in order to hold individuals responsible for the quality of their work: standardized methodology that is demonstrated to deliver the desired quality output; documented work instructions that will produce the standard work; training of “process doers” in the methodology so they can demonstrate their ability to perform the tasks satisfactorily; performance measures that will monitor the “process doer’s” work and assure that successful outcomes are achieved; and decision rights delegated to the “process doer” so they can adjust performance within the boundary limits of process control to deliver the desired result. Elements contained in this approach to management of self-control include continual improvement, self-inspection, reflective judgment, self-criticism, and flexible work capability.

Guidance on career development is presented in the final module to focus on professional development and education goals after certification as an Advanced Quality Professional



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3

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EDUCATIONAL PROGRAM – PERSONAL QUALITY AND CAREER DEVELOPMENT:

- Lecture 1: Understanding Accountability for Quality
- Lecture 2: Developing a Quality Mindset
- Lecture 3: Defining Personal Quality Needs
- Lecture 4: Pursuing Personal Professional Development



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Joseph M. Juran on “Personal Quality”

“A key dimension of the management process is the establishment and maintenance of a work climate that encourages and makes it possible for workers to behave in ways that contribute to effective individual and organizational performance. Only management can create the conditions which enable workers to control the processes over which they preside and to participate with management in projects that seek to achieve breakthrough to new quality levels. In turn, the work must provide meaningful rewards to each worker.”

~ Juran’s Quality Control Handbook, 4th edition, 10.1



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Personal Quality and Career Development

Lecture 1: Understanding Accountability for Quality



5

6

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EDUCATIONAL PROGRAM – PERSONAL QUALITY AND CAREER DEVELOPMENT:

- **Lecture 1: Understanding Accountability for Quality** ←
- Lecture 2: Developing a Quality Mindset
- Lecture 3: Defining Personal Quality Needs
- Lecture 4: Pursuing Personal Professional Development



6

7

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Satisfaction of what conditions does it take to hold a person accountable for the quality of their work?

Management must assure that three conditions must be satisfied:

- The job has been designed in such a way that it satisfies the performance need of the process and that people performing the job have been trained so they possess the skills and competence to perform the work.
- Objective measurements may be taken to assure that the quality of work is meeting the requirement for performance and that targets are understood by the workers.
- Workers are delegated the decision rights necessary to self-regulate the daily management of their work to assure successful performance.



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How does job design relate to quality?

Job design must assure that quality work can be repeatedly performed.

- What are the outputs expected of this job?
- What tasks are required to complete these outputs?
- What is the quality required for the output?
- How do each of the tasks contribute to producing overall quality output?
- What specific skills must workers possess to do this quality job effectively?
- What specific tasks must be managed to complete this work efficiently?
- How can employees be developed in a way that demonstrates these skills?



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How do performance measurements assure quality work?

Work measures must define quality outcomes and assure quality processes.

- What outcome measurements are most meaningful to customers?
- How is the data supporting these measurements captured objectively?
- What is the level of customer performance expectations by market segment?
- What is the minimum level of expectation of performance by customers?
- What targeted level of performance should become the performance goal?
- How is the data captured to support these measures?
- How well is the measurement system specified, documented and tested?



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How do decision rights assure quality work?

Decision rights allow workers to adjust processes within limits to deliver results.

- Where are the limits of performance established for monitored measures?
- What can workers do to adapt their process activities in response to the data changes in the monitored measures that they observe?
- What happens if additional resources are required to support the process? Is it possible for workers to request support? Is there a clear process for the escalation of a request to management level with proper decision authority?
- What worker decisions are possible to prevent poor customer deliverables?



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CLASS DISCUSSION:

- Satisfying each of the three requirements needed before holding workers to be accountable for the quality results of their activities is a responsibility of managers. How can each of these three needs apply to the development and management of your own career? How can paying attention to these three questions help you to guide your career development in a more effective manner?

Problem Characteristic	Lesson Learned
Competence Development	
Performance Measures	
Decision Rights	




11

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Personal Quality and Career Development

Lecture 2: Developing a Quality Mindset




12

13

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EDUCATIONAL PROGRAM – PERSONAL QUALITY AND CAREER DEVELOPMENT:

- Lecture 1: Understanding Accountability for Quality
- **Lecture 2: Developing a Quality Mindset** ←
- Lecture 3: Defining Personal Quality Needs
- Lecture 4: Pursuing Personal Professional Development



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What is a “Quality Mindset” and how do you develop it?

Quality Mindset is to a person as Quality Culture is to an organization:

- **Quality Mindset:** A predisposition or mental attitude that conditions or predetermines a person’s interpretations of and responses to any given situation – it implies an inclination or a habit to interpret and respond to circumstances in a way that is consistent with quality principles.
- **Bias toward Action:** A quality mindset acts without thinking according to the set of embedded quality principles and embodies the SDCA-PDCA logic of continual improvement cycles coordinated with standardization.
- **Quality Action:** All action represents an interplay between permanence and change.



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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”).




15

16

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Architecture of the company-wide improvement system – 2:

Organizational Quality Culture

Business Assessment	Strategic Management	Business System
Strategic Benchmarking	↓	
Performance Management	↓	
Operational Benchmarking	Systems Engineering	

Cross-Functional Management

Hoshin Tenkai – Policy Deployment






16

17

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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
<ul style="list-style-type: none"> • Inhibitive • Mechanistic • Mindless • Static • Risk-avoiding • Closed • Collusive • Opaque 	<ul style="list-style-type: none"> • Innovative • Adaptive • Mindful • Dynamic • Risk-embracing • Open • Accountable • 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.




17

18

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Leadership: Constructive or destructive?

What type of leader are you?

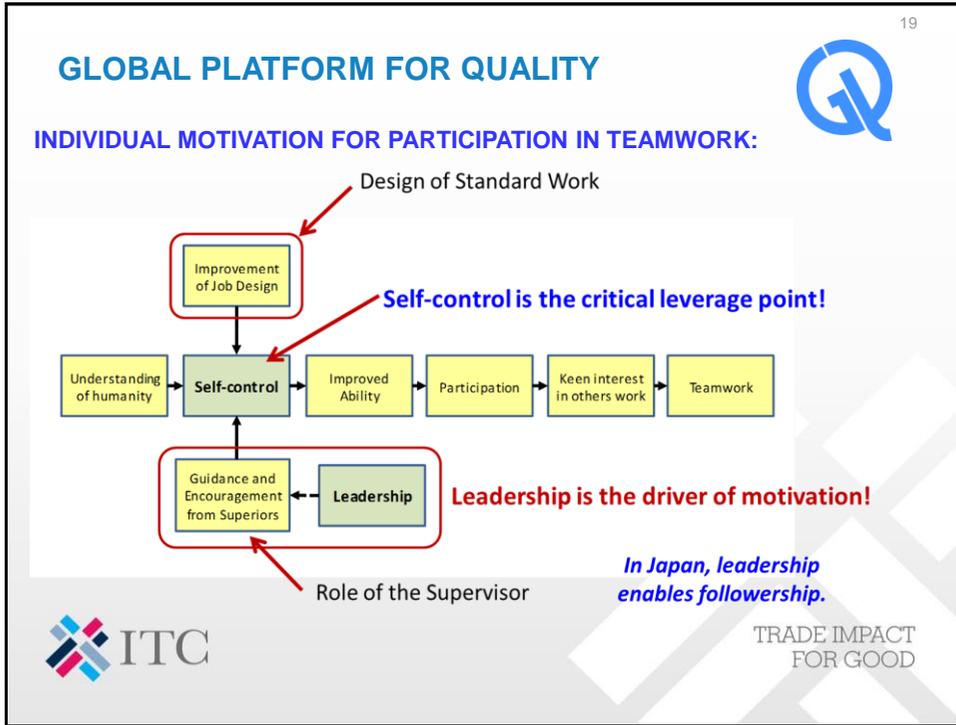


Constructive: share maximum information with workers; use power carefully, mindfully and vigilantly; create conditions that motivate; are obsessed with performance and results; eliminate poor behavior among workers: review wins and losses with equal passion and discipline; adjust goals to ensure they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

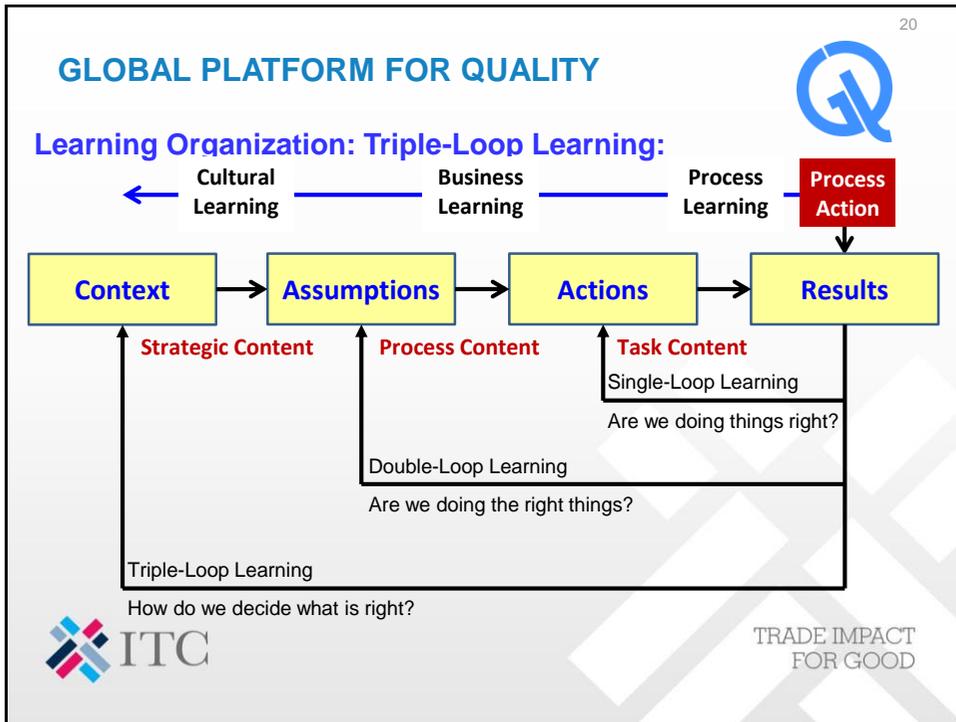
Destructive: keep information secret and compartmented; abuse power so it makes themselves appear "better" and others "lesser;" takes credit for work of others; apply pressure, fear, and authority to "motivate;" myopically focus on financial results; tolerate poor personal behavior in workers if the 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.




18



19



20

21

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Characteristics of a Quality Mindset

What practices would a person follow to indicate a quality mindset?

Elements of a supportive humanistic quality culture:

- Customer sensitivity
- Respect for humanity
- Teamwork and consensus-based decisions
- Responsibility management
- Process-orientation
- Doing what makes sense
- Standard work
- Statistical thinking
- Problem-solving
- Decision-making and management using objective facts:
 - Data-based
 - Empirically-based
 - Evidence-based decision-making)
- Goal-directed achievement



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How would a high-performing Quality Professional act?

What separates a top-performer from those who just do the basic job?

- In a survey conducted of Hewlett-Packard quality managers there were 16 characteristics that contributed to positive performance and one that was predictive of negative performance. The sixteen positive factors were:
 - Customer-oriented
 - Customer advocate
 - Organizationally astute
 - Influencing
 - Interpersonally diagnostic
 - Goal-oriented
 - Persistent
 - Planning and organization
 - Mentors subordinates
 - Collaborative
 - Initiating
 - Professional
 - Conceptual
 - Innovative
 - Communicative
 - Self-confident
- The negative characteristic? “Communication style of command & control!”

Nobody likes to be controlled by someone else!



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The “reflective person” manages their own career:
How does self-reflection aid to steer personal development?

A “reflective person” creates discipline in daily work by applying four attitudes which must be practiced diligently in the operation of the daily management system:

- **Ownership.**
- **Reflection.**
- **Second Pair of Eyes.**
- **Self-Management.**



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The “reflective person” manages their own career:
How does self-reflection aid to steer personal development?

- **Ownership** encourages workers to accept responsibility for the quality of their actions and seek its continual improvement of standard work. Workers must create and maintain a clean and safe work environment avoiding conditions called the **3D's: Dirty, Dangerous, and Difficult or Demeaning.**



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25

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The “reflective person” manages their own career:
How does self-reflection aid to steer personal development?

- **Reflection** relates to mental acts that increase self-awareness applying self-reflection, meditation, introspection, or contemplation. This occurs during the “Check” step of PDCA and SDCA. It marks acceptance of a problem and that the work was committed wrongly. Workers must develop a sense of shame (loss of pride in their work) that they didn’t perform correctly and accept their obligation to perform these tasks properly, and commit to improving work in the future.



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26

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The “reflective person” manages their own career:
How does self-reflection aid to steer personal development?

- **Second Pair of Eyes** suggests that sometimes workers may be too close to a problem and this keeps them from seeing what is wrong with their process – they have become so accustomed to waste, that it no longer appears as waste to them. Using local improvement teams to conduct an inquiry into the problem provides the “fresh eyes” from colleagues to help those having problems in carrying out this specific work in the daily management system.



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The “reflective person” manages their own career:
How does self-reflection aid to steer personal development?

- **Self-Management** means that every worker must manage quality of their own work output or results operating independently as a self-controlled management system and they must also evaluate the quality of work that is provided to them as input to assure that the quality is right. Thus, the link of all processes becomes a self-directed management system that operates in a synergistic way to achieve the common output with desired quality levels.



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CLASS DISCUSSION:

- A person’s quality mindset is very strongly related to an organization’s quality culture. How do you determine if you are a “good fit” to the cultural needs of an organization? Below is a list of five characteristics of a sound organizational culture that might characterize a quality company. What characteristics of a person’s own mindset be particularly aligned with each of these five elements?

Organizational Quality Culture	Pesonnal Quality Mindset
Managing by fact using data	
Working in teams	
Goal-oriented behavior and achievement	
Customer-focus and advocacy	
System-oriented management process	



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Personal Quality and Career Development

Lecture 3: Defining Personal Quality Needs




29

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30

EDUCATIONAL PROGRAM – PERSONAL QUALITY AND CAREER DEVELOPMENT:

- Lecture 1: Understanding Accountability for Quality
- Lecture 2: Developing a Quality Mindset
- **Lecture 3: Defining Personal Quality Needs** ←
- Lecture 4: Pursuing Personal Professional Development




30

31

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As Organizations Grow in Size Specialization is Necessary

There are several areas of professional development available in quality:

- Quality Manager – Responsible for management of the quality function.
- Quality Trainer / Facilitator – Responsible for delivering quality training and facilitating team activities.
- Quality Engineer – Responsible for technical analysis of quality problems.
- Quality Auditor – Responsible for conducting internal quality assessments.
- Other skills that are necessary to support quality in a large organization are the skills of Quality Technician, Measurement and Calibration Technician.



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32

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Developing Your Ability as a Manager

The Role of the Quality Manager includes:

- Responsibility for external communication with customers regarding the quality system especially dealing with resolution of customer problems.
- Responsible for managing the internal quality function, including training, document management, monitoring daily management system metrics, auditing work performance, overseeing production activities, and setting policy, strategic plans, and internal reviews.
- Reports to the business leader (or leadership team in a large organization).



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32

33

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Developing Your ability as a Trainer/Facilitator

The Role of the Quality Trainer / Facilitator includes:

- Responsible for defining the skills and competence required to effectively manage the organization.
- Responsible for designing, developing, and delivering training to assure that critical skills and competence are developed within all people.
- Responsible for determining the competence of all employees to perform the work that they are assigned to do.
- Reports to the Quality Manager (or the Human Resource Manager with an informal relationship to the Quality Manager).



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34

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Developing Your Ability as an Engineer

The Role of the Quality Engineer includes:

- Responsibility for technical analysis of reliability and maintainability issues in product designs and production systems design and operation.
- Responsible for technical problem-solving of complex engineering issues or technical problems that arise with respect to products or operating systems that are beyond the ability of the workers to manage.
- Reports to the Quality Manager for professional skills development and may report to the appropriate manager in Product Development or Operations for specific operational duties.



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34

35

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Developing Your Ability as an Auditor

The Role of the Quality Auditor includes:

- Responsible for conducting an independent assessment of the operation of the organization with respect to performance and satisfaction of all quality-related requirements. Acts on behalf of the senior management team.
- Responsibilities include: designing random audit schedules, planning and conducting audits, reporting results to management, and also conducting follow-up reviews to assure adverse audit findings have been corrected.
- Reports to the Quality Manager for professional skills development and for management issues but reports findings to the senior management team.



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CLASS DISCUSSION:

- Not all of these roles need to be added to an organization at the beginning. First, an organization may have just one person applying all roles. As the organization is growing different roles may be added. Discuss in your team what makes sense for adding roles to an organization? What could trigger a need to increase complexity in the quality organization as a top priority for the whole over other needs?

Professional Role	What will trigger the need to develop this role?
Quality Manager	
Quality Trainer/Facilitator	
Quality Engineer	
Quality Auditor	
Quality Technician	



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Personal Quality and Career Development

Lecture 4: Pursuing Personal Professional Development




37

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38


EDUCATIONAL PROGRAM – PERSONAL QUALITY AND CAREER DEVELOPMENT:

- Lecture 1: Understanding Accountability for Quality
- Lecture 2: Developing a Quality Mindset
- Lecture 3: Defining Personal Quality Needs
- **Lecture 4: Pursuing Personal Professional Development** ←




38

39

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Technical Skills Development

What do you need to improve to perform the job that you are doing or want to do next?

Conduct a personal reflection regarding your skills and competence in them:

- **Computer skills:** Microsoft Word, PowerPoint, and Excel.
- **Analysis Skills:** Work Analysis, Process Mapping and Analysis, Problem-Solving, Failure Analysis, Statistical Analysis, and Data Visualization.
- **Managerial skills:** Human Interpersonal and Facilitation skills, Report development and graphical presentation skills, personal assessment and evaluation skills, resource management and budgeting skills, and planning and scheduling skills.



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Human Skills Development

What do you need to improve to work with others in your job?

Conduct a personal reflection regarding your skills and competence in them:

- **Interpersonal skills:** team-building skills, collaboration skills, interpersonal diagnostic skills, human problem-solving skills, and conflict resolution skills.
- **Facilitation skills:** group management skills, questioning skills, team/meeting management skills, consensus development skills, and report presentation skills.



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GLOBAL PLATFORM FOR QUALITY



CLASS DISCUSSION:

- Career development is a personal activity – it requires that you know yourself and evaluate your personal capacity to learn and grow on the job. What is it that gives you the most challenge and motivates you to want to work? How does this activity relate to needs of the organization where you work? What are your strengths and what development opportunities do you require? List the top five skills and identify what you must do to improve your performance in each area.

Critical Skills Required	Focus Areas for Personal Development



TRADE IMPACT
FOR GOOD